Conceptualizing Household and Neighbourhood Safety From Wildfire in Australia

Karl Anthony-Harvey-Beavis, Royal Melbourne Institute of Technology (RMIT), Bushfire CRC
Alan Rhodes, Country Fire Authority (CFA), Royal Melbourne Institute of Technology (RMIT), Bushfire CRC
Gerald Elsworth, Royal Melbourne Institute of Technology (RMIT), Bushfire CRC

Introduction

In recent years major fires have taken a heavy toll on communities around Australia. Recent inquires into major fires and reviews of fire prevention have addressed a common set of themes relating to improved community safety (Auditor General Victoria 2003; Esplin, Gill et al. 2003; Mcleod 2003; Ellis, Kanowski et al. 2004). Fire agencies across Australia have generally acknowledged that when a major bushfire occurs they do not have the resources to defend every home that may be in danger. In the past decade there has been a shift amongst emergency management organisations to acknowledge that reducing the risk from hazards, such as fire, will be enhanced by the level of community preparedness and the ability of the community to respond effectively. Many emergency management organisations, including fire services have adopted a risk management approach with greater emphasis on prevention, mitigation and community preparedness (Smith, Nicholson et al. 1996).

A key element of this shift has been a focus on involving communities in partnerships with emergency services organisations to deal more effectively with risks. In this new paradigm, a safe community has been defined as, 'locally organised and resourced, well informed about local risks, proactive in prevention, risk averse, motivated and able to manage the majority of local issues through effective planning and action' (Hodges, 1999, p.2). The notion of community self-reliance is often used to encapsulate these ideas. In addition, more traditional approaches to dealing with bushfire risk such as regulations and restrictions on the use of fire, fire prevention planning, land use planning, building codes and standards, and prescribed burning are also used as part of comprehensive and integrated suite of methods of dealing with the bushfire risk.

Increasingly, organisations are seeking ways to engage more effectively with communities to both promote greater understanding by providing information, but also to increase community involvement in the issues through consultation, and by enabling communities to share in decision making on these issues. Fire services and land management agencies now frequently advocate the importance of partnerships with both other organisations and with the community in order to achieve common goals.

At present there is little understanding of how effective this approach and the associated programs are, and, if indeed they are effective, for which households and communities and in what particular settings they work best, and how. This paper describes the first step in a research program designed to develop a comprehensive framework and methodology for evaluating the broad range of community safety programs from a theory and evidence-based perspective (Lipsey 1993; Kazi and Spurling 2000; Kazi and Rostila 2002; Pawson 2003; McGuire 2005). Concept mapping was used to identify the range of potential outcomes for community safety programs and provide a starting point for the development of a program logic model and a more elaborated program theory.

AES Head Office: PO Box 5223 Lyneham ACT 2602 **ABN** 13 886 280 969
Ph: +61 2 6262 9093 **Fax:** +61 2 6262 9095
Email: aes@aes.asn.au **Website:** www.aes.asn.au

Concept Mapping

The term 'concept mapping' can be applied to any process that allows a diagrammatic representation of the way an individual or group thinks about the content and relationships associated with a specific object, idea or issue. The particular method of concept mapping used during the current research is based on the work of William M. K. Trochim and used his program, The Concept System. This methodology is particularly suited to work with groups of participants to develop a conceptual framework as a guide for program planning and/or evaluation (Trochim and Linton 1986; Trochim 1989; Trochim 1989).[1]

Participants

Fire agency personnel as well as community members took part in eleven concept mapping workshops. Table 1 shows the location and number of participants from each group.

Table 1: Distribution of participants across the 11 Concept Mapping workshops

	Community Group	Bushfire Agency
New South Wales	2 workshops – 6, 7 participants	2 workshops – 5, 6 participants
South Australia	1 workshop – 10 participants	1 workshop – 12 participants
Tasmania	1 workshop – 8 participants	1 workshop – 7 participants
Victoria	1 workshop – 10 participants	1 workshop – 9 participants
Western Australia	-	1 workshop – 6 participants

Method

As an initial step participants were asked to brainstorm ideas in response to the statement:

> *'Thinking as broadly as possible, generate statements that describe specific changes or improvements you think need to be achieved to make households and neighbourhoods safer from bushfires'.*

The brainstormed statements were printed onto individual paper slips and returned to participants. Each person was then asked to sort the statements into piles that '*made sense to them'*. Participants were free to sort the statements in any way they chose, with the following restrictions: (a) More than one pile should be used; (b) the number of piles should be less than the number of statements; (c) there should not be a 'miscellaneous' pile; and (d) statements that cannot be sorted into a pile should be placed singly, in their own pile. Participants were also asked to rate each statement on two five-point scales according to the *importance* of achieving the change or improvement and the perceived *difficulty* in implementing it.

During a break in the proceedings, a two-stage, computer assisted analysis was done using the sorted statements. The first step involved the use of multi-dimensional scaling (MDS) to array the statements in two-dimensional space according to the degree of similarity between each statement. This procedure resulted in a two-dimensional 'point-map' on which each statement was represented as a single point on the map and where the closeness (proximity) of two points was a measure of the similarity (common meaning) of the statements as perceived by the group as a whole.

[1] The concept mapping workshops were facilitated by Roy Batteram, Plexus Consulting, Melbourne.

AES Head Office: PO Box 5223 Lyneham ACT 2602 **ABN** 13 886 280 969
Ph: +61 2 6262 9093 **Fax:** +61 2 6262 9095
Email: aes@aes.asn.au **Website:** www.aes.asn.au

Following the creation of the point-map, a further procedure known as Hierarchical Cluster Analysis was carried out. The Hierarchical Cluster Analysis involved the grouping of the two closest, individual points into a single cluster; this was repeated until the number of clusters equalled approximately one-fifth the number of statements (the default for the particular program that was being used). The clustering results can be portrayed by a structured listing of the brainstormed statements or as a two-dimensional map (the Cluster Map) where the point-map is overlayed by lines that mark the cluster borders.

