A better future from imagining the worst: land use planning & training responses to natural disaster

March and Henry outline a training approach to complement forward land use planning for natural hazards.

Abstract

This paper argues that it is necessary to move beyond the apparent inevitability of natural hazards by using forward land use planning to significantly reduce their impacts. Land use planning, as a focus for building knowledge and information of various types associated with land, is central to reducing the risks associated with natural hazards. Planning mechanisms offer significant opportunities to reduce both the initial likelihood of natural hazards impacting on human settlements and natural systems, and to reduce the potential consequences of those events that do occur. This paper sets out a training approach that complements forward land use planning for natural hazards.

Introduction

It is a truism to state that natural disasters of various type, magnitude and impact occur periodically. However, few people move beyond the apparent inevitability of natural hazards to consider that forward land use planning can significantly reduce hazard impacts. This paper sets out a training approach that complements forward land use planning for natural hazards. Land use planning, as a focus for building knowledge and information of various types associated with land, is central to reducing risks associated with natural hazards. The inter-disciplinary and varied nature of issues that land use planning must resolve suggest that a hands-on, experiential mode of training is best suited to training people to plan for natural hazard risks. It is argued that this approach draws on the complementary nature of land use planning and natural hazard management, the need to engage communities and to draw on a range of knowledge types, and the location-specific challenges posed by natural hazards themselves.

The paper first examines the main natural hazard threats of relevance to strategic spatial planning, noting that these occur in a spatially diverse, but relatively predictable, manner. It then goes on to examine the nature of forward planning and its ability to reduce the impacts of disaster threats. The paper then provides an outline of Emergency Management Australia's multidisciplinary and experiential approach to training people in land use planning for natural hazards. To begin, the next section examines the fundamental nature of land use planning as a first step to planning for natural hazards.

Land Use Planning & Uncertainty

A simple definition of planning is 'determining a desired future outcome, and then causing that outcome to occur' (Ackoff, 1970). Land use planning, a particular planning type, is focussed upon establishing the best spatial arrangements of land use, development, and management. Paying attention to the future spatial organisation of places allows communities to enjoy the various benefits, and conversely to also avoid the dangers, associated with particular spatial urban and regional circumstances. Planning typically involves trying to achieve particular arrangements of housing, industry, agriculture, conservation, and transportation (Albrechts, 2004: 745; Healey, 1997: 4). To do this, land use planning is confronted with the task of establishing which of the many potential patterns and organisations of land use are likely to be the most advantageous in the future, in a particular place, and for a particular community. In this sense, planning must try and influence ongoing land use decisions towards the most advantageous outcomes (Steiner, 1979: Ch2).

Land use planning, however, is only one of the many forces that act upon land use and management (Bruton, 1974; CEC, 1997: 22). This complicates both the determination of desired planned futures, and the achievement of these desired outcomes. Land owners and managers expect to be able to exercise their

property rights to buy, sell, develop or subdivide land, and typically resist restrictions upon their ability to do this in multiple ways. Various agencies of government focus primarily upon the goals within their particular scope, whether it is provision of roads, street lighting, parks maintenance, education, or reticulated services. Bureaucratic organisations may resist change, adaptation and collaboration. Interest groups maintain diverse, but typically single-issue focuses. In this complex of activity and influences, land use planning must seek to represent 'good' overall decision-making, and to coordinate all these various parties, even while politicians retain final decision making powers.

In addition to the variety of actors in land management settings, land use planning is undertaken in situations of 'imperfect foresight' (Hopkins, 2001). Uncertainty as to population growth, the economic fortunes of nations or regions, changes of political sentiment, or even of climatic changes, erode the ability of agencies to effectively plan. Yet, even while uncertainty adds complexity to the planning task, it is also a fundamental rationale for planning itself. A plan, suitably prepared, provides mechanisms that adapt to and improve changing circumstances. For example, within limits, flexible regulations typically allow market forces to determine the exact detail of land use and development, rather than using rigid controls that are overly prescriptive and quickly outdated. Planning regulations that provide clear objectives without prescribing exact details allow creative designs that 'fit' the circumstances of specific places. Accordingly, good planning is both adaptable and flexible, while increasing certainty where possible.

