

INTRODUCTORY CHAPTER

PROBLEM STATEMENT AND JUSTIFICATION

...On August 23, 1992 Hurricane Andrew blasted the southern tip of Florida with sustained winds of 140 miles per hour and gusts of up to 164 miles per hour. The storm travelled quickly across the Florida peninsula, levelling virtually everything in its path. It continued to move in a west-north westerly direction over the Gulf of Mexico. Early on August 25, Andrew made landfall again. This time it hit a sparsely populated section of southern Louisiana...In its wake, Hurricane Andrew left hundreds of thousands of people homeless, and thousands more without power, water, communications, and sewer facilities. This compact but extremely fierce storm caused at least forty deaths and over \$20 billion in property damages...

In 1993, another type of natural disaster hit the central portion of the United States. From April 1 to July 31, ten times the normal rain fell in the central section of the nation, completely saturating the entire area. There was so much water that the Mississippi and Missouri rivers were simply incapable of handling it. The excess spilled over onto the surrounding land, creating enormous new lakes, rivers, and inland seas. Severe flooding was reported in nine states, stretching from Minnesota in the north to south eastern Missouri. The scope of flooding was immense. Millions of acres of farmland were completely submerged; hundreds of highways, levees, and dams were washed away; thousands of residents were forced to leave their homes and farms. In all, the flooding caused forty deaths and between \$10 billion and \$15 billion in damages... (Schneider, 1995:4).

Although pertaining to the United States of America, these descriptions define the "true-face-of- disaster" in terms of extreme hazard potential. Disaster is highly complex, and the means of managing disaster is by no means always certain (discussed in Chapter One). In this respect, disaster management is influenced by a wide range of socio-political-economic-organisational factors (discussed in Chapter Two). Localised physical and/or environmental variables can also impede disaster management in terms of disaster mitigation, disaster preparedness, disaster response, and disaster recovery.

Australia, however, is not immune from experiencing the effects of extreme hazard events. Tropical Cyclone Tracy (December 1974) left 65 people dead; 5,000 houses destroyed or damaged beyond repair, while only 500 remained intact and continuously habitable; many thousands of residents were left without proper shelter, resulting in the mass evacuation of 23,000 (from a total population of 45,000) people to various capital

cities; there was no water, power, or sanitation; and there was a total breakdown in communication systems (Chamblain *et al.*, 1981). Tropical Cyclone Tracy caused \$798 million [adjusted to 1995 dollars] in damages (Insurance Council of Australia, 1995:10).

Comparably, the Newcastle Earthquake (December, 1989) caused \$1071 million [adjusted to 1995 dollars] in damages (Insurance Council of Australia, 1995:10). Disasters then, do occur and will continue to occur in Australia, albeit infrequently. This is where the problem lies. Infrequent high magnitude hazard events make it difficult to plan effectively for community response to the threat of disaster in terms of disaster mitigation, preparedness, response, and recovery. Moreover, infrequent high magnitude hazard events have the capacity to intensify the effect of possible socio-political-economic-organisational impediments.

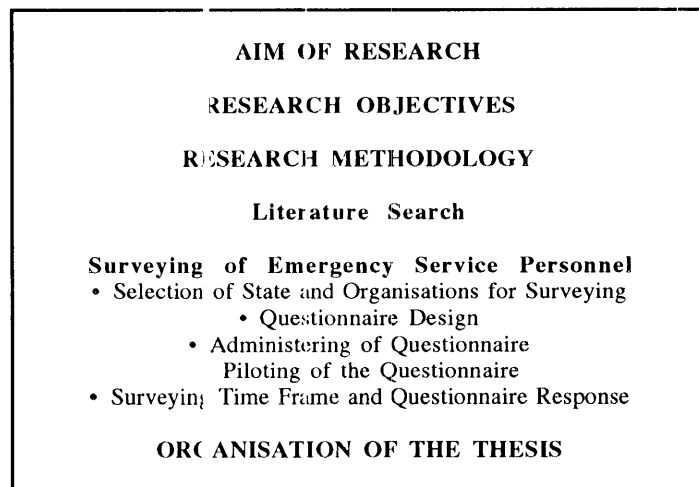
Notwithstanding the advances that have occurred (within the last twenty years) in the capabilities of individual organisations directly responsible for emergency management in Australia (Hodges, 1996), there still remains a weak and ineffective inter-organisational counter-disaster structure, using an inappropriate practice ideology (discussed in Chapter Two). In particular, this thesis questions the organisational capacity of Australian emergency service organisations to cope with 'disaster', as opposed to accidents and emergencies (discussed in Chapter Four). Counter-disaster management and planning, as distinct from incident management and planning, has traditionally drawn scant interest from governments (discussed in Chapter Two and Five). It is not surprising that as a result, there is low community perception and awareness of the threat of disaster in Australia (discussed in Chapter Two). Attempts by academics and practitioners to communicate hazard risk and vulnerability to the wider public, as well as governments, has been far from satisfactory.

Nevertheless, it would be all too easy and rather foolish under the circumstances described, to argue both politically and economically for a continuation of the status-quo (ie. a response orientated approach to disaster management). There is a need for disaster mitigation, disaster preparedness, and disaster recovery planning; not least because as the more technologically complex our society becomes, so the more diverse are the risks and effects of disaster (discussed in Chapter One). The growth in socially created disaster means that the potential for disaster complexity and uncertainty is growing steadily to the point where the future, may very well bring more frequent high magnitude disaster events. As decision making under disaster conditions has become more complex, so the

need for greater professionalism and intelligent leadership on the part of emergency service personnel, as well as specialist training and education is very much underlined. A move to design, develop, and implement an Australian Intelligent Disaster Management System (IDMS) provides a means of overcoming problems associated with decision making under disaster conditions.

The diagram below outlines the sequence of discussion in the Introductory Chapter.

ORGANISATION OF INTRODUCTORY CHAPTER



AIM OF RESEARCH

The aim of this research is to outline the design of a new improved Australian counter-disaster management system. Relevant to this task is the highlighting of socio-political-economic-organisational impediments that undermine the current system of arrangements.

RESEARCH OBJECTIVES

- To examine the nature of disaster;
- To review Australia's existing counter-disaster organisational structure and associated management arrangements;
- To search for intelligent effective and efficient organisational structures, system designs, and associated management arrangements with a view to designing, developing, and implementing an IDMS;

- To assess inter-organisational relationships among selected emergency service related personnel in New South Wales and Queensland with a view to designing, developing, and implementing an IDMS;
- To investigate political and bureaucratic impediments with a view to designing, developing, and implementing an IDMS;
- To investigate economic impediments with a view to designing, developing, and implementing an IDMS; and
- To outline the design of an Australian IDMS for the 21st Century.

RESEARCH APPROACH

An inter-disciplinary approach is taken in data/information collection and in the writing of the thesis. Unlike many doctoral theses which tend to focus on a narrow terms of reference, the author has chosen to select a very complex, but exceedingly significant problem that is at the very core of a key public policy issue in many societies: "What is disaster management best practice, and what type of organisational and management system will best provide it?" Because an inter-disciplinary approach is taken, the reader will recognise the possible limitation of the scope of the thesis to official disaster management strategies. Indeed, it is at the very heart of the research methodology that the thesis will raise more questions, than it will find answers.

The research approach is one of discovery and deductive reasoning, making sense of a complex and diverse literature field. Extensive cross-disciplinary searching into disaster planning, public policy analysis, organisational sociology, public administration and management, economics, and other fields is undertaken. Such cross-disciplinary searching is warranted, if an understanding of socio-political-economic-organisational impediments is to be achieved. More importantly, cross-disciplinary searching provides the concepts and/or 'ideas' for the design, development, and implementation of an IDMS. The IDMS is a product of the author's cross-disciplinary learning and application.

A simple, rather than scientific style of writing is adopted. It blends theory and practice. It distils the essence of a complex situation in a way which is readily grasped. The author uses a number of devices to assist the reader to stay on track, including a clear and logical thesis organisation that is repeated at the outset of each chapter, chapter summaries, repetition and/or reinforcement, and extensive use of tables and figures that summarise large amounts of complex and diverse information.

Before undertaking the project the author had limited knowledge of public policy dynamics, political and bureaucratic administration, economics, and organisational sociology. Indeed, as a social science graduate with a triple major in geography, sociology, and anthropology the author was awestruck at the size and complex arena of study he was embarking on.

RESEARCH METHODOLOGY

Literature Search

The author commenced his Ph.D research in March 1992. To begin with, the author set himself the task of endeavouring to become familiar with the relevant literature. To this end, the Dixson Library, University of New England is used exclusively. Given the author's inter-disciplinary charter, it was inevitable the problem arose of deciding what data/information was relevant. A decision was taken to focus predominantly on disaster planning, public policy, organisational sociology, public administration and management, and economic literature. Where necessary, the Australian Emergency Management Institute library in Victoria, Australia was used to cite data/information pertaining to disaster planning.

A deliberate decision by the author is to avoid a detailed analysis of conflict related disaster. The author cites as a reason for this decision the limited applicability of such an analysis to the thesis. In particular, the limitation of conventional command and control models to the author's charter of wishing to design, develop, and implement an IDMS, where flexibility, innovation, and mutual cooperation, coordination, and collaboration are the emphases.

In assessing the relevance of data/information, the author always kept in mind that he was looking for an IDMS design that would provide a cooperative, coordinated, and collaborative partnership within the disaster-relevant organisational network; a design that would effectively work in any given disaster situation. This proved to be easier said than done given the multiplicity and complexity of factors involved. Indeed, the author considers that the design, development, and implementation of an IDMS would address and reconcile, where necessary, the following issues:

- The divergent interests of key stakeholders;
- The extent to which the ends justify the means;
- The shifting stage of disaster management research;
- The interpretation and understanding of the relevant problems and issues;
- The type and level of analysis adopted;
- The socio-economic pre-occupation of society;
- The increase in the frequency, magnitude, and complexity of disaster world-wide, particularly that associated with technological advances;
- The heightened interest in disaster management, with society becoming increasingly risk-averse and seeking greater levels of insurance;
- The increased costs associated with disaster mitigation, preparedness, response, and recovery;
- The extent of political and bureaucratic fragmentation and muddling; and
- The extent of urban, rural, and remote area differences.

Analysis of the above issues is made difficult by the historical long-standing fragmented, secretive, complacent, and compromised administrative and bureaucratic subculture characterising disaster-relevant organisations (see Britton, 1984a; 1984b; 1985a; 1986a; 1989a; 1989b; 1993; Heathcote, 1980; Pickup & Minor, 1980; Wettenhall, 1980; 1984). This subculture affects the type and level of possible research analysis. Moreover, the administrative and bureaucratic subculture reinforces a pattern of in-house secrecy across emergency service organisations. Operational de-briefing notes concerning previous disaster event operations were not made available to the author. Indeed, access appeared a privilege. Without access to sensitive case material, it made it very difficult to substantiate claims of inherent structural and management weaknesses with regard to inter-governmental and inter-organisational cooperation and coordination in the disaster-relevant organisational network. Publicly available documents and a survey of emergency service personnel (discussed in Chapter Four) were thus the principal means left to the author as a means of evaluating the weaknesses of the Australian counter-disaster system.