During the final stage of each concept mapping workshop the participants were presented with copies of the Point-Map, the Cluster Map and a list showing which statements made up each cluster. They were then asked to name each cluster and suggest any alterations they felt would be appropriate. Finally participants were asked to note anything that they felt was missing from the final concept map.

Post Workshop Analysis

The lists and maps generated during the workshops were very useful in providing feedback to participants and for eliciting their interpretation of the structure in the statements generated. However, the statistical analysis available in the Concept System program is quite limited (in particular, the MDS solution is restricted to two dimensions where, frequently, a three-dimensional solution may be necessary to represent adequately the complexities in structure in the data). In order to achieve a more precise statistical representation of the results, data from the workshops were re-analysed using the specialised cluster analysis and MDS program Clustan Graphics (Wishart, 2004).

Comparisons of the results obtained in the concept mapping workshops with a three-dimensional MDS solution using Clustan Graphics showed the three-dimensional solution typically yielded a more detailed and precise representation. For this reason all workshop results were re-analysed using Clustan Graphics. Firstly a three-dimensional MDS solution was calculated. Then the statements, arrayed along these three dimensions, were analysed by hierarchical cluster analysis (Ward's method) and the optimal ('best-cut') number of cluster suggested by the program was selected as the starting-point for interpretation. This cluster number was sometimes modified in order to locate the solution that provided the most interpretable separation of clusters and coincided well with the workshop solution agreed by participants.

The primary result of this analysis was a series of three two-dimensional scatter-plots on which the cluster solution (identified by differently coloured points) was arrayed across Dimensions 1 and 2, Dimensions 1 and 3 and Dimensions 2 and 3. These three plots are analogous to the single Cluster Map provided by the Concept System program. Each member of the research team independently examined each of the new cluster maps, naming both the axes and the clusters.[2] A final consensus on the best representation of the results of each workshop was reached in a series of group meetings following this individual work.

Synthesis of Results across the 11 Workshops

Following the re-analysis of the data using Clustan Graphics a further meeting of the research team was conducted to achieve a synthesis of the concepts developed in the community and agency concept mapping workshops. The synthesis was achieved using a process that could be described as a qualitative version of Ward's method. For the meeting, cluster names were written on A4 sheets of paper and displayed on the meeting room walls. The group started off by pairing the cluster names that were most similar in meaning, justifying each pairing as it was suggested. After a small number of pairs was established, the group worked in an hierarchical fashion, adding cluster names to already established pairs. When all individual cluster names had been included in a synthesized group, each was named and a final revision was undertaken. This procedure yielded 14 general concepts that are outlined below.

[2] The team involved in this step comprised Karl Anthony-Harvey-Beavis, Gerald Elsworth, John Gilbert, Helen Goodman, Sandra Nolte and Alan Rhodes

AES Head Office: PO Box 5223 Lyneham ACT 2602 **ABN** 13 886 280 969
Ph: +61 2 6262 9093 **Fax:** +61 2 6262 9095
Email: aes@aes.asn.au **Website:** www.aes.asn.au

Results

As an example of some of the results generated in each individual workshop, Figure 1 shows a cluster map from one of the community group workshops, using the Concept System program. Seven clusters of statements were identified and named by the workshop participants (see Figure 1). During the final discussion, the group also identified two broad regions of their concept map (*Education, Information and Advice*; *Preparation of Your Household and Neighbouring Households*), suggested that Clusters 5, 7 and 6 were causally related to Clusters 2, 3 and 4, and noted that the workshop process had not suggested any specific implementation strategies that might be used to achieve the outcomes identified in the map.

Reanalysis of the card-sort results using a three-dimensional MDS solution in Clustan Graphics also yielded seven-clusters that were, however, somewhat differently characterised by the research team. The reanalysis revealed a slightly different grouping, with a new cluster concerned with householders with special needs emerging, as well as two clusters relating to educational activities essentially merging into one named *Community Education to Improve Individuals Understanding and Knowledge*. This process was followed for all eleven workshops.

Synthesis of the Clustan Graphics results from the 11 workshops yielded 14 general concepts. Twelve were derived from the results of both community and agency workshops while two were derived from community workshops only and one from agency workshops only. Thirteen of the 14 general concepts were derived from the results of more than one workshop. The 14 concepts together with a summary of their content are listed in Table 2.

Table 2: Synthesised Concept Names and Descriptions

Concept #	Concept Name	Concept Description
1	Agency/Community Interaction	The flow of information between agencies and the public, before an incident occurs, with the aim of increasing resident awareness of the risks posed by bushfire as well as encouraging preparation to mitigate those risks.
2	Household/Neighbourhood Planning & Preparation	The formulation of a plan that outlines an appropriate response to a bushfire and preparation that enables the chosen plan to be implemented.
3	Deciding & Planning for 'Stay or Go'	Understanding of the issues surrounding the 'Stay or Go' message as well as making decisions about what individuals or households will do when threatened by bushfire, based on accurate information.
4	Use of Incentives to Achieve Preparedness	The use of incentives to encourage preparedness or, conversely, the use of penalties to discourage inappropriate or risky behaviour.
5	Understanding/Application of Regulations for Bushfire Safety	The need for appropriate legislation to be put in place and enforced as well as ensuring community members and local governments understand why those laws are necessary.
6	Policy Framework for Agency & Organisational Roles	Ensuring the fire agencies implement appropriate policies and procedures to support community safety initiatives.
7	Principles Underpinning Program Development & Adult Learning	The importance of creating an environment conducive to effective learning by adults/
8	Individuals/Community have a Realistic Understanding of Risk	The focus of the statements in this cluster is on the importance of community members understanding the range of factors that influence risk.
9	Appropriate Information/Education Activities	The provision of education, to a range of groups and using a number of different methods.
10	Greater Community Ownership &	The statements in this cluster are about community members taking