Even in conditions of partial uncertainty, good planning seeks to allow communities to 'make current decisions in the light of their future effects' (Reeves & Coile, 1984). To make good decisions, the dual nature of planning must be appreciated. On one hand, a 'plan' needs to anticipate future circumstances to the extent that reasonably likely events can be dealt with. On the other hand, a plan must not be too prescriptive, or it will be inflexible and unable to gauge likely future effects. This tension is resolved by a division of land use planning activities. Firstly, forward planning is mainly the establishment of planning provisions, or 'rules'. Secondly, these rules are subsequently used to assess whether proposed actions, such as a residential subdivision, will actually achieve the outcomes we desire for the future.

Accordingly, good land use planning, both plan-making and implementation, establishes and uses regulations that can reduce uncertainty. It is contended that the effects of natural hazards can be anticipated by good land use planning, and the risks associated with these hazards significantly reduced. Before we discuss how this is undertaken, we first turn briefly to an examination of the main hazards of particular relevance to land use planning.

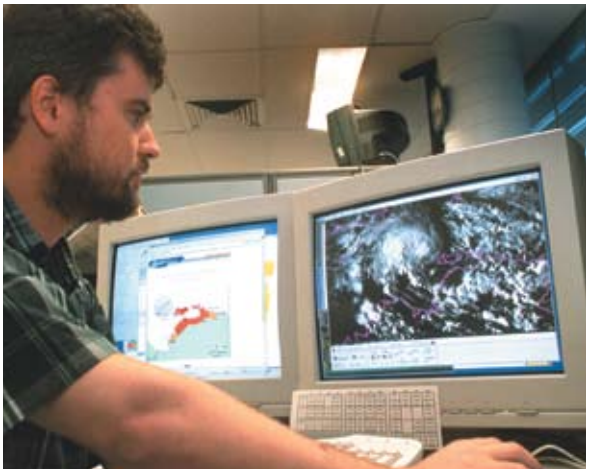
Location-specific nature of hazards is a consideration in disaster land-use planning.

Hazards & Risks

In considering planning for natural hazards, three main aspects of hazards first require attention: the nature of hazards that are of relevance to land use planning; the concept of risk; and the interdisciplinary and location-specific nature of responding to these hazards.

Hazards are considered to be 'sources of potential harm or situations with a potential for loss' (Emergency Management Australia, 2005a). Hazards are the event or phenomenon from which devastating effects originate. Conservatively, the average cost of natural disasters (considering only major events that cause damage greater than $10 million) to Australia each year is $860 million (Bureau of Transport Economics, 2001). In terms of impacts and frequency, the predominant natural hazard events across Australia are flooding, cyclones, and bushfire.

On a world-wide basis, floods constitute approximately one third of all naturally occurring disaster events. They cause more than half of the fatalities and more than a third of the economic loss of all natural disasters (Bureau of Transport Economics, 2001; Emergency Management Australia, 2005b). Averaged out over time, costs to the Australian economy each year due to flood events are in the order of $300 million (Bureau of Transport Economics, 2001). Cyclone events up to Category 5 can occur from November to April in the coastal areas ranging from Perth, to Darwin, to northern NSW. Impacts from cyclones include high winds, storm surge, and flooding. There is a general belief that cyclones may become more prevalent and more intense due to the effects of global warming. The average cost of cyclones is estimated at $266 million per year (Bureau of Transport Economics, 2001). Bush fires affect many of Australia's most valued farming and natural conservation areas, also commonly being near to



Using electronic means to assess the impact of disasters.

the most densely settled areas. For example, the South East corner of Australia is the most fire-prone area in the World. Fire behaviour ranges from widespread grassfire to intense, hot-burning wildfire. While accurate worldwide estimates of bushfire impacts have not been documented, income and production loss in the Shires of Alpine, East Gippsland, Indigo and Towong from January to May 2003 – following the widespread Alpine fires that summer – is estimated to be $121.1 million (Gangemi, Martin, Marton, Phillips, & Stewart, 2003). In addition to the above, earthquake, severe storm, and landslip are also important hazard sources.