Clearly, the risks associated with this research task are high. The high risk comes from the apparent complexity of the subject given the vast array of issues, with many of these issues not being fully understood or appreciated. In many cases the issues are beyond the

conscious control of government and society. One is dealing with issues which interact dynamically. There are also conflicting ends and means of disaster management, as well as intractable social, spatial, and environmental issues.

The author took the opportunity to present information pertaining to socio-organisational-political-economic impediments in the Australian counter-disaster system, and more importantly to refine 'ideas' concerning an IDMS, at the 3rd International Conference of Emergency Planning and Disaster Management, University of Lancaster (U.K.) in July 1995. Useful feedback from the Conference left the author in no doubt as to the importance of the role of leadership and mentorship in disaster management and to an IDMS.

Surveying of Emergency Service Personnel

Selection of State and Organisations for Surveying

In January 1993, the author decided to evaluate, by means of a mailed questionnaire, the development and effectiveness of cooperative inter-organisational relationships across selected emergency service organisations in Australia. For the sake of time and manageability, New South Wales and Queensland were selected for investigation. This choice was made for three reasons. One, they have the longest history of disaster experience across Australian States and Territories. Two, they have contrasting bureaucratic systems, establishing different approaches to disaster management. Three, they had the advantage of being readily accessible from Armidale. Data was collected on: roles and responsibilities; qualifications; level of authority; operational experience; Commonwealth counter-disaster management concepts; working relationships; organisational capacity; financial arrangements; inter-organisational liaison personnel; organisational restructuring; and amalgamation of services. This choice of data was selected for its possible usefulness in determining the nature of cooperative relationships among emergency service organisations.

The selection of relevant disaster response organisations in both States proved difficult. Some twenty-six State-level organisations with an involvement in disaster prevention, preparedness, response and recovery were identified (see Chapter Two, Table 2.5). Again, based on time and manageability, it was decided to survey personnel in the:

- State Emergency Service;
- Fire Service;
- Ambulance Service;
- Police Service;
- Health Service; and
- Public utilities.

These State-level organisations were selected for three reasons. One, the organisations constitute the principal disaster response organisations which usually form a consortium to combat the effects of disaster. Two, contrastingly, the remaining organisations not selected fulfil more of a support role in disaster response and recovery, and to this extent they form part of a referral system of specialist expertise that the principal disaster response organisations call upon as required. Three, the selection of organisations was made after extensive consultation with supervisors; selected University of New England academic staff; and with the relevant State-level organisations. Advice on selection was also obtained from Emergency Management Australia, and in particular, the Australian Emergency Management Institute. The decision to exclude some twenty State-level organisations from answering the questionnaire undoubtedly affects overall analysis and interpretation, but the amount and complexity of material that would have been forthcoming in respect of inter-organisational relationships, cooperation, and coordination would not have been manageable, and beyond the scope of the research task. The same reasoning is used to justify the decision not to survey the important role of unofficial, private, and philanthropic organisations in disaster management.

Selection of relevant personnel who could be surveyed in the State-level organisations proved to be more difficult than the initial selection of organisations. The principal dilemma was deciding who exactly in these organisations was the most appropriate or qualified to judge issues pertaining to inter-organisational relationships, cooperation, and coordination. In this respect, the author had a choice of Head Office, Regional, or District Officers, or some combination of them. Senior administrative personnel in Head Offices were discounted on the basis of their executive position and bureaucratic tendency to down play weaknesses, and be secretive. A fact, recognised by Britton (1984; 1985a; 1989a; 1989b; 1991a; 1991b) Quite simply, the author envisaged a biased and/or inaccurate assessment of organisation operation and sentiment; particularly, in terms of inter-organisational relationships, cooperation, and coordination. A second dilemma affecting selection of relevant personnel for surveying was the dilemma of deciding whether or not issues pertaining to inter-organisational relationships, cooperation, and coordination were better answered by local and/or volunteer emergency service personnel.

Local and/or volunteer emergency service personnel were discounted for two reasons. One, the author decided to restrict the questionnaire to permanent career based State-level personnel. Two, questionnaire questions regarding issues such as financial management, organisation restructuring, and amalgamation of services, were such, that meaningful answers could really only be provided by personnel with at least Regional or District Officer level training.

The final outcome, then, was the decision to survey Regional and District Officers in the selected State-level organisations. A sample was undertaken. Every second Regional and District Officer in the New South Wales and Queensland State Emergency Service; Fire Service; Ambulance Service; Police Service; Health Service; and Public utilities was surveyed. These decisions were made after extensive consultation with supervisors; selected University of New England academic staff; and with the relevant State-level organisations. Advice on selection was also obtained from the Australian Emergency Management Institute. The decision to exclude Head Office personnel from answering the questionnaire undoubtedly affects overall analysis and interpretation, but an option to interview at a later stage senior management (as necessary) on the opinions of Regional and District Officers was recognised. Again, time and thesis manageability was paramount in any selection made. Had it been possible to survey all management levels, then this would have been undertaken.

Questionnaire Design

The questionnaire assessing inter-organisational relationships consists of ten structured open and closed type questions (The Appendice contains a copy of the questionnaire).

The questionnaire follows the structure presented in Table I.1

Table I.1

Structure of Questionnaire Assessing Inter-Organisational Relationships in Selected Emergency Service Organisations

QUESTIONNAIRE STRUCTURE

RESPONDENT DETAILS

(eg. ascertaining respondent role(s), responsibilities, qualifications, authority and experience in disaster management).

COUNTER DISASTER TRAINING

(eg. ascertaining the type and effectiveness of disaster (as opposed to accident and emergency) training undertaken by disaster relevant organisations).

COMMONWEALTH COUNTER DISASTER MANAGEMENT CONCEPTS

(eg. investigating the extent to which organisations involved in disasters are recognising and planning counter disaster management operations around four approaches commonly used in disaster management).

WORKING RELATIONSHIPS

(eg. understanding the nature of relationships between organisations with an involvement in disasters).

ORGANISATIONAL CAPACITY

(eg. ascertaining an organisation's capacity/ability to deal with disasters).

FINANCIAL ARRANGEMENTS

(eg. gauging an organisation's success at (a) competing for funds, and (b) utilising allocated funds effectively for disaster management).

INTER-ORGANISATIONAL LIAISON PERSONNEL

(eg. examining the presence of, and effectiveness of liaison personnel in an organisation).

ORGANISATION RESTRUCTURING

(eg. investigating the presence of, and effectiveness of restructuring in an organisation).

AMALGAMATION OF SERVICES

(eg. investigating the presence of, and effectiveness of amalgamation in emergency services).

ADDITIONAL COMMENTS

The questionnaire was prefaced by two letters of introduction. Letter One, originated from the author's supervisor, and Head of Department, Geography & Planning. Letter Two originated from the author. In each case, the letters were introducing the author as a Doctor of Philosophy student in the Department of Geography & Planning working in the field of disaster management. Both letters stressed the confidentiality of information. An idea to preface the questionnaire with a letter of introduction from the Australian Emergency Management Institute was not implemented. It was important for the questionnaire to appear independent, and not aligned with an institution, where

respondents to the questionnaire may feel suspicious of motives and/or intimidated in their responses.

The questionnaire and covering letters were sent to respondents with a pre-paid envelope. Respondents were asked to return it within three weeks, and were given specific return dates to this effect (dates varied depending on when particular batches of questionnaires were sent out).

Administering of Questionnaire

Permission to conduct the questionnaire was granted by the relevant organisational Directors/Chief Executive Officers in New South Wales and Queensland by June 1993. Each Director/Chief Executive Officer in the State-level organisations selected was sent a copy of the questionnaire for their records. All Directors/Chief Executive Officers gave written support to the questionnaire and research project more generally. No Director/Chief Executive Officer questioned the objectives of the questionnaire, wording, style, or raised any potential problems. Moreover, no Director/Chief Executive Officer queried in relation to the nature and type of questions asked, the appropriateness or inappropriateness of surveying Regional and District Officers.

Although verbal and written support was positive and encouraging, support did not extend into offers of resource (i.e. provision of stationery and reimbursement of postage and phone/fax costs) or travel assistance. Had this been the case, then the author may have considered surveying all twenty-six State-level organisations with an involvement in disaster management. Alternatively, the author may have considered face-to-face interviewing of Regional and District Officers.

Piloting the Questionnaire

The questionnaire was piloted in August-September 1993 with the purpose of identifying any possible problems with question type, wording and style. Part of this exercise was also to judge the acceptance of the questionnaire, and more generally the research objectives, as well as the appropriateness or inappropriateness of surveying Regional and District Officers. Table I.2 identifies the organisations to whom pilot-questionnaires were sent. These organisations each received two pilot-questionnaires which were distributed to Regional and District Officers. Thirty-two pilot questionnaires in all were mailed out.

Officers receiving these pilot-questionnaires were recorded and deleted from the final mailing list of Regional and District Officers to be surveyed.

Table I.2
Organisations Receiving Pilot-Questionnaires

New South Wales State Emergency Service;
New South Wales State Rescue & Emergency Services Board;
New South Wales Electricity Commission - Pacific Power;
Water Board - Sydney-Illawarra-Blue Mountains;
New South Wales Department of Bushfire Services;
New South Wales Department of Health;
New South Wales Police Service;
New South Wales National Parks & Wildlife Service;
New South Wales Ambulance Service;
New South Wales Fire Brigades
Queensland Department of Health;
Queensland Emergency Services;
Queensland Police Service;
Queensland Electricity Commission;
Queensland Department of Forest Industries-Forest Service; and
Queensland Water Resources Commission.

Thirty percent of pilot-questionnaires were returned by October-November 1993. Pilot-questionnaire results were discussed with supervisors; selected University of New England academic staff and the relevant state-level organisations. Advice was also taken from the Australian Emergency Management Institute. Only slight adjustments to question wording and style were made. Returned pilot-questionnaires did not lead the author to believe that there was any notable confusion or misunderstanding with regard to questionnaire objectives, motives, or questions asked. Nor, was there any indication that Regional and District Officers were perhaps an inappropriate choice of respondents. It was noted, however, that where a written explanation was forthcoming from a respondent to an open question, the discussion appeared limited and cautious.

Surveying Time Frame and Questionnaire Response

Regional Officers were surveyed in New South Wales and Queensland between November 1993 and April 1994. Table I.3 and Table I.4 identifies the surveying time frame and questionnaire response in New South Wales and Queensland respectively. In New South Wales only 10 of 71 questionnaires mailed out were returned. A response rate

of 14%. In Queensland, 23 of 89 questionnaires were returned. A response rate of 26%, was only marginally better than New South Wales.