AES Head Office: PO Box 5223 Lyneham ACT 2602 **ABN** 13 886 280 969
Ph: +61 2 6262 9093 **Fax:** +61 2 6262 9095
Email: aes@aes.asn.au **Website:** www.aes.asn.au

	Responsibility for Bushfire Safety	increased responsibility for their own safety, planning for themselves and the communities they belong to.
11	Agency/Inter-Agency Responsibilities & Co-ordination	Within cluster 11 the researchers have identified two related, yet distinct concepts. The first relates to agency responsibilities for the community. The second relates to the intra-agency relationship between the operational branches of an agency and those concerned with community safety initiatives.
12	Effective Communication of Information during Bushfire	The majority of statements in this cluster are concerned with the way in which fire agencies deliver information to community members during a bushfire. Another element expressed in cluster 12 is that to improve community safety from bushfire, systems need to be implemented that enable community members to communicate information to fire agencies, making use of local knowledge.
13	Neighbourhood & Community Networks & Partnerships	The majority of people are, in some way part of community networks. These networks will influence the capacity of communities to self-organise, and to work effectively with fire agencies, and other authorities. The networks will also influence community resilience and sustainability of community safety efforts.
14	Community & Agency Responsibilities to Address Specific Needs	Statements in this cluster are related to very specific, local issues, offering practical solutions to identified problems.

From the Concept Mapping Results to a Program Logic Model

A common criticism of program logic models is that they are merely *ad hoc* representations of linkages between program activities and presumed outcomes. Thus, for example, Chen (1990) described a program logic as "…simply a series of ad hoc logical premises about how the program elements fit together". Additionally, a frequent criticism is that many program logics are merely extended 'black-box' models, linking 'inputs' to presumed 'outputs' and 'outcomes' in a linear chain with little or no information about the processes that might be thought to bring about the apparent linkages (it should be noted, however, that Funnell's (1997; Funnell 2000) program logic matrix is a notable exception). That is to say, many logic models simply obfuscate the very problem the idea of a program logic model or theory was meant to address.

Leeuw (2003) suggested that one general way to reconstruct program theories was to use one of a variety of approaches to generating 'mental models' or 'cognitive maps' of program processes and outcomes. A small number of recent studies discuss the possible use of structured concept mapping as the source of these 'mental models' in the development of program logic models or program theories (Yampolskaya, Nesman et al. 2004; Rosas 2005; Anderson, Gwaltney et al. 2006). Yampolskaya et al. provide the most extensive account of the method used in generating a program logic model from a concept map in their study of a (US) state-wide community-based agency providing mental health services for children with multiple needs. They describe an iterative three-step process in which: (a) the evaluation team filled out a pro forma logic model diagram using concept mapping results; (b) this model diagram was reviewed in a discussion with program staff (who had previously generated the concept map) and some minor modifications were made; and (c) a final review by the evaluation team was undertaken and the result checked with program staff. A central element of the resulting logic model is a set of four 'categories of service' and lists of associated activities that are directly based on the results of the brain-storming and clustering components of the concept mapping workshop. The service activities are subsequently subsumed under two general 'strategy' dimensions ('assessing conditions' – 'changing conditions'; 'individual activities' – 'team activities') derived from an examination and naming of the apparent axes of the two-dimensional point map.

AES Head Office: PO Box 5223 Lyneham ACT 2602 **ABN** 13 886 280 969
Ph: +61 2 6262 9093 **Fax:** +61 2 6262 9095
Email: aes@aes.asn.au **Website:** www.aes.asn.au

One evident strength of the 'mental models' approach to program logic development, seen clearly in the Yampolskaya et al. study, is that the implicit theories held by practitioners provide a potentially rich source of ideas and hypotheses about program processes and mechanisms and the ways these might usefully be classified and linked. As the present study yielded multiple concept maps that were consolidated retrospectively by the project team, an approach to program logic development was evolved that did not necessitate (at this stage) further work with the community and agency groups who provided the initial concept mapping data. Additionally, an attempt was made to represent the nature of the causal processes implicit in the arrows linking the concepts in the logic model by seeking to identify the most appropriate linking word (or phrase) for selected pairs of concepts. Linking words are a critical feature of freehand concept maps (Novak and Gowin 1984; Novak Undated) but aside from the inventive application by McClintock (McClintock 1990; Greene and McClintock 1991) to a hospice program they appear to have been rarely (if ever) used in program logic models in the evaluation literature.

A feature of the 14 generic 'community safety' concept clusters that became clearly evident during their development from the results of the individual concept mapping workshops by the project team was that the concepts extended across at least three 'levels' of desired change: individual and household; community and local bushfire agency; central agency and policy institution. These three 'levels', together with the elements of a typical context (or input)/process/outcomes model, were initially used to form a two-dimensional matrix and the 14 generic concepts were sorted into the matrix cells. Next, using the elements of the 'context/process/outcomes' dimension together with any 'causal arrows' in the workshop maps to suggest the possible causal direction, pairs of concepts that potentially represented strong proximal (and more distal) links were selected by one member of the project team. Linking words or phrases that appeared best to represent the nature of the relationship were identified and checked (and modified) for the accuracy of their 'meaning in context' using the on-line version of WordNet (Fellbaum 1998). Finally, the resulting logic model (Figure 3) was reviewed by all members of the project team.