It is only when hazards are assessed in terms of their likely impacts upon humans or natural systems that their true importance, as risk, is understood. Risk is 'the chance of something happening that will have an impact on objectives' (Standards Australia/Standards New Zealand, 2004). For example, the magnitude of impacts associated with a cyclone over uninhabited areas of the Indian Ocean are scarcely comparable to those that might be expected from a cyclone affecting densely populated coastal urban settlements. Importantly, the concept of risk is inherently associated with conscious recognition and assessment of the likelihood and impacts of a particular hazard. One of the primary challenges of considering and dealing with the risks associated with natural hazards is that they are non-routine. The consequences of hazard events may be high-consequence, but on a month-by-month or seasonal basis in a given place there is often a low likelihood of occurrence, concurrent with a high certainty of occurrence in the long term (Petak & Atkisson, 1982). Accordingly, such hazards are traditionally those for which resourcing and commitment are difficult to obtain because of ignorance, a belief that 'it will never happen here' or at least, 'it won't happen this year'. In fact, the risks these hazards pose typically can be assessed and significantly reduced via land use planning.

Finally, a key characteristic of dealing with the natural hazards is the proper assessment of risk specific to a particular place, and the activities proposed to be carried out there. Tropical cyclones do not have catastrophic effects upon the southern coastline of Australia. Similarly, the nature of bushfire risk for grazing properties in open grasslands is different to those associated with a residential subdivision in a mountainous sclerophyll forest area. Further, to be able to assess risk in a meaningful way requires drawing upon a range of inter-disciplinary expertise, using and building local knowledge, encouraging inter-sectoral government responsibilities, and focussing this knowledge into action. The next section shows how land use planning can provide a mechanism to undertake this.

Risk-Based Land Use Planning

The move to considering natural hazards in land use planning complements a corresponding shift over time in emergency management itself. Emergency management has evolved over several decades, developing more emphasis on managing and preparing for risk, in preference to solely responding to the consequences of the emergency caused by an event (Tarrant, 2006). The land use planning process provides a medium for the reduction of uncertainty in dealing with hazards, allowing mitigation of their worst effects, and even the remediation of past mistakes. For example, the advantages of a residential subdivision that, while being constructed in a bushfire prone area, includes sufficient vehicular escape and fire fighting routes in various fire event scenarios, refuge and assembly points, setbacks between ignition sources and houses, are hardly comparable with ad hoc development without these features. So while it is uncertain exactly when a fire event will occur in a bush fire prone area, we can be much more certain a community can respond effectively in the very likely case that it will happen at some time. Indeed, the forward planning process may often allow communities and decision makers to determine that certain areas are too risky to be built upon or used for certain purposes.

The most enduring planning process model, both theoretically and in practice, is the Rational Comprehensive Model (RCP). Even while it is periodically criticised or augmented since its first development in the 1950s, no fundamental challenger to RCP has emerged 9; Hoch, 1984; Levy, 2000: 331; Sandercock, 1998: 86; Yiftachel, 1991: 21). The main steps of RCP are as follows, in Figure 1.