Table I.3

Surveying Time Frame and Questionnaire Response for New South Wales

Organisation	Distribution	Response	Period
NSW State Emergency Service	11	4	April, 1994
NSW State Rescue & Emergency Services Board	2	1	November, 1993
NSW Pacific Power	2	1	November, 1993
NSW Water Board	2	1	February, 1994
NSW Department of Bushfire Services	2	1	April, 1994
NSW Department of Health	9	0	February, 1994
NSW Police Service	12	1	April, 1994
NSW National Parks & Wildlife Service	7	0	December, 1993
NSW Ambulance Service	6	1	November, 1993
NSW Fire Brigades	7	0	December, 1993
TOTAL	71	10	

Table I.4

Surveying Time Frame and Questionnaire Response for Queensland

Organisation	Distribution	Response	Period
QLD Department of Health	12	1	February, 1994
QLD Emergency Services	50	13	February, 1994
QLD Police Service	11	4	February, 1994
QLD Electricity Commission	6	2	December, 1993
QLD Forest Service	6	2	December, 1993
QLD Water Resources Commission	4	1	December, 1993
TOTAL	89	23	

The response rate for both States was very disappointing and somewhat unexpected. Unexpected, in the sense that verbal and written communications with the relevant Directors/Chief Executive Officers was positive, with no hint that a poor response to the questionnaire from Regional and District Officers was a distinct possibility. These Officers were also sent a reminder letter after three weeks had elapsed from the author requesting immediate completion and return of the questionnaire in the pre-paid envelope. Relevant Directors/Chief Executive Officers were also sent a letter from the author requesting that they 'drum' up some encouragement among their Regional and District Officers in the completion and return of the questionnaire.

Although, the return of pilot-questionnaires was low, there was no indication in the results that suggested a reason for the low response. Pilot-questionnaire results were generally well thought through and argued. Discussion of pilot-questionnaire results with supervisors; other selected University of New England academic staff; and the Australian Emergency Management Institute did not highlight a reason to be concerned. Quite simply, for all concerned there was no clear evidence to suggest that a poor response to a mailed questionnaire from Regional and District Officers, probing inter-organisational relationships, cooperation, and coordination was likely. In retrospect, a possible warning was there in the poor return of the pilot-questionnaires.

The decision to principally use the mailed questionnaire was not taken lightly. Indeed, extensive discussions took place before surveying concerning whether the interview method or mailed questionnaire would be the better methodology to use in tackling emergency service personnel.

Use of the interview method is expensive; requires considerable skill, time and patience to administer; requires considerable explanation; is restricted to a small group of people; is restricted to a small geographic area(s); is difficult to maintain a level of standardisation and uniformity; is difficult to establish a level of anonymity; and puts pressure on the respondent to respond immediately (de Vaus, 1991; Booth, Colomb & Williams, 1995).

Use of the mailed questionnaire, in contrast to the interview method, is comparatively cheap to administer; requires less skill to administer; can be administered with a minimum of explanation; can be administered to large numbers of individuals; can be used to survey a wider geographical area(s), thereby obtaining information from more people; the impersonal nature of a questionnaire - its standardised wording, its standardised order of questions, its standardised instructions for recording responses - ensures some uniformity from one measurement situation to another; respondents usually have greater confidence in their anonymity, and thus feel free to express views they fear might be disapproved; and finally, the mailed questionnaire puts less pressure on the respondent for an immediate response (de Vaus, 1991; Booth, Colomb & Williams, 1995).

Although the value of the interview method was recognised, it was the advantages of using the mailed questionnaire that stood out. The questionnaire seemed to encapsulate everything that was needed to successfully survey a large number of Regional and District

Officers, in six State-level organisations, across two States. This task presented a complex and time consuming logistical operation. Interviewing did not seem a practical alternative under these circumstances, particularly given the amount of travelling that would be required. Consideration was given, however, to interviewing Regional and District Officers using the telephone. However, the concerns raised earlier with regard to face-to-face interviewing, while somewhat lessened through the use of the telephone, still seemed to apply. Moreover, the expected large expense from using the telephone with possible follow-up (given that the author was studying inter-organisational relationships across two States and six organisations) was well beyond the scope of funding for the thesis.

A mailed questionnaire, then, seemed the only feasible way in which to proceed with the research task. Most importantly, the mailed questionnaire was expected to provide emergency service personnel with greater confidence in their anonymity to express perhaps controversial views. This aspect seemed very important given that there was an element of reluctance, apprehension, confusion, uncertainty, lack of trust, and perhaps even fear among emergency service personnel in New South Wales, and particularly Queensland, to speak their minds freely. Sensitive organisational re-structuring of emergency service organisations in both States at the time of surveying also did not help.

In hindsight, the interview method would "perhaps" have been the better option. Interviewing face-to-face, or even interviewing using the telephone, would perhaps have yielded not only more quality information, but also a greater quantity of information. Had the interview method been chosen solely to assess inter-organisational relationships, then the author would have most likely canvassed only one State and reduced the number of canvassed organisations to perhaps two.

The para-militaristic and/or bureaucratised nature of disaster management and the organisation of emergency services in New South Wales and Queensland cannot be discounted as possible reasons for poor questionnaire response. Despite assurances of confidentiality and anonymity of collected questionnaire data, there was obviously a notable reluctance on the part of emergency service personnel to make available the necessary information. This seems to be a problem of middle management in stable and/or defensive organisations (Mintzberg, 1989). The enduring bureaucratic imperative, then, in the emergency services probably affected the quantity and quality of questionnaire data returned.

The author's interest in, and decision to survey emergency service personnel with regard to matters concerning inter-organisational relationships, no doubt increased the reluctance of senior personnel to make available critical de-briefing notes, or for that matter, provide meaningful formal, or albeit informal explanations of collected questionnaire and informal interview data.

The nature of the questionnaire itself may have been a reason for the poor response. The length, content, wording of questions, and presentation may have all played a part. While piloting the questionnaire should have identified this, perhaps it did not. Indeed, several respondents questioned the relevance of certain sections and/or questions in the questionnaire (eg. financial arrangements) to their position. In this respect, it was interesting to consider that disaster management training and education, is for want of a better word, very compartmentalised in the sense that personnel appear to have knowledge of some areas of their organisation but not others. This obviously makes it difficult to have a total-system perspective of one's organisation, let alone, the disaster-relevant organisational network! This is a worrying finding if valid, because what hope does the development of inter-organisational relationships, cooperation, and coordination have, if in fact, individual organisations have not well-developed intra-organisational relationships, cooperation, and coordination?

Selecting Regional and District Officers from the relevant organisations may not have been in hindsight the best choice of respondents. This raises the question of whether Local Government personnel should have been surveyed instead, or additionally? While a clear early decision was made to not survey by questionnaire senior administrative personnel in Head Offices, was this the right or wrong decision?

In the desire to appear to be running an 'independent' questionnaire, was a dis-service done by not having accompanying letters of introduction from the Australian Emergency Management Institute and/or Centre for Disaster Management, University of New England?

Poor questionnaire response may have been just simply linked to apathy and complacency on the part of emergency service personnel in New South Wales and Queensland. In Queensland, complex restructuring of emergency services and associated Committees of Inquiry into inefficient Government practice (in progress at the time of surveying) may also have been to blame for the poor response. This cannot be discounted as a major

reason. Intensive investigations and controversial restructuring of emergency services could have been seen as threatening to existing individual and organisational culture and functioning, and as a consequence personnel may have been unusually suspicious, and cautious of motives. Perhaps, the timing of the questionnaire for Queensland may have been simply inappropriate?

The emphasis in the questionnaire on the word 'disaster' rather than emergency appeared to both confuse and anger some respondents in both States. Many respondents failed to differentiate in their thinking between accidents, emergencies, and disasters when discussing training and planning. Other respondents, on the other hand, challenged the use and application of 'disaster' terminology.

Did the author put enough effort into follow-up work? As previously stated, Regional and District Officers were sent a reminder letter requesting immediate completion and return of the questionnaire in the pre-paid envelope. Additionally, the relevant Directors/Chief Executive Officers were also sent a letter from the author requesting that they 'drum' up some encouragement among their Regional and District Officers in the completion and return of the questionnaire.

ORGANISATION OF THE THESIS

Chapter One examines the nature of disaster;

Chapter Two reviews Australia's existing counter-disaster organisational structure and associated management arrangements;

Chapter Three searches for intelligent effective and efficient organisational structure(s), system designs, and associated management arrangements with a view to designing, developing, and implementing a 1 IDMS;

Chapter Four assesses inter-organisational relationships among selected emergency service related personnel in New South Wales and Queensland with a view to designing, developing, and implementing a 1 IDMS;

Chapter Five investigates political and bureaucratic impediments with a view to designing, developing, and implementing an IDMS;

Chapter Six investigates the economic impediments with a view to designing, developing, and implementing an IDMS; and

Chapter Seven is the outline of a Australian IDMS and conclusion to the research project.

PART ONE

CHAPTER ONE

THE NATURE OF DISASTER

Chapter One examines the nature of disaster;

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INTRODUCTION

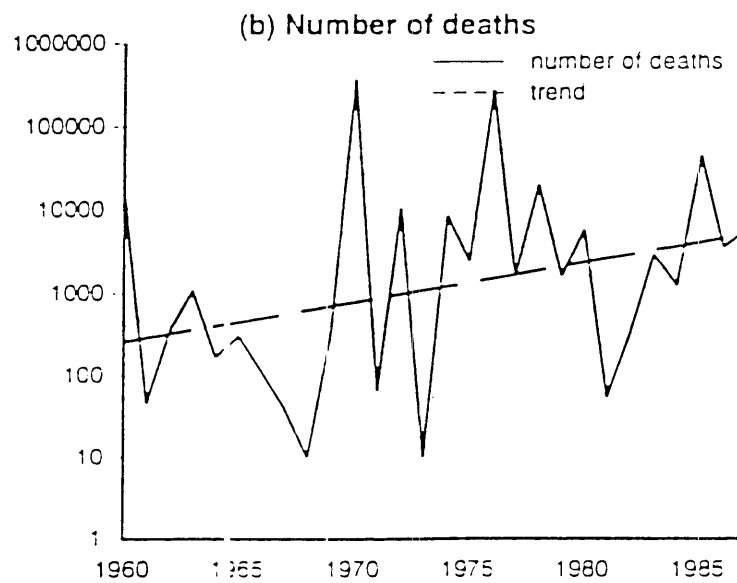
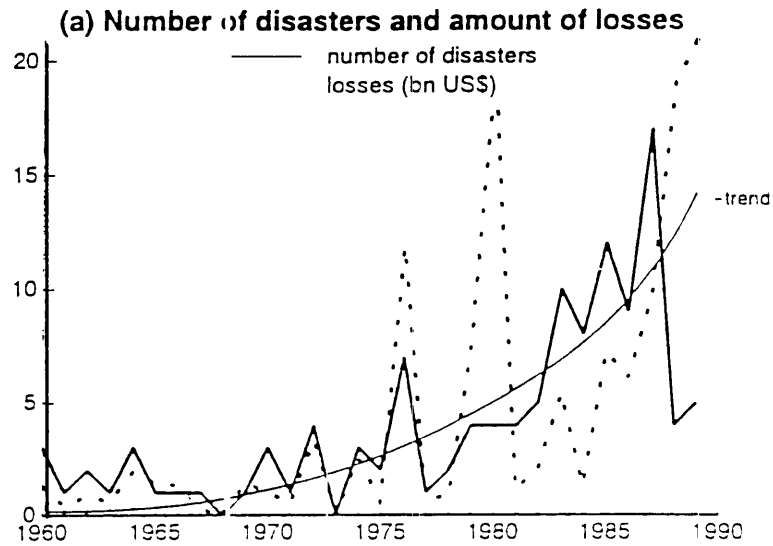
The aim of this Chapter is to examine the nature of disaster. More specifically, we ask the question: "What makes an event a disaster?" Certainly, the very connotations of the term disaster are suggestive of great catastrophe, crisis, calamity, and misfortune (Comfort, 1988). Increasingly, however, there is realisation that disaster causation is the result of failure in organisational systems to cope with complexity and uncertainty (Horlick-Jones, 1990; Toft & Reynolds, 1994). The aetiology of disasters is typically comprised of a complex combination of technical, individual, group, organisational, and social factors (Toft & Reynolds 1994).