One particular use of this kind of generic program logic model is, we believe, worth highlighting. At present, the project team is working on the application of a theory-based approach to evaluating community safety for bushfire in relation to three broad kinds of initiative: (a) community education programs; (b) community development programs that might utilise, or alternatively seek to develop, existing community infrastructure and strengths; and (c) regulatory initiatives, frequently requiring inter-agency partnerships. A generic logic model can be used as a starting point for conjecturing about the more detailed theory that might underpin each of these three types of initiative, and about a theory for specific examples within each type. Figure 4 shows a portion of the generic model that might usefully form a starting point for development of a logic model for community education programs for bushfire. Using the language developed by Tilley (2004) to distinguish the intended (STD - "Supposed to Do") from the unintended (OAD – "Otherwise/Also Does") outcomes of a program, the STD causal pathway for a community education program is contrasted against one possible OAD pathway where the 'ultimate outcome' of *Enhanced Community Safety From Bushfire* is potentially achieved by an increased householder understanding of regulatory interventions (e.g. building codes, fire-ban days) associated with bushfire safety in addition to (or instead of) the modelled community education intervention.

Towards a More Elaborated Program Theory

The structured concept mapping, and the subsequent cluster analysis deal with these statements based on the frequency with which workshop participants grouped the statements together. Statements were grouped together because participants saw some similarity between statements or identified a common theme in the statements. This common element underpins the naming of the clusters in both the workshop and subsequent analysis by the research team. However, often the 14 general clusters contain statements that reflect different dimensions of the central idea or extensions of the central theme (cluster name). For example, the statements in the cluster *Agency/community interaction*, relate to 'coordination

AES Head Office: PO Box 5223 Lyneham ACT 2602 **ABN** 13 886 280 969
Ph: +61 2 6262 9093 **Fax:** +61 2 6262 9095
Email: aes@aes.asn.au **Website:** www.aes.asn.au

between agencies' working with the community, 'developing agency capacity' to enable them to work effectively with the community, 'importance of community understanding' of a partnership approach to fire prevention, and reference to various 'strategies and outputs' that flow from agency/community interaction. Many of the statements in the clusters also refer directly to, or infer particular processes necessary to sustain effective agency/community interaction, such as 'interactive communication', or 'agency support for community action'. In some cases the clusters contain statements that appear more closely related to another cluster altogether but have been grouped in the particular cluster because of a perceived similarity, for example where workshop participants grouped statements relating to 'increased preparedness', 'planning' or 'accurate information during a fire' in the clusters forming the general cluster agency/community interaction, perhaps because they saw these as outcomes of effective interaction between agencies and the community.

The diverse array of statements in each cluster reflects the complexity of the concepts embedded within each cluster, rather than a sign of inaccurately grouped statements. As such, disentangling the different dimensions and elements within each cluster provides an opportunity to elucidate more completely the concepts underpinning community safety outcomes.

A qualitative analysis of the statements in each cluster was undertaken by one of the research team. The statements in each cluster were read and coded as 'elements' that emerged within each cluster. These elements were then mapped onto a three-level schematic of the macro 'organisation/policy' level, an intermediate 'community/neighbourhood' level, and the micro 'individual/household' level, and a series of 'processes' identified in the statements by their role in connecting, in various ways, the elements located on each level. The schematic also reflected a general 'causal' path from left to right at each level.

Figure 4 shows the schematic populated with the elements identified in the 14 general clusters and Figure 5 shows the processes operating between the various levels. The elements in Figure 4 are similar to the 14 general clusters however there are some that are more elaborated. For example, the three elements 'organisational values', organisational coordination' and 'clarity of organisational role/function' emerged from several of the 14 general clusters, namely, 'agency/community interaction', 'understanding/application of regulations for bushfire safety', 'individuals and community have a realistic understanding of risk', and 'community and agency responsibilities to address specific needs'. Figure 5 shows a number of processes and mechanisms that were also identified across several of the general clusters and which form an overlay of mechanisms operating across the various outcomes.

This elaboration of the 14 general clusters into multiple elements and processes in a rough causal sequence outlines a generic program theory of community safety outcomes that is consistent with a realist theoretical perspective (Pawson and Tilley 1997). It provides a basis from which to identify community safety outcomes, the logic of the relationships between outcomes in the community safety approach, the ways in which possible mechanisms may operate to bring about these outcomes, and some of the conditions necessary to achieve such outcomes.

References

Anderson, L. A., M. K. Gwaltney, et al. (2006). "Using concept mapping to develop a logic model for the Prevention Research Centres Program." Preventing Chronic Disease [Serial On-line] **3**(1): 1-9.

Auditor General Victoria (2003). Fire Prevention and Preparedness. Melbourne, State Government of Victoria.

Chen, Y. T. S. (1990). Theory-driven Evaluations. Newbury Park: CA.

Ellis, S., P. Kanowski, et al. (2004). National Inquiry on Bushfire Mitigation and Management. Canberra, Commonwealth of Australia.

AES Head Office: PO Box 5223 Lyneham ACT 2602 **ABN** 13 886 280 969
Ph: +61 2 6262 9093 **Fax:** +61 2 6262 9095
Email: aes@aes.asn.au **Website:** www.aes.asn.au

Esplin, B., A. M. Gill, et al. (2003). Report of the Inquiry into the 2002-2003 Victorian Bushfires. Melbourne, State Government of Victoria.

Fellbaum, C. E. (1998). Wordnet: An electronic lexical database. Cambridge: MA, Bradford Books.

Funnell, S. (1997). "Program logic: an adaptable tool." Evaluation News and Comment **6**(1): 5-17.