Figure 1: RCP flow chart

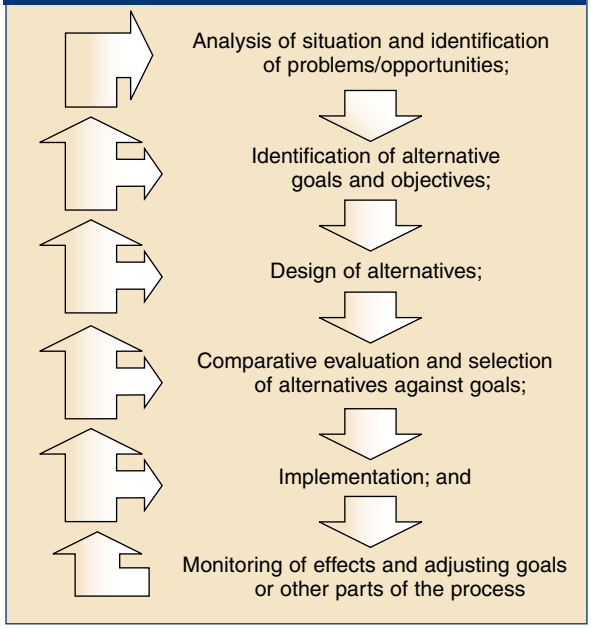
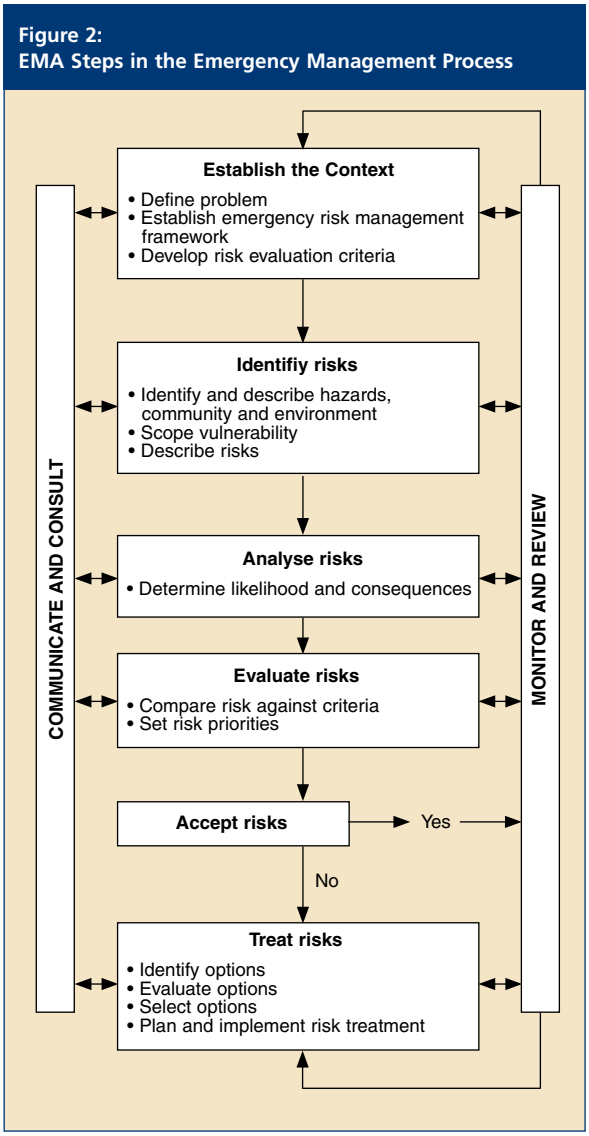


Figure 2:
EMA Steps in the Emergency Management Process



The RCP model is intended as a generic approach, that can be adapted and used in a variety of settings for various substantive topic area. Indeed, the procedural approach used by Emergency Management Australia to manage is strikingly similar to the RCP model, as can be seen in Figure 2 below.

The emergency risk management framework has a sound basis in logic and statutory recognition. It has been adapted for implementation in community settings from the Australian & New Zealand Standard for Risk Management (AS/NZ 4360). Indeed, the models for land use planning and emergency management are remarkably similar, making the current movement in emergency management towards evidence-based forward planning highly complementary to land use planning processes. Indeed, it is only through the mechanisms of land use planning that the risks associated with proposed (and sometimes existing) land use and development can be assessed against a range of other considerations, such as ecological values, land affordability, transport planning, community services provision or economic prosperity, to name but a few. Land use planning can act as a central focus for a range of knowledge types revolving around land and spatial concerns (March & Low, 2004). Accordingly, it can also accommodate information and knowledge regarding risks specific to a particular place, and to a specific community. This knowledge base is interdisciplinary, and must engage with all the trade-offs and issues that planning embodies, while also providing a base for disseminating knowledge in communities. Accordingly, land use planning, as a series of informed decisions, can incorporate and build knowledge about natural hazards in seeking to reduce uncertainty in communities. This reduction in uncertainty plays out along two related dimensions. Firstly, it can decrease the likelihood of hazards causing harm in the first instance, say for example, by determining that a development should simply not occur in certain high risk bushfire locations. Secondly, planning can modify the design and quality of settlements, which of course can never be completely free of risk in any case, so that the consequences of events, if they occur, are reduced.