Taking a global perspective, it would appear that the toll of death and damage in natural disasters is increasing (Figure 1.1), although there is no international database of information with sufficient comprehensiveness to verify this supposition (Alexander, 1993:1). It would also appear, however, that the frequency of the most severe impacts

on the socio-economic system is decreasing, thanks to improvements in prediction, warning, mitigation, and international aid (Alexander, 1993:1).

Figure 1.1

Number of Disasters and Average Losses, 1960-88



Source: After Berz (1988), cited in Alexander (1993:2)

The cost to the global economy exceeds US\$50,000 million per year, of which a third represents the cost of predicting and mitigating disasters, and the other two-thirds represent the direct costs of the damage (Alexander, 1993:1). Death tolls vary from year to year around a global mean of approximately 250,000, while major disasters kill an average of 140,000 people per year (Alexander, 1993:1); a notable 95% of deaths occur in Third World countries, where some 4,200 million people live (Table 1.1).

Table 1.1
Loss of Life by Disaster Type and by Continent, 1947-80

Agent	No. of events	Asia	Oceania	Africa	Europe	South America	Caribbean & Central America	North America
Earthquake	180	354,421	18	18,232	7,750	38,837	30,613	77
Tsunami	7	4,459	--	—	—	—	—	60
Volcanic eruption	18	2,805	4,000	—	2,000	440	151	34
Flood	333	170,664	77	3,891	11,199	4,396	2,575	1,633
Hurricane	210	478,574	290	864	250	—	16,541	1,997
Tornado	119	4,308	--	548	39	—	26	2,727
Severe storm	73	22,008	--	5	146	205	310	303
Fog	3	—	--	—	3,550	—	—	—
Heatwave	25	4,705	100	—	340	135	—	2,190
Avalanche	12	335	--	—	340	4,350	—	—
Snowfall & extreme cold	46	7,690	17	—	2,780	—	200	2,510
Landslide	33	4,021	--	—	300	912	260	—
Total		1,054,090	4,502	23,540	28,694	49,275	50,676	11,531

Source: After Shah (1983), cited in Alexander (1993:2)

When compared globally, Australia does not appear to have had many events that could be considered 'disasters', particularly if significant loss of life, total destruction of social processes, widespread destruction of functional infrastructure, and significant economic losses are key measures. Australian history does, however, identify some notable disasters. Of interest, was a tropical cyclone in April 1887, that left 140 people dead, and destroyed some twenty-two ships at Ninety Mile Beach, Western Australia (Southern, 1979:178). In more recent times, some notable extreme events have been characterised by significant economic losses (Table 1.2).

Table 1.2
 Notable Australian Disasters Characterised by Significant Economic Losses

YEAR	EVENT	ORIGINAL DOLLARS \$M	DECEMBER 1995 DOLLARS \$M
Feb 1967	Bushfires, Hobart, TAS	14	96
Jan 1970	T.Cyclone 'Althea', Townsville, QLD	25	140
Feb 1974	T.Cyclone 'Wanda', Brisbane, QLD	68	312
Dec 1974	T. Cyclone 'Tracy', Darwin, NT	200	798
Nov 1976	Hailstorm, NSW	40	125
Feb 1983	Bushfires (Ash Wednesday), VIC	138	243
Nov 1984	Floods, NSW	80	126
Jan 1985	Storms, Brisbane, QLD	180	285
Oct 1986	Hailstorm, Sydney, NSW	104	153
Dec 1989	Earthquake, Newcastle, NSW	800	1071
Mar 1990	Hailstorm, Sydney, NSW	319	366
Feb 1992	Storms, Sydney, NSW	--	113
Jan 1994	Bushfires, Sydney, NSW	48	53
Sep 1996	Hailstorm, Armidale, NSW	--	100 ¹

¹ - September 1996 Dollars
 Source: Insurance Council of Australia (1996:12)

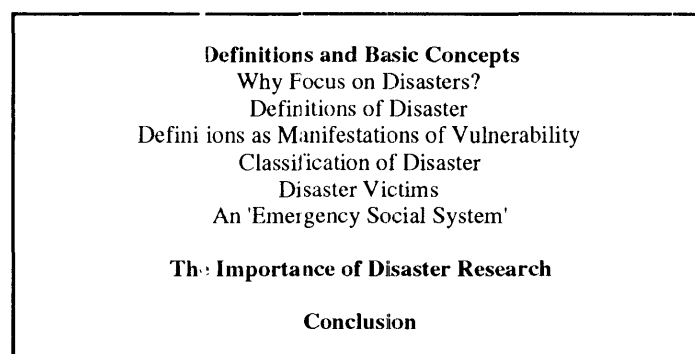
Whether one can conclude that disasters in Australia, particularly at the national level, are largely economic, is a matter of opinion. The Commonwealth appears to expend a high proportion of its annual disaster relief funds on drought and flooding (Drought Policy Review Task Force, 1990). Interestingly, drought would appear to be Australia's most highly ranked disaster in terms of social and economic impact (Bryant, 1991), but it has been argued that the traditional views of drought fail to take into account the productivity of the land or the capacity to induce drought-like effects through inappropriate farm management practices (Drought Policy Review Task Force, 1990:3).

Disasters exert a substantial and consistent influence on modern society. Alexander (1993) argues this point further, by suggesting that there are additional reasons why people should be encouraged to take an interest in and seek to understand natural disasters:

First, in professional, administrative and political roles, many people will have to deal with and face the effects of disaster in their own communities and spheres of influence. Secondly, the more technologically complex our society becomes, the more diverse are the risks and effects of disaster; the more people travel and relocate, the more people put themselves at risk. Thirdly, it is vital to dispel popular myths and misconceptions about the occurrence and impact of disasters, for their effects can only be combated effectively if we have a rational and objective understanding of the m...(p3).

The diagram below outlines the sequence of discussion in Chapter One.

ORGANISATION OF CHAPTER ONE



DEFINITIONS AND BASIC CONCEPTS

Why Focus on Disasters?

There are similarities as well as fundamental differences between disaster and other types of social crisis or collective stress management. Disasters are events with special characteristics that necessitate specific planning and management initiatives. Such a finding has been demonstrated time-and-time-again by many leading international researchers (ie. Drabek, Dynes, Kreps, Scanlon, and Quarantelli) in the field of disaster management.

It is a major mistake to think of disasters as just being large-scale accidents (Britton, 1986b). Indeed, Britton highlights the differences separating accidents and emergencies from disasters.

An accident can be identified as having the following properties:

- Both the immediate and long term consequences of the incident are restricted in geographical area. It is extreme localised ie. focalised event.
- It is restricted to a small group of persons involved plus their significant others (eg. family or friends). Proximal others may be involved, but the long term consequences, if there are any, will not usually affect these proximal others. An accident involves the disruption of a special interest group which is composed mainly of the victims and their significant others.
- There is little, if any disruption of 'generalised others' within the greater population of the community. There may be slight disruption around the immediate incident site, but these disruptions are minimal, and are of short duration.

An emergency can be regarded as having the following properties:

- The geographical area which the incident covers is still localised, but is not as focalised as that which typifies an accident. The extent of the disruption may extend over a 'block' of built area.
- The number of persons directly involved as participants (victims and helpers) can be substantial, and the numbers of significant others and proximal others are likely to be high as a result of this.
- Because of the larger area affected and the greater number of people ultimately involved, an emergency is more complex in terms of remedial action; hence there is a conspicuous time lapse between the event occurrence and the resolution of that event.

- An emergency can also mean that a small section of the community's infrastructure is temporarily rendered inoperative as the emergency services attempt to rectify the incident.
- There is no disruption or destruction of the overall structure, or to the ongoing wider social system processes characteristic of the community in general.

Specific actions that are appropriate to disaster may not always be applicable under other social crisis conditions and vice versa. For the disaster manager, it is much more effective to address and/or anticipate the worse case scenario and extrapolate accordingly down to accident and emergency situations, than it is to do the reverse. Adoption of the reverse approach, is to have in place, a totally inappropriate practice ideology. A disaster is a unique event, which has specific characteristics that require practitioners to develop broad planning options, pursue preparedness activities, and undertake actual field operations (Britton, 1993).

Definitions of Disaster

Researchers and practitioners are apt to define disaster differently. And, not surprisingly so does the general public, including the media. Disagreements on what exactly constitutes a disaster have also made it difficult to plan, manage, and organise for disaster impact. The term disaster is very much a 'sponge' word. That is, it is a catch-all term with as many meanings as there are people using it. Consequently, agreement on what exactly constitutes a disaster has been an ongoing debate (see Dombrowsky, 1995; Gilbert, 1995; Hewitt, 1995; Forlick-Jones, 1995; Kreps, 1995; Porfiriev, 1995; and Quarantelli, 1995a).

Defining the term natural hazard is good starting point for understanding disaster. Alexander (1993) and Bryant (1991) suggest that the term natural hazard can, and has, been defined in several ways:

- A natural hazard is a natural occurring or man-made geological condition or phenomenon that presents a risk or is a potential danger to life or property;
- A natural hazard is an interaction of people and nature governed by the co-existent state of adjustment of the human use system and the state of nature in the natural events system;
- A natural hazard composes those elements in the physical environment which are harmful to man and caused by forces extraneous to him; and

- A natural hazard is the probability of occurrence within a specified period of time and within a given area of a potentially damaging phenomenon.

These definitions make it quite clear that, in order for a hazard or disaster to occur, one must have a physical event impacting in some capacity on a human population. In this regard, a natural disaster has been defined by Alexander (1993) as:

...some rapid, instantaneous or profound impact of the natural environment upon the socio-economic system...

...an extreme event [manifesting itself] in a geophysical system...which differs substantially or significantly from the mean. If human socio-economic and physiological system do not have the capacity sufficiently to reflect, absorb or buffer the impact, then disaster may occur (p4-5).

This is a useful definition because it overcomes many of the problems associated with some of the early definitions of disaster. These early definitions somewhat misguidedly tended to focus solely on the physical characteristics or attributes of the hazard event (see Dynes, 1970; 1978). The focus in these definitions of disaster was purely on:

- Frequency;
- Predictability;
- Controllability;
- Cause;
- Speed of onset;
- Length of warning;
- Duration;
- Scope of impact; and
- Destructive potential.