Funnell, S. (2000). Developing and using a program theory matrix for program evaluation and performance monitoring. Program Theory in Evaluation: Challenges and opportunities. P. Rogers, T. Hacsi, A. Petrosino and T. Huebner. SanFrancisco, Jossey-Bass Publishers. **87:** 91-101.

Greene, J. C. and C. McClintock (1991). "The evolution of evaluation methodology." Theory Into Practice **30**(1): 13-21.

Kazi, M. and I. Rostila (2002). The practice of realist evaluation in two countries. European Evaluation Society Fifth Conference, Sevilla, Spain.

Kazi, M. and L. J. Spurling (2000). Realist evaluation for evidence-based practice. European Evaluation Society Fourth Conference, Lausanne, Switzerland.

Leeuw, F. L. (2003). "Reconstructing program theories: Methods available and problems to be solved." American Journal of Evaluation **24**(1): 5-20.

Lipsey, M. W. (1993). Theory as method: Small theories of treatments. Understanding Causes and Generalising About Them. L. B. Sechrest and A. G. Scott, Wiley Periodicals Inc. **57:** 5-38.

McClintock, C. (1990). "Evaluators as applied theorists." Evaluation Practice **11**(1): 1-12.

McGuire, W. L. (2005). "Beyond EBM: new directions for evidence-based public health." Perspectives in Biology and Medicine **48**(4): 557-569.

Mcleod, R. (2003). Inquiry into the Operational Response to the January 2003 Bushfires in the ACT. Canberra, ACT Government.

Novak, J. D. (Undated). The theory underlying concept maps and how to construct them., IHMC Concept Map Software. **2006**.

Novak, J. D. and D. B. Gowin (1984). Learning How to Learn. New York, Cambridge University Press.

Pawson, R. (2003). Arealist approach to evidence based policy. Making Realism Work. B. Carter and C. New. London, Routledge.

Pawson, R. and N. Tilley (1997). Realistic Evaluation. London, Sage.

Rosas, S. R. (2005). "Concept mapping as a technique for program theory development: An illustration using family support programs." American Journal of Evaluation **26**(3): 389-401.

Smith, P., J. Nicholson, et al. (1996). "Risk Management in the Fire and Emergency Services." The Australian Journal of Emergency Management **11**(2): 5-13.

Tilley, N. (2004). "Applying theory-driven evaluation to the British Crime Reducaion Programme: The theories of the programme and of its evaluations." Criminal Justice **4**(3): 225-276.

Trochim, W. (1989). "Concept mapping: Soft science or hard art?" Evaluation and Program Planning **12**(1): 87-110.

Trochim, W. M. K. (1989). "An introduction to concept mapping for planning and evaluation." Evaluation and Program Planning **12**: 1-16.

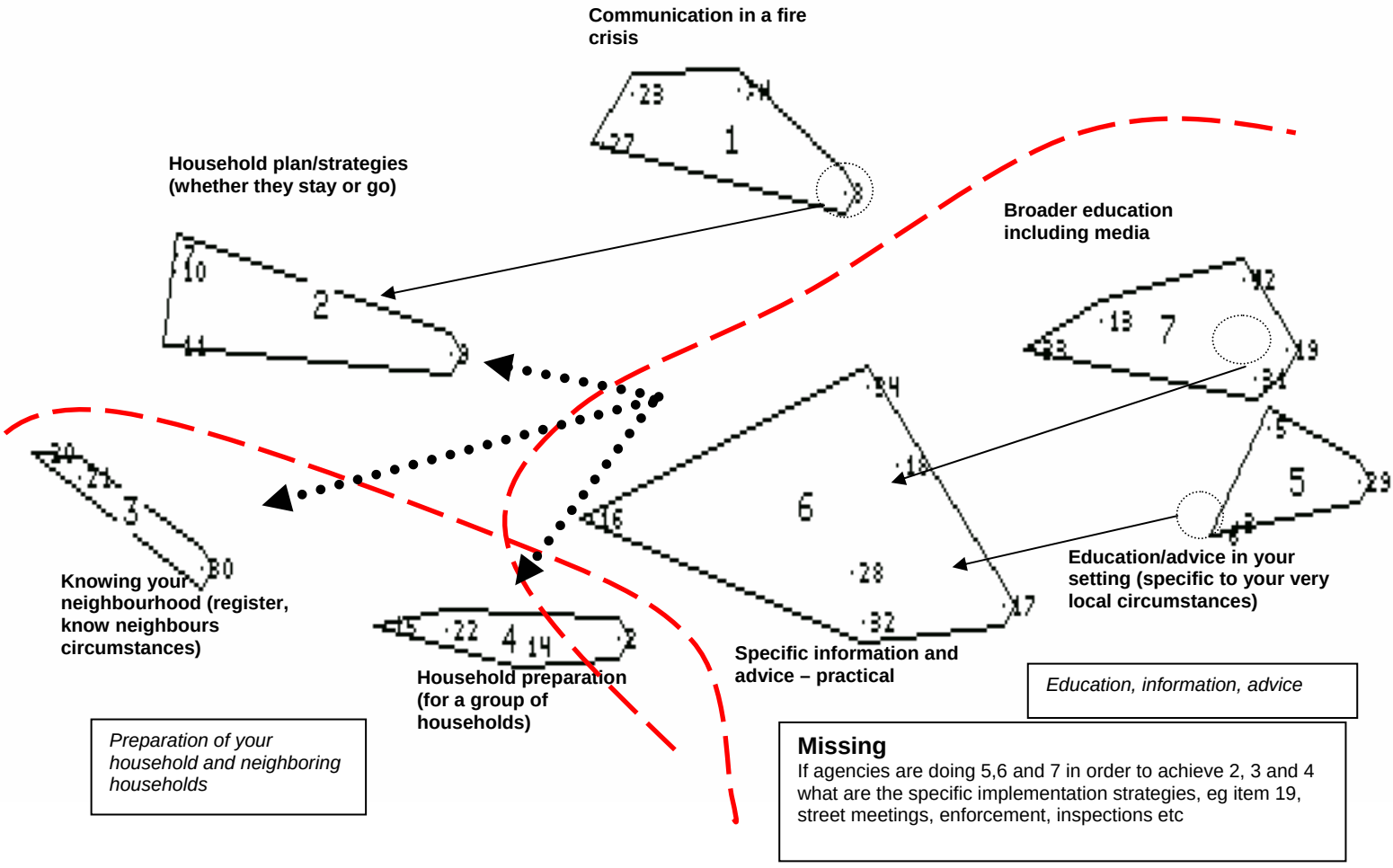
Trochim, W. M. K. and R. Linton (1986). "Conceptualisation for evaluation and planning." Evaluation and Program Planning **9**: 289-308.