Training Responses

The nature of land use planning for natural hazards suggests that particular training approaches are required. The fundamental rationale used by Emergency Management Australia (EMA) conforms to the main practices of experiential learning theory (ELT), where relatively abstract ideas, such as the need to plan for risk, are transformed into concrete experiences, experimentation and skills, which the participant can then understand even more fully upon subsequent reflection (Kolb & Boyatzis, 2000). Accordingly, EMA provides structured and hands-on adult training and educational

Floods constitute approximately one-third of all naturally occuring disaster events.

experience. Participants from roles such as local and state planning agencies, state emergency services, bushfire planning and response, and floodway management agencies, are invited to apply throughout Australia.

Participants are initially introduced to the ideas of planning for risk, and are encouraged to contribute their own understandings and perspectives, typically starting from, and then comparing, their disciplinary backgrounds. They are then trained to use the ERM framework in simulated decision-making environments. The primary focus of participants' work is the preparation and justification of AMCORD-based planning controls that account for natural hazards on the basis of reasoned assessments of risk.

Role-play scenarios, in which participants may be required to take on roles that are unfamiliar, develop an appreciation of the actual challenges of spatial planning for risk. They are challenged to establish planning scheme 'rules' specific to locations, ex ante, or in preparation for future possible development pressures. In preparing risk based planning controls, participants are exposed to a number of experiences which prepare them for the application of ideas to real life situations. To justify their planning controls they must use an evidence-based process. Participants gather data, prepare planning tools, consider public and developer expectations, and political decision-making environments. Their controls must draw together key planning functions and non-planning functions to identify existing and potential risks and make informed decisions. The participants' planning provisions are then subsequently used and 'tested' as the basis of development control for land use proposals and the coordination of various interests and activities beyond natural hazard management.

Participants leave the course having practised new and enhanced skills in a "safe" educational environment, as well as having challenged, and been challenged by, different ideas, points of view, and methodologies. Training in a residential program, where participants stay on-campus for a number of days, allows for formal and informal networking across disciplines, particularly those in emergency response and land use planning. Drawing together participants from each state also allows the exchange of ideas and examples between organisation types and functions. A subsequent critical reflection assignment when they have returned to their normal work environment encourages deeper understandings, and the transference of understandings into actual practice. The Risk-Based Land Use Planning program is nationally accredited and results in participants receiving a Statement of Attainment once they have completed the related assessment. It is also accredited by the Planning Institute of Australia as contributing to Continuing Professional Development.

Conclusions

To move beyond the apparent inevitability of natural hazards, this paper has argued that land use planning is an important mechanism for the reduction of risks in the built and natural environment. The social process of gathering evidence for decision-making in spatial planning provides an opportunity to build and disseminate a knowledge base in the related areas of spatial planning, emergency management, and emergency risk management. The planning process can also provide an opportunity to coordinate policy areas and integrate sound risk management practices into spatial planning.

However, the particular qualities of land use planning and natural hazard risk assessment require that training be undertaken in particular ways. It is suggested that skills in dealing with the inter-disciplinary and locally specific character of natural hazard management are

best learnt via a hands-on, experiential mode of training. This approach allows participants to experience and resolve the tensions that arise in planning between competing issues and natural hazard risk, the need to engage with communities, to use evidence-based reasoning, and to cross disciplinary and agency boundaries.

Using a risk management framework for understanding and informing spatial planning can produce sensible and balanced options for treating risk. The framework and its associated processes also embeds ownership for various risk treatments, assigned timelines for the treatment processes, and a vehicle for two-way communication with interested parties and the general community.

Planning regulations and controls that are developed through exhaustive and thorough consultation represent consolidated understanding of the concerns and perceptions in communities. In combining the processes used in spatial planning and emergency risk management, the complementary 'fit' of both processes allows risk to be managed in an embedded way as part of wider planning processes.

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