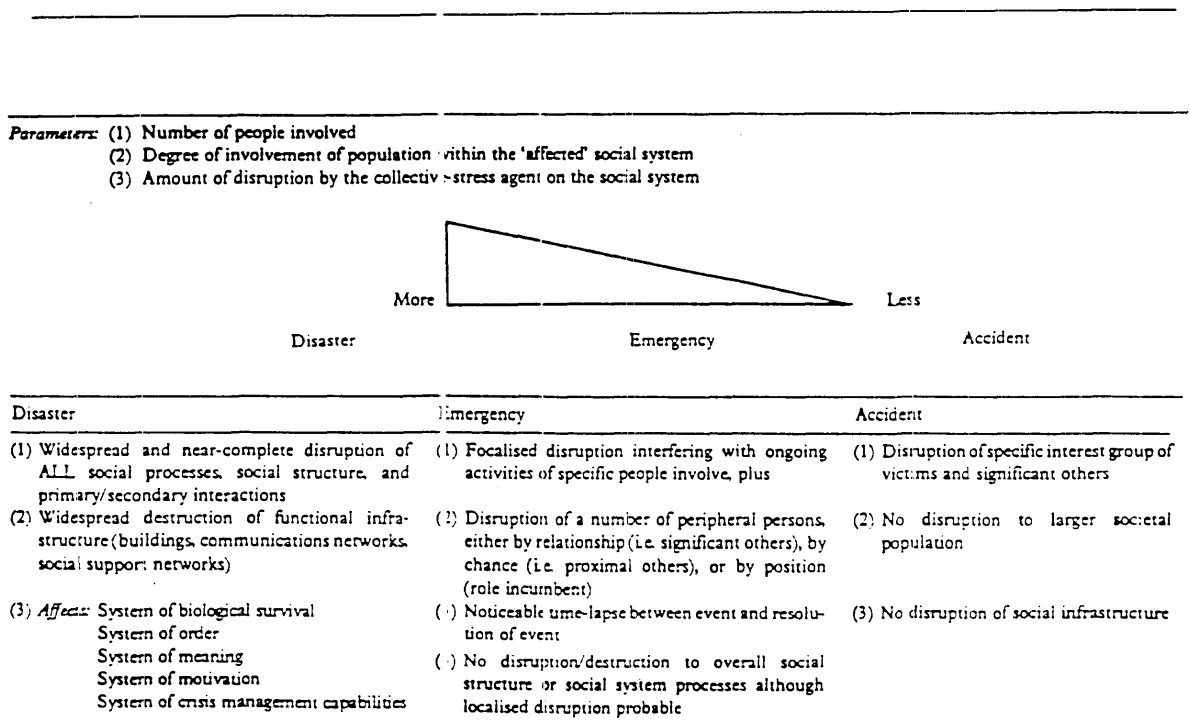
Recognising the limitations of defining disaster by solely using physical characteristics of the hazard agent alone (see Quarantelli, 1987a; Kreps, 1989; and Tierney, 1989), Britton (1986b) developed an understanding of disaster based on the fact that disasters are very much social phenomena and therefore to a large degree represent failures on the part of human systems. In a continuum of collective stress (Figure 1.2), Britton (1986b:266-267) defines disaster in the following way:

- It produces an overall, although temporary, breakdown in the established social processes, routines and interactions and leads to societal remedy and collective social change rather than requiring the individual or small group to bear the burden of replenishment from an intact, unchanged society.
- As such, the number of victims in proportion to the total population may be high, with a concomitant increase in the number of significant others who are affected. Proximal others may reach high figures because of the extent of the dislocation.

- Included within a disaster situation is the probability that there will be widespread (diffuse) destruction of the functional infrastructure to the extent that ongoing routines can no longer be supported or maintained throughout the entire affected area.
- The event jeopardises the system of biological survival; the system of order; the system of meaning and motivation (at least in the initial stages following impact); and also has the potential to exhaust the crisis management capabilities of the community, thereby making the affected community more reliant on external aid.

Figure 1.2

Continuum of Collective Stress



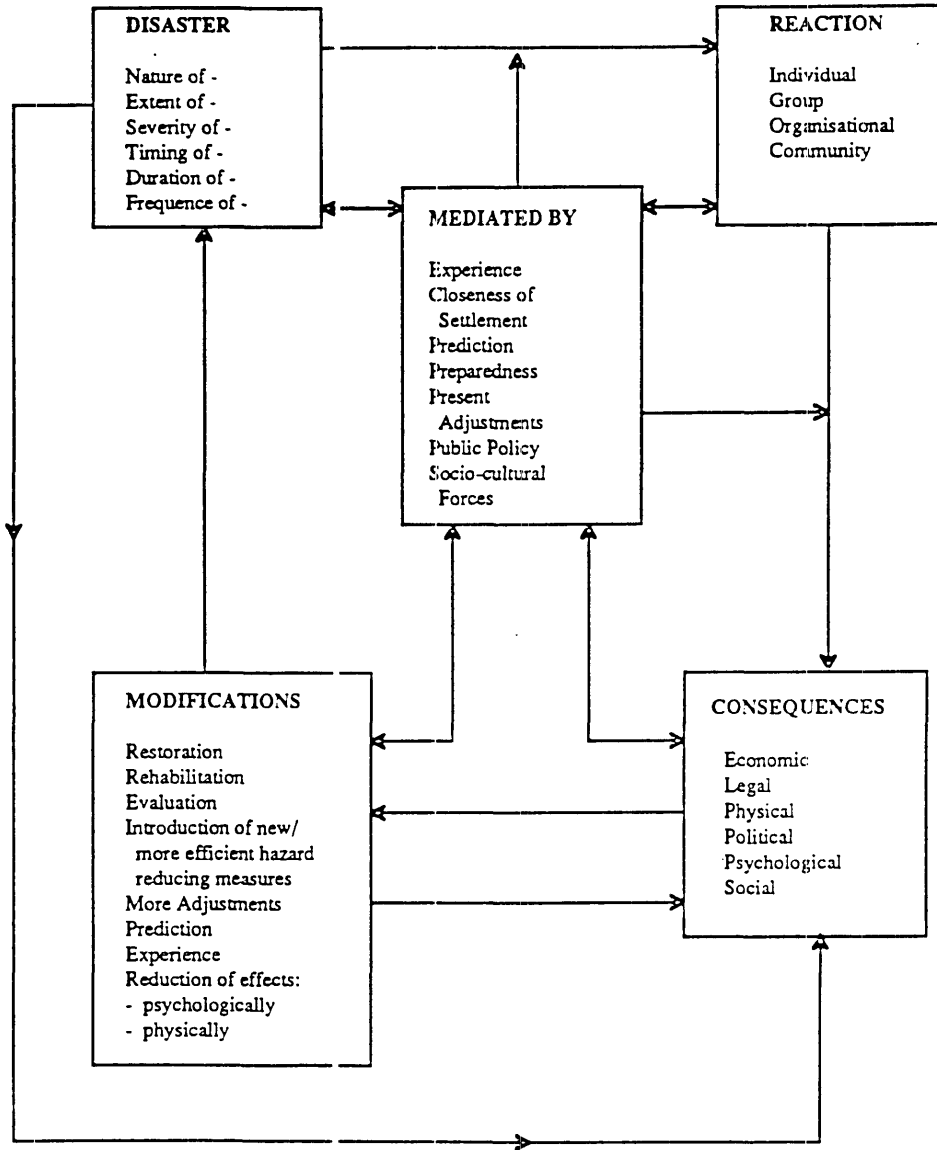
Source: Britton (1986b:266)

In comparatively recent times a new species of disaster - technological disaster - has identified itself with catastrophic consequences. Typical world examples, include Three Mile Island, Chernobyl, Love Canal, and Bhopal. The irony, however, is that the technological advances which have afforded us a degree of protection from natural disasters, now :

...have created a whole new category of what specialists have come to term technological disasters, which is to say everything that can go wrong when system fail, humans err, designs prove faulty, engines misfire, and so on (Erikson, 1991).

Clearly, it can be expected that disaster events, irrespective of type, will result in disruption of social structure and social processes; and destruction of functional infrastructure, resulting in considerable disruption of services. Britton (1993) acknowledges the economic consequence of disaster when detailing the respective components of disaster (Figure 1.3). Different types of disaster will have different effects on social behaviour, primarily because each type of disaster has different boundaries or working areas.

Figure 1.3
Components of Disaster



Source: Britton, N R. 1993, 'Introduction to Disaster Management', AD01 Unit Folder, Centre for Disaster Management, University of New England, Armidale, NSW, p.113.

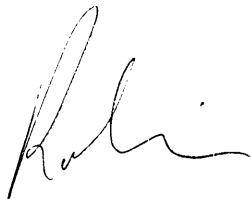
Robin PAGRAM,
136 Angelo Street,
SOUTH PERTH, WA 6151
Phone - 089 3673940

25th April, 1997

Dear Tony,

I enclose the revised PhD. The best I can do! I think I have addressed many of the critic sms, so J. Handmer and L. Heathcote should be happy.....

Best wishes,

A handwritten signature in cursive script, appearing to read 'Robin', written in black ink.

For the purposes of this thesis a definition of disaster is adopted that satisfies four criteria:

- It will affect many people either directly or indirectly;
- It will involve widespread to near-complete disruption of all social processes, social structure, and primary/secondary interactions;
- It will involve widespread destruction of functional infrastructure (buildings, communications networks, social support networks); and
- It will involve significant economic losses.

Some recent Australian disasters which embody a combination of the criteria above include:

- 1967 Hobart, Tasmania Bushfires;
- 1974 Darwin, Tropical Cyclone Tracy;
- 1983 Victoria and South Australia Bushfires;
- 1989 Newcastle Earthquake; and
- 1991 Nyngan Flood.

Disasters as Manifestations of Vulnerability

The degree to which a society remains unaffected by disasters reflects its ability to adapt to threat (its absorptive capacity). In this regard, disasters can also be viewed as manifestations of vulnerability (see Douglas 1985; Boule, 1990; National Research Council, 1991; Alexander, 1991; Cannon, 1995; Salter, 1995; and Buckle, 1993). Vulnerability is defined by Buckle (1995) as:

...the degree of susceptibility and resilience of the individual, family and community and environment to hazards...

...vulnerability is a measure of the extent to which a potential event is likely to deplete or damage available resources such that the re-establishment of usual living conditions cannot be achieved within a reasonable period. In this sense vulnerability may be measured as a ratio of damaged to undamaged resources (p11).

Britton (1993) suggests that it is the interaction between human and physical influences that produces disaster vulnerability, and ultimately disaster. Figure 1.4 illustrates the process of disaster vulnerability in terms of the interaction between the physical event

(disaster agent) and the social conditions of human organisation. Buckle (1995) further argues that any evaluation of vulnerability must consider:

- The level of social aggregation being assessed for vulnerability;
- The type of loss, damage or consequence potentially or actually suffered;
- The capacity to recover (resilience);
- The change of vulnerability status over time;
- The interests and responsibilities of the person making the assessment of vulnerability; and
- The characteristics of the hazard agent.