Yampolskaya, S., T. M. Nesman, et al. (2004). "Using concept mapping to develop a logic model and articulate a program theory: A case example." American Journal of Evaluation **25**(2): 191-207.

AES Head Office: PO Box 5223 Lyneham ACT 2602 **ABN** 13 886 280 969
Ph: +61 2 6262 9093 **Fax:** +61 2 6262 9095
Email: aes@aes.asn.au **Website:** www.aes.asn.au

Figures

Figure1: Cluster Map Generated During a Concept Mapping Workshop with a Community Group



AES Head Office: PO Box 5223 Lyneham ACT 2602 **ABN** 13 886 280 969
Ph: +61 2 6262 9093 **Fax:** +61 2 6262 9095
Email: aes@aes.asn.au **Website:** www.aes.asn.au

Figure 2: A General Logic Model for Bushfire Safety Programs

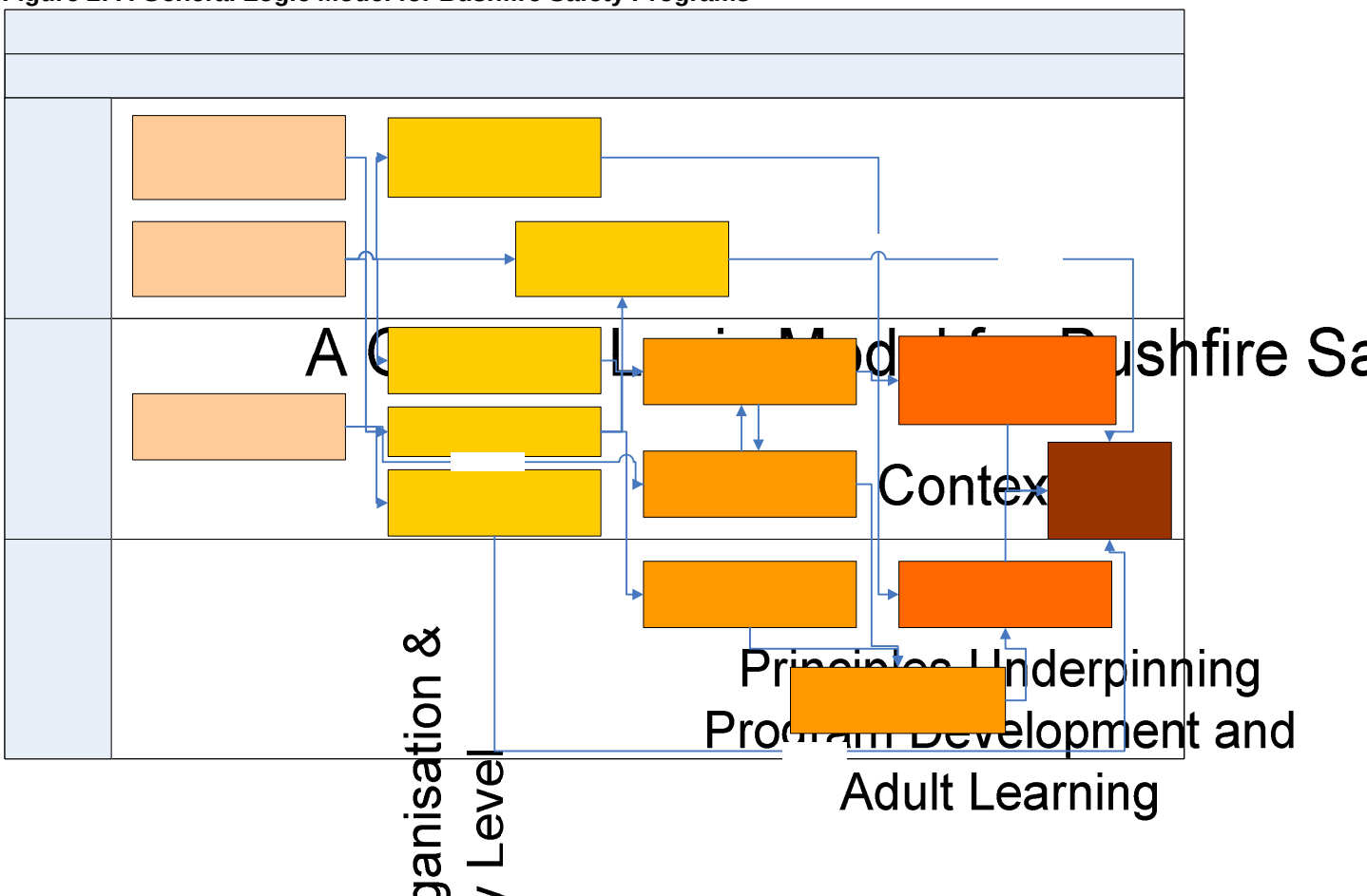
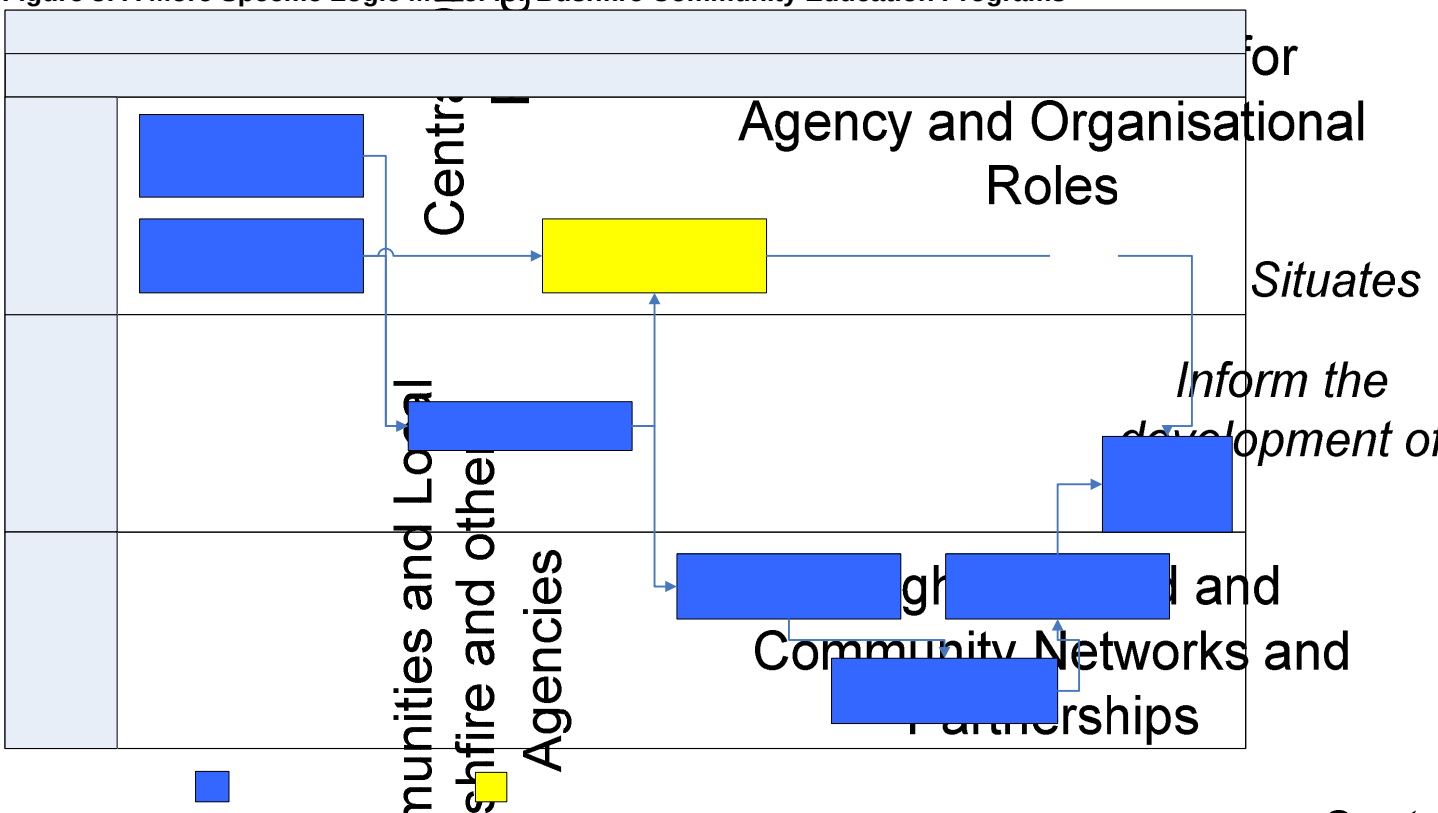


Figure 3: A More Specific Logic Model for Bushfire Community Education Programs



AES Head Office: PO Box 5223 Lyneham ACT 2602 **ABN** 13 886 280 969
Ph: +61 2 6262 9093 **Fax:** +61 2 6262 9095
Email: aes@aes.asn.au **Website:** www.aes.asn.au