Vulnerability can also be viewed as a conceptual equation of risk. UNDRP (1982) highlights such an equation which analyses in more depth the sequence of states pertaining to disaster. The equation consists of three components:

$$R_t = E (R_s) = E (H.V)$$

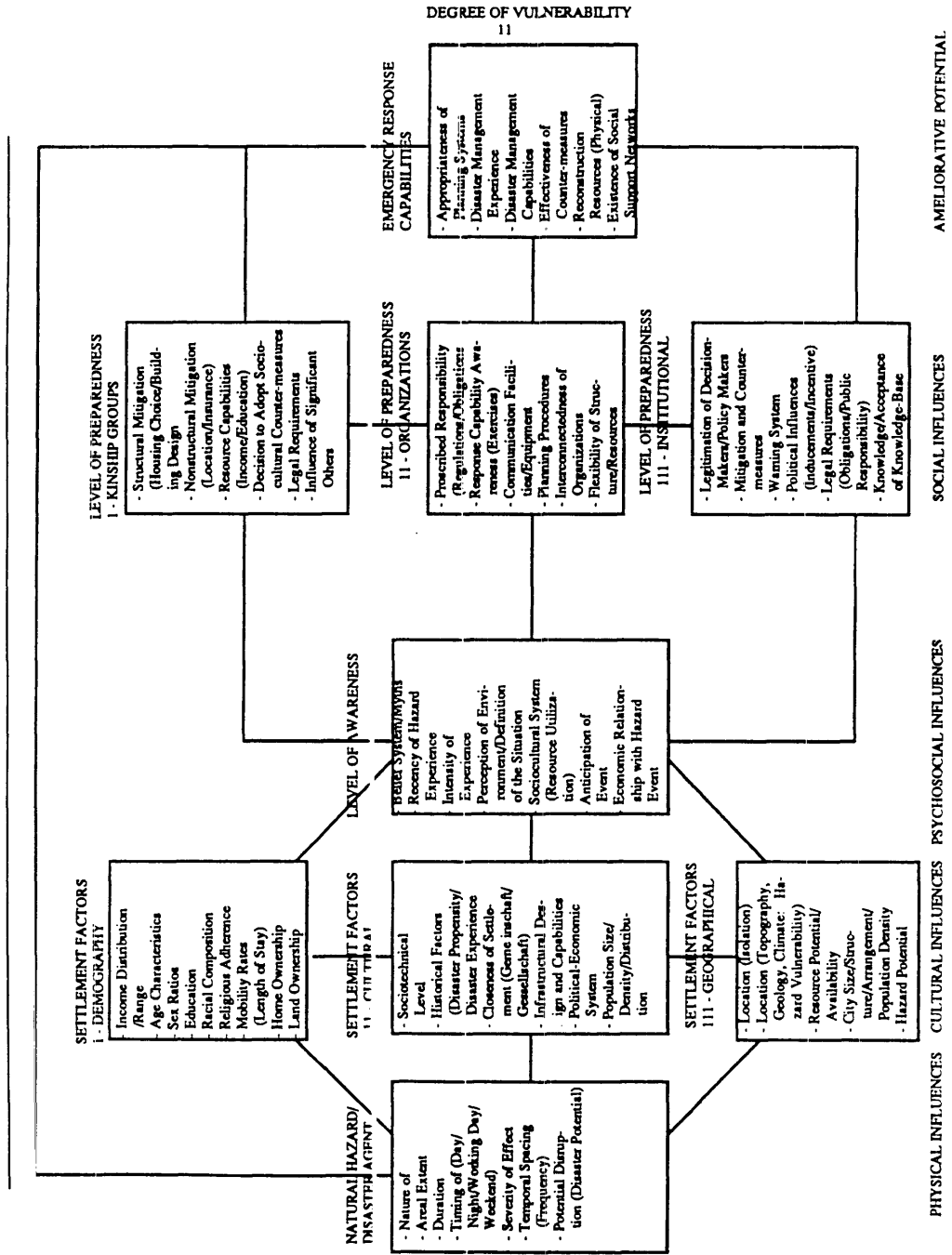
In the equation:

- (R_t) is total risk;
- The elements at risk (E) comprise the population, properties, economic activities, public services, and so on, which are under the threat of disaster in a given area;
- Specific risk (R_s) is the degree of loss likely to be caused by a particular natural phenomenon. It may be expressed as the product of the natural hazard, H , times the vulnerability, V ; and
- The total risk (R_t) consists of the number of lives likely to be lost, the persons injured, damage to property and disruption to activities caused by a particular natural phenomenon. It is the product of the specific risk (R_s) and the elements at risk (E) .

Risk amplification occurs as a result of the continued development of past and future disaster areas (Alexander, 1993), but it can be reduced by mitigation efforts. Mitigation can be divided broadly into structural and non-structural forms (Table 1.3).

Figure 1.4

Model Illustrating the Process of Vulnerability
(In Terms of the Interaction Between the Physical Event (Disaster Agent) and the Social Conditions of Human Organisation)



Source: Britton, N.R. 1993, 'Introduction to Disaster Management', AD01 Unit Folder, Centre for Disaster Management, University of New England, Armidale, NSW, p.98.

Table 1.3
Structural and Non-structural Methods of
Disaster Mitigation

• <i>Structural methods:</i>		
Retrofitting of existing structures		
Reinforcement of new structures:		design features
		overdesign
Safety features:		structural safeguards
		failsafe design
Engineering phenomenology		
Probabilistic prediction of impact strength		
• <i>Non-structural methods:</i>		
(a) short-term:		
Emergency plans:	(civil):	co-ordinator(s)
		police and firemen
		Red Cross and charities
		volunteer groups
		medical services
Evacuation plans:	military forces	
	routes and reception centres	
	for the general public	
	for vulnerable groups: the very young,	
	elderly, sick or handicapped	
Prediction of impact:	monitoring equipment	
	forecasting methods and models	
Warning processes:	general message	
	specialized warning (e.g. ethnic)	
(b) long-term		
Building codes and construction norms		
Hazard microzonation		selected risks
		all risks
Land-use control:		regulations, prohibitions, moratoria,
		compulsory purchase
Probabilistic risk analysis		
Insurance		
Taxation		
Education and training		

Source: Alexander (1993:5)

Overcoming vulnerability ultimately requires adaptation. Alexander (1991) defines four forms, or levels, of adaptation to natural hazard risk. The first level of adaptation involves comprehensive measures for hazard mitigation and abatement. The second adaptation involves cohabitation with the damage caused by past disasters in a state of maximum geographical inertia. It is complemented by a third adaptation, in which damaged or destroyed structures are abandoned, but populations relocate within the risk zone, hence creating secondary geographical inertia. A fourth level of adaptation may be

planned or unplanned migration to safer zones. Collectively, adaptation to risk or efforts to reduce the negative impact of disaster is termed adjustment.

Classification of Disaster

Disasters and the agents that produce them are sufficiently complex to defy easy classification (Alexander, 1993). Inevitably, for the practitioner and disaster researcher some classifications will appear to be more objective than others. This section will outline several classifications of disaster, but will not critically evaluate them.

A ranking of global hazard events by characteristics and impacts (Table 1.4) is presented by Bryant (1991). The hazards are listed in relative order of importance based upon a subjective assessment by Bryan .

Table 1.4
Ranking of Hazard Events by Characteristics and Impacts

Overall Rank ^b	Event	Grading of Characteristics and Impacts ^a								Occurrence of Associated Hazards
		Degree of Severity	Length of Event	Total Areal Extent	Total Loss of Life	Total Economic Loss	Social Effect	Long-term Impact	Suddenness	
1	Drought	1	1	1	1	1	1	1	4	3
2	Tropical Cyclone	1	2	2	2	2	2	1	5	1
3	Regional Flood	2	2	2	1	1	1	2	4	3
4	Earthquake	1	5	1	2	1	1	2	3	3
5	Volcano	1	4	4	2	2	2	1	3	1
6	Extra-tropical Storm	1	3	2	2	2	2	2	5	3
7	Tsunami	2	4	1	2	2	2	3	4	5
8	Bushfire	3	3	3	3	3	3	3	2	5
9	Expansive Soils	5	1	1	5	4	5	3	1	5
10	Sea-level Rise	5	1	1	5	3	5	1	5	4
11	Icebergs	4	1	1	4	4	5	5	2	5
12	Dust Storm	3	3	2	5	4	5	4	1	5
13	Landslides	4	2	2	4	4	4	5	2	5
14	Beach Erosion	5	2	2	5	4	4	4	2	5
15	Debris Avalanches	2	5	5	3	4	3	5	1	5
16	Creep & Solifluction	5	1	2	5	4	5	4	2	5
17	Tornado	2	5	3	4	4	4	5	2	5
18	Snowstorm	4	3	3	5	4	4	5	2	4
19	Ice at Shore	5	4	1	5	4	5	4	1	5
20	Flash Flood	3	5	4	4	4	4	5	1	5
21	Thunderstorm	4	5	2	4	4	5	5	2	4
22	Lightning Strike	4	5	2	4	4	5	5	1	5
23	Blizzard	4	3	4	4	4	5	5	1	5
24	Ocean Waves	4	4	2	4	4	5	5	3	5
25	Hail Storm	4	5	4	5	3	5	5	1	5
26	Freezing Rain	4	4	5	5	4	4	5	1	5
27	Localized Strong Wind	5	4	3	5	5	5	5	1	5
28	Subsidence	4	3	5	5	4	4	5	3	5
29	Mud & Debris Flows	4	4	5	4	4	5	5	4	5
30	Air-supported Flows	4	5	5	4	5	5	5	2	5
31	Rockfalls	5	5	5	5	5	5	5	1	5

^a Hazard characteristics and impacts are graded on a scale of 1 (largest or greatest) to 5 (smallest or least significant).
^b Overall rank is based on average grading

Source: Adapted from Bryant (1991:9)

Classification of disaster can make use of the distinction between sudden impact and slow onset (creeping) disasters. There is in fact a continuum in both lengths of forewarning and speeds of onset (Table 1.5).

Table 1.5
Classification of Disasters by Duration of Impact and Length of Forewarning

Type of disaster	Duration of impact	Length of forewarning (if any)
Lightning	instant	seconds–hours
Avalanche	seconds–minutes	seconds–hours
Earthquake	seconds–minutes	minutes–years
Tornado	seconds–hours	minutes
Landslide	seconds–decades	seconds–years
Intense rainstorm	minutes	seconds–hours
Hail	minutes	minutes–hours
Tsunami	minutes–hours	minutes–hours
Flood	minutes–days	minutes–days
Subsidence	minutes–decades	seconds–years
Windstorm	hours	hours
Frost or ice storm	hours	hours
Hurricane	hours	hours
Snowstorm	hours	hours
Environmental fire	hours–days	seconds–days
Insect infestation	hours–days	seconds–days
Fog	hours–days	minutes–hours
Volcanic eruption	hours–years	minutes–weeks
Coastal erosion	hours–years	hours–decades
Accelerated erosion	hours–millennia	
Drought	days–months	days–weeks
Crop blight	weeks–months	days–months
Expansive soil	months–years	months–years
Desertification	years–decades	months–years

Source: Alexander (1993:10)

Disasters can be classified according to frequency or type of occurrence (Table 1.6).