Figure 4: Program Theory – Elaborated Community Safety Outcomes

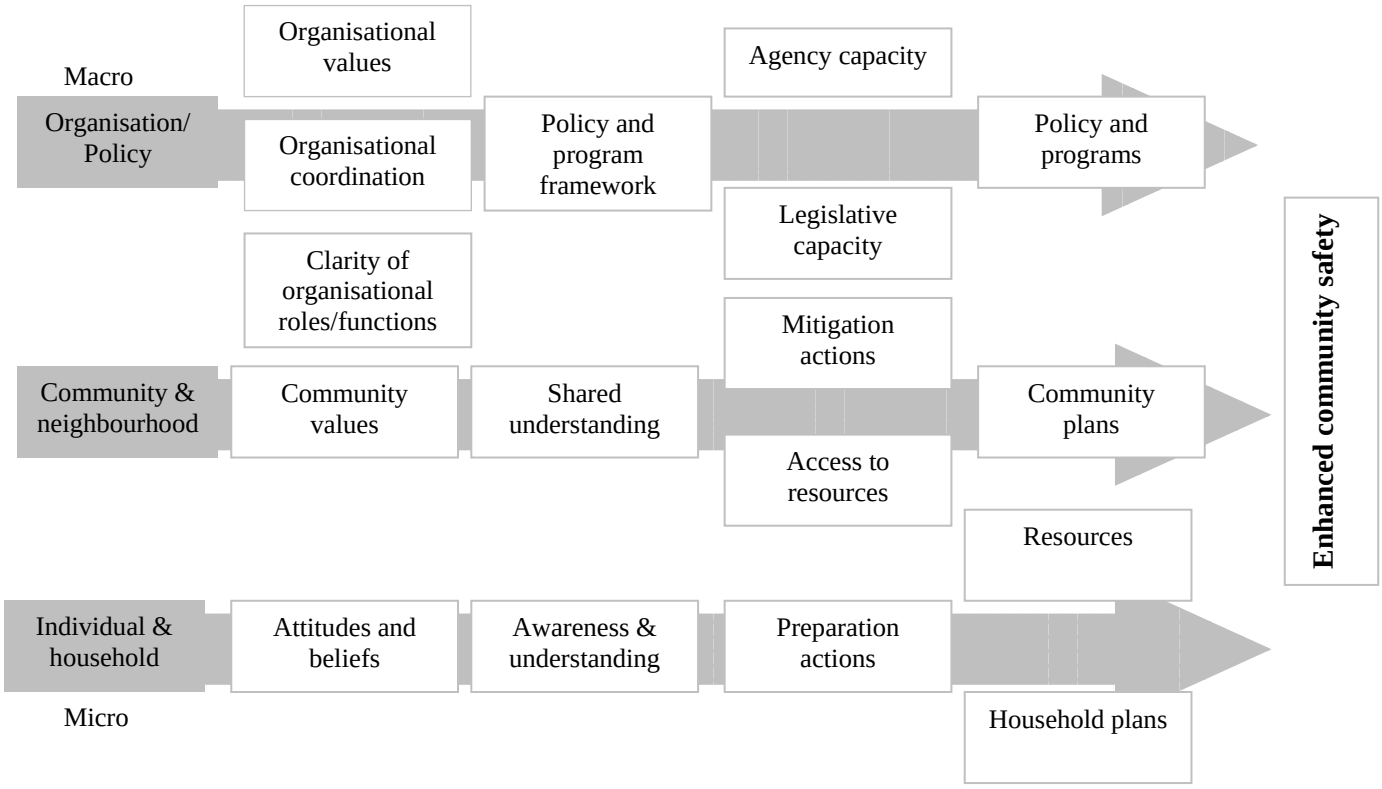
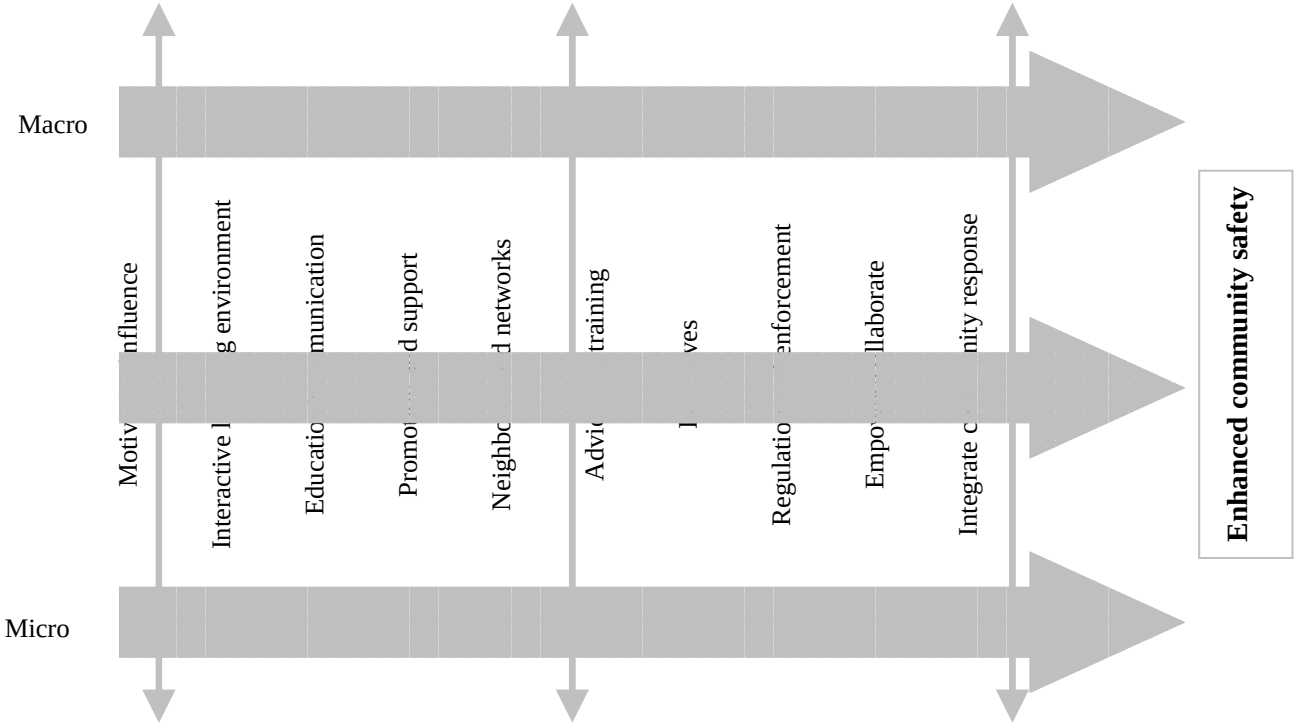


Figure 5: Program Theory – Processes and Mechanisms



AES Head Office: PO Box 5223 Lyneham ACT 2602 **ABN** 13 886 280 969
Ph: +61 2 6262 9093 **Fax:** +61 2 6262 9095
Email: aes@aes.asn.au **Website:** www.aes.asn.au