Table 1.6
Classification of Disasters by Frequency or Type of Occurrence

Type of disaster	Frequency or type of occurrence [†]
Lightning	Random
Avalanche	Seasonal/diurnal; random
Earthquake	Log-normal
Landslide	Seasonal-irregular
Tornado	Seasonal; negative binomial
Intense rainstorm	Seasonal/diurnal; Poisson
Hail	Seasonal/diurnal; Poisson, gamma, negative binomial
Tsunami	Random
Subsidence	Sudden or progressive
Windstorm	Seasonal/exponential
Frost or ice storm	Seasonal/diurnal; Markovian, binomial
Hurricane	Seasonal/irregular
Snowstorm	Seasonal; modified Poisson‡
Environmental fire	Seasonal; random
Volcanic eruption	Irregular
Insect infestation	Seasonal; random
Fog	Seasonal/diurnal
Flood	Seasonal; Markovian, gamma, log-normal
Coastal erosion	Seasonal/irregular; exponential, gamma
Drought	Seasonal/irregular; binomial, gamma
Crop blight	Seasonal/irregular
Expansive soil	Seasonal or irregular
Accelerated erosion	Progressive (threshold may be crossed)
Desertification	Progressive (threshold may be crossed)

[†] Frequency distributions adapted from Hewitt (1970: 333–4).

[‡] Eggenberger and Polya modification: see Hewitt (1970).

Source: Alexander (1993:22)

Disasters can be classified in time and space. Disasters can be classified into distinct time phases pertaining to isolation, rescue, and remedy (Alexander, 1993). The physical and human timescales in disaster are summarised for three hypothetical examples in Table 1.7.

Table 1.7
Summary of Time Periods in Disaster (With Example)

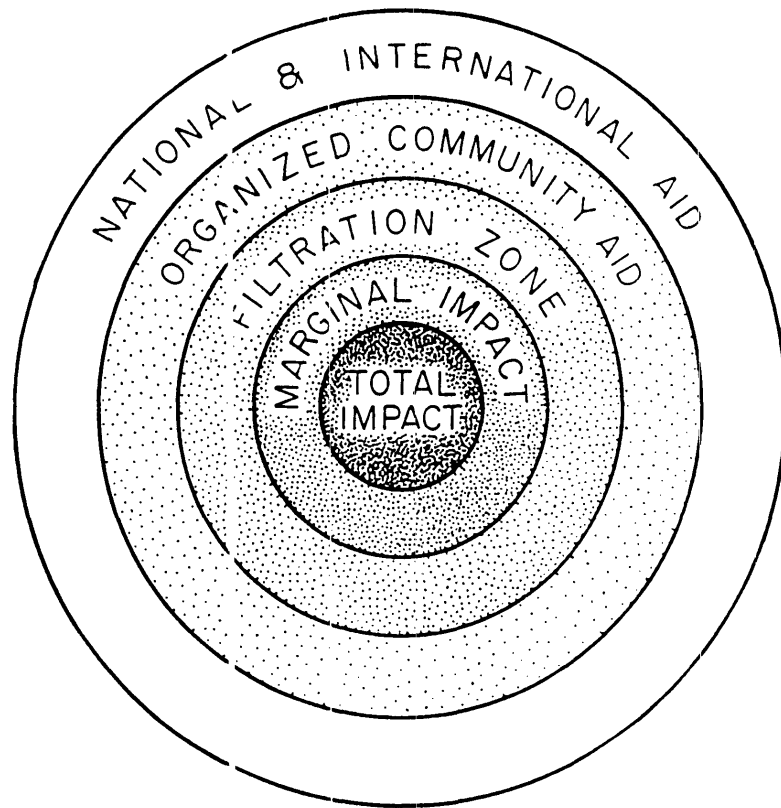
Time period	Purely hypothetical examples:		
	Earthquake	Tornado	River flood
“Incubation” or return period	150 years	5 years	100 years
Immediate precursor period	none	20 mins	15 hours
Impact	100 secs	5 mins	36 hours
Aftermath or crisis period:			
Isolation	8–48 hrs†	2 hours	2 hours
Search and rescue	2–7 days	12 hours	3 days
Repair of basic services	4 weeks	3 weeks	5 weeks
The long term:			
Restoration–reconstruction	12 years	2 years	4 years
Developmental reconstruction	25 years	3 years	12 years

† Time lapse represents centre-periphery dichotomy.

Source: Alexander (1993:25)

The spatial model of disaster has received little theoretical treatment (Alexander, 1993). Wallace (1956) proposed a simple conceptual model of spatial relations in disaster consisting of four concentric areas (Figure 1.5). The model proposed how human behaviour can change with distance and/or location from the immediate impact zone. Weisaeth (1991) researching post-traumatic stress reactions to the Chernobyl disaster, used the spatial model to identify that the closer one gets to the disaster centre, the greater the intensity of the post-traumatic stress reaction; with other psychological reactions occurring at-distance away from the disaster centre.

Figure 1.5
Spatial Model of Disaster



Source: Wallace (1956), cited in Alexander (1993:25)

Adding to the complexity of classifying disaster, is the composite nature of some events. For example, an earthquake can result in secondary hazards, including flooding through dam or reservoir failure, fire, building damage, landslides and/or slope avalanches, tsunamis, and the like.

Hood & Jackson (1991) recognising the complexity of disaster, go one step further by suggesting that the distinction between natural disaster and socially-created disaster is a fuzzy one (Table 1.8). Hood & Jackson (1991) suggest that:

Instead of thinking of a sharp dichotomy, it is better to think of a continuum stretching from purely natural disasters (quite unpredictable events which are solely created by forces outside human control) to purely social disasters (events which are solely the product of decisions made about and within human organisations rather than of random shifts in the forces of nature). Between these two extremes is a large group of "hybrid" disasters which are a compound of human decisions and volatile "natural" forces (p13).

It is this growth in hybrid disasters, involving complex and often rapid human decision making, that reinforces the need for an Intelligent Disaster Management System (IDMS).

Table 1.8

The Continuum from Natural to Social Disaster

TYPE OF DISASTER			
	Purely Natural	Hybrid	Purely Social
Causation	Not caused by any human activity	Caused by interaction of human activity and natural forces	Caused by human activity alone
Example	Meteorite strikes Earth without warning	Floods ravage community built in known flood plain	Multiple failure causes nuclear reactor to melt down

Source: Hood & Jackson (1991:18)

Any classification of disaster would not be complete without recognition of disaster victims. Like the actual event, disaster victims are not always easy to classify.

Disaster Victims

Any understanding of natural or technological disaster would be not complete without some consideration of the effect of disaster on people. Stress and coping are common outcomes of a disaster (Davidson & Baum, 1991). For example, the Three Mile Island Nuclear Power Station disaster left people with abnormal levels of chronic stress up to six years following the accident (Davidson & Baum, 1991). Table 1.9 shows that Three Mile Island residents reported more bothersome symptoms of chronic stress: anxiety, somatic distress, depression, suspiciousness, and fear than did control subjects based in Frederick, Maryland. Employing self-blame as an attempt at coping with chronic stress (Table 1.10) showed that Three Mile Island residents who did not report using self-blame had the most bothersome symptoms of stress when compared with the control group based at Frederick (Davidson & Baum, 1991).

Table 1.9

Stress at Three Mile Island and Frederick (January, 1984)

Stress Measure	TMI	Frederick	*probability <i>P</i>
Total Symptoms (0-90)	34.63	16.06	.01
Somatic distress (0-4)	.70	.21	.01
Depression (0-4)	.58	.19	.01
Anxiety (0-4)	.67	.15	.01
Fear (0-4)	.29	.05	.01
Suspiciousness (0-4)	.79	.42	.01
Proofreading (% errors found)	35	60	.01
Norepinephrine (ng/hr)	2064	1158	.01
Epinephrine (ng/hr)	325	238	.10
Cortisol (mcg/hr)	321	156	.01
Systolic blood pressure (mmHg)	125	117	.05
Diastolic blood pressure (mmHg)	76	71	.01
Heart rate (beats/min)	76	68	.01

* The symbolic statement, $P < .01$, means that the chances are less than 1 out of 100 that the observed differences are due to chance.

Source: Davidson & Baum (1991:43)

Table 1.10
Stress and the Use of Self-Blame at Three Mile Island and Frederick
(January, 1984)

Stress Measure	TMI, no self- blame	TMI self- blame	Control no self- blame	Control self- blame	probability <i>P</i>
Total Symptoms (0-90)	39.40	19.70	23.50	.22	.05
Depression (0-4)	.69	.19	.37	.29	.05
Anxiety (0-4)	.79	.18	.46	.23	.01
Proofreading (%)	33.00	63.00	40.00	58	.01
Cortisol (mcg/hr)	391.00	119.00	168.00	201.00	.01
Norepinephrine (ng/hr)	2542.00	914.00	1277.00	1152.00	.06
Epinephrine (ng/hr)	370.00	244.00	238.00	277.00	.01

Source: Davidson & Baum (1991:41)

Examining psychosocial reactions in Norway to nuclear fallout from the Chernobyl disaster showed that residents were experiencing forms of stress and coping. Significantly, a study by Weisaeth (1991) identified community concern (71.4%); 'very' unpleasant thoughts and feelings (20.8%); and, 'somewhat' unpleasant thoughts and feelings (56.7%) (Weisaeth, 1991). Although definite clinical symptoms indicating traumatic stress effect were rare, there were nonetheless significant numbers of people who were either defensively avoiding thinking about the accident, and/or experiencing periodic intrusive thinking (33.3%) (Weisaeth, 1991).

Table 1.11

Worries, Thoughts and Feelings in a Sample (N = 998) of the Norwegian Population
3-6 Weeks After the Chernobyl Accident

		<i>n</i>	%
Worrying most about:			
Being hurt oneself from radiation			
Acute		245	25.5
Long-term		280	29.2
Close ones hurt from radiation			
Acute		239	24.9
Long-term		297	30.9
Thoughts and feelings:			
Not at all unpleasant	1	208	22.4
Somewhat unpleasant	2	526	56.7
Very unpleasant	3	193	20.8
Affected by thoughts and feelings:			
No thoughts or feelings		84	8.8
Thoughts, but little distress		494	51.5
Periodic intrusive thinking		320	33.3
Avoidance of accident related themes		64	6.7
Continuous intrusive thoughts		12	1.3
Repetitive nightmares		5	0.5
Change in thinking in general			
More positive		27	3.0
Unchanged		604	67.0
More pessimistic		271	30.0
Degree of depressive reaction			
Not at all	1	503	54.1
Rather little depressed	2	324	34.9
Rather depressed	3	88	9.5
Very depressed	4	14	1.5

Source: Weisaeth (1991:62)

When classifying disaster victims there must be realisation of:

- The extent to which they have suffered personal injury and sickness, bereavement, and property loss (Beinin, 1985);
- The particular task focus or emotional focus methods they used for coping (Baum & Singer, 1983);
- The social chaos, disruption, and havoc occasioned in a community by a particular disaster (Barton, 1969); and
- Emergency service personnel who despite their special selection, training, and high level of performance were sometimes found to be under strain (Hartshough & Myers, 1985).

Moreover, it was a clinical concern with emergency service personnel and their ancillary groups, that led Taylor & Frazer (1981;1982) to develop a classification system that would place them in a separate category (Table 1.12).

Table 1.12

Classification of Potential Victims

-
- | | |
|--|--|
| <p>1. PRIMARY VICTIMS—those who are directly exposed to a large scale catastrophe with the potential for destroying life, disrupting well established relationships and patterns of behavior, and for destroying property;</p> <p>2. SECONDARY VICTIMS—those with close family and personal ties to the primary victim; who themselves have severe grief and perhaps guilt reactions;</p> <p>3. TERTIARY VICTIMS—those whose occupations and duties require them to respond to any major alert in the community and to assist with any subsequent rehabilitation and restoration work;</p> <p>4. QUATERNARY VICTIMS—those concerned and caring members of communities beyond the impact area who express their intentions often with inappropriate goods and services. They might also come from organizations that feel some responsibility</p> | <p>ity for having perhaps contributed to the cause of a particular disaster;</p> <p>5. QUINTERNARY VICTIMS—those individuals and groups who lose control when in proximity to disasters and either reveal their underlying psychopathology by their ghoulish preoccupation with cadavers or by their unruly behavior in mobs;</p> <p>6. SESTERNARY VICTIMS—those miscellaneous people who</p> <ul style="list-style-type: none"> (a) think that but for chance events they would have been primary or secondary victims; (b) refrained from expressing a premonition to somebody who subsequently became a primary victim; (c) actively induced people to enter situations in which they became primary victims; (d) were the close relatives and friends of the tertiary victims who waited at home for news that their people were safe and then shared the emotional burden of the postdisaster working situation; (e) as clinicians and researchers, at a stage often far removed from the "disaster-face," are liable to have their professional competence affected because of <ul style="list-style-type: none"> 1. the acute and prolonged demands presented by their own postdisaster work, 2. the risk of emotional identification with the suffering of some workers, 3. any compelling desire to appear to be doing something immediately 'useful' as distinct from indirect or abstract, 4. any thirst from seeking sustained dramatic experience; (f) suffer guilt from benefiting from a disaster. |
|--|--|
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Source: Taylor (1989:17-18)

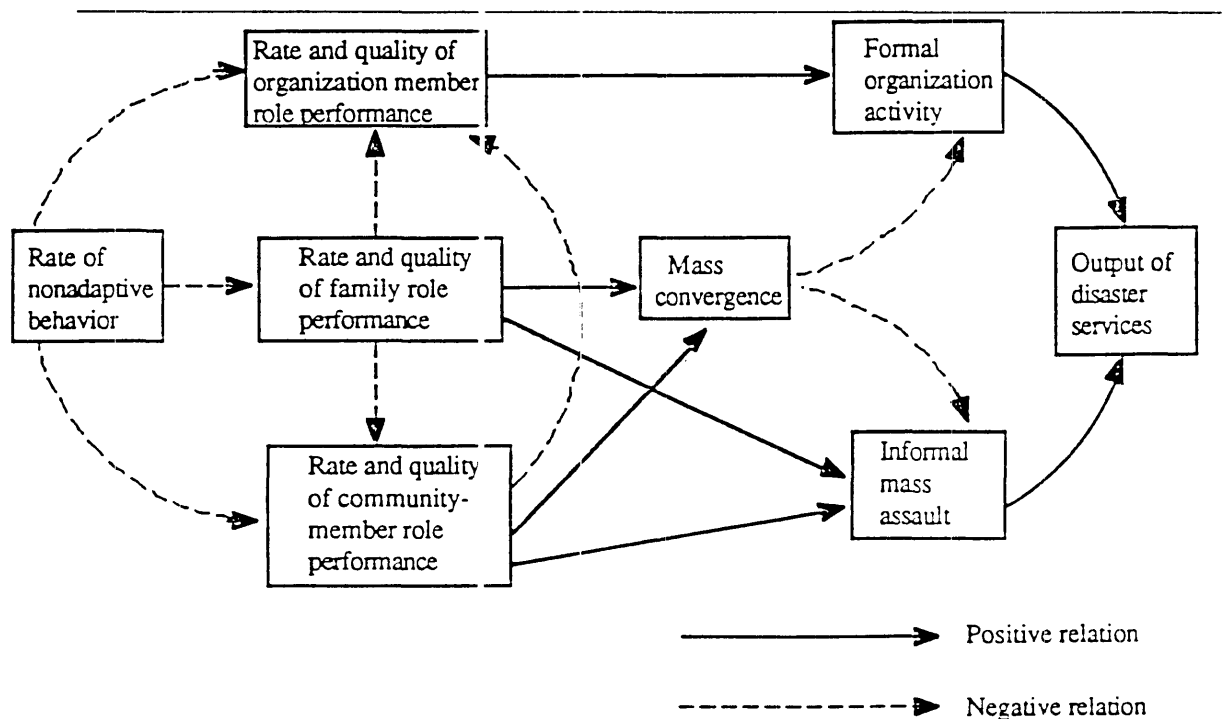
An 'Emergency Social System'

An emergency social system is set up in response to disaster. When a disaster is sudden and on a large scale relative to capacity of the normal system to cope with it, an emergency social system has to be created to quickly provide a large volume of disaster services (Britton, 1993). Disaster-relevant organisations and masses of individuals must be mobilised to provide such services as rescue, transportation of the injured, medical care, food and shelter, reassurance and psychological support, and the restoration of damaged essential facilities. At the same time non-postponable maintenance activities must be continued, including taking care of children and feeding families as well as keeping up public order and public utilities output. This improvised system must perform these services under conditions of damaged facilities and partly incapacitated personnel.

Barton (1962) addresses a number of issues affecting the output of the emergency social system. Figure 1.6 illustrates the relationships influencing the output of the emergency social system.

Figure 1.6

Relationships Influencing Output of the Emergency Social System



Source: Barton (1962:85)

Barton (1962:34-46) identifies a number of factors affecting response of the emergency social system:

- People exposed to severe threats to highly valued objects without adequate role definitions or equipment for dealing with them, or with conflicting role obligations, are put under great strain. This could conceivably lead to a high rate of non adaptive behaviour.
- Normal primary-group ties provide quick help for many, but they do not provide for all victims. The entire group may be incapacitated or essential members may be away; and some victims may be socially isolated. Unless there is a norm requiring help to all community members in distress, or a general emotional response of sympathy for such people many will go without aid.
- Certain kinds of impacts cannot be handled by the mass response. They may require special skills and equipment which the general public does not have. Or they may saturate the primary groups with injuries and material losses so that many cannot help even their own members, and few can spare help for outsiders.
- The mobilisation of people to play family or general community-member roles competes with organisational mobilisations and may leave the formal organisations short of or entirely without personnel. This is the organisational consequence of the 'role conflict' problem.
- Organisations may have difficulty making decisions and directing their personnel under unexpected conditions and for unexpected tasks, due to inadequacies of the leadership or of previously worked out programs.
- Organisations may not define the situation as one which requires them to act. Relieving suffering or helping the general community may not be 'their business'.
- Organisations become highly dependent on one another in disaster, but they may lack experience, plans, and facilities for coordinating their activities under the unexpected conditions and needs of disaster, so that their joint output is far below what it should be.
- The uncoordinated mass response of individuals and small groups may overload facilities of all kinds, interfering with one another and with the formal organisations. One form of this has become known as the 'convergence problem'.
- Organisations may need public support in supplies and personnel in a situation where there are no established expectations and channels, with the result that organisations may fail to take advantage of potential help, or the mass response may be too much or too little.
- Organisations must find ways of getting their services to masses of people in a situation where there may be no established expectations and channels to guide the public and the organisations, or where normal expectations cause improper mass responses.

Clearly, an emergency social system in its planning and organisation for dealing with disaster must reconcile factors affecting its possible response, and thus success.

A search of the definitions and basic concepts of disaster and its management highlight the complexity of the area and the importance of continuing disaster research.

THE IMPORTANCE OF DISASTER RESEARCH

The management of disasters is receiving greater recognition from governments worldwide. Australia is no exception (see Buckle, 1996; Kanarev, 1996; Koob, 1996; Smith, 1996; and Wright, 1996). The risk of disaster, particularly that associated with new technologies is increasing and thus society is becoming increasingly vulnerable. For these reasons, both academics and practitioners will need to join forces, where possible, and communicate their specialist knowledge and experience to one-another, and more importantly, the wider community. Significantly, Australia recently held a conference, Natural Disaster Reduction 1996, the second such conference after the passing of some twenty years, to consider the state of knowledge on various aspects of natural disasters.

In essence, the identification of, and encouragement of continuing disaster research, is critical for the development of learning and understanding of natural through to social disaster. Perrow (1984) underlined this fact with his critical evaluation of living with high-risk technology.

The late twentieth century is witnessing a significant increase in the risk associated with disaster, which has only partially been offset by better preparation and mitigation (Alexander, 1993). There are, suggests Alexander, four inherent reasons for this:

- Firstly, geographical inertia and the economic advantages of specific locations have led to a continued inhabitation of past and potential disaster zones;
- Secondly, particular risks of dangerous conditions have sometimes been increased by neglect or environmental malpractice;
- Thirdly, the impact of hazards has become more profound as the complexity of society has increased; and
- Fourthly, until recent times there has been a lack of knowledge, research and protective regulations concerning disasters and their impacts.

Britton (1993:47) has highlighted a number of reasons for Australian society becoming increasingly vulnerable to the threat of disasters:

- The increasing demand for land due to population increase especially in Sydney, but also in Melbourne and Brisbane.
- The relocation of specific groups into vulnerable areas, elderly people move into the sun-belt of south-east Queensland and northern New South Wales, both of which are prone to flooding and severe storms.
- Inadequate resource provision eg. townships have sprung up throughout the northern Australian coastal areas to export mineral resources: by doing so, they are vulnerable to cyclones and in some cases, storm surge inundation.
- The spread of population into marginally safe areas eg. flood plains.
- The development of structural mitigation works eg. flood levees which local government officials and citizens think will prevent future flooding, but homes are built adjacent to levee banks.
- Changes in life-styles eg. the “back-to-nature” development and movement into bushland.
- The increased acceptance of public responsibility for the burden of costs caused by disasters. (Governments have a tendency to provide disaster relief funds unthinkingly, in a spirit of humanitarianism., but in doing so, inadvertently creating a disincentive for people to take responsibility for their own actions. The classic illustration of this is the move of metropolitan populations into urban bushland 1945 onwards exacerbating the bushfire risk. It was the importation of Eucalypts into California which has exacerbated bushfire risk in already fire-prone parts of the Los Angeles and San Francisco Metropolitan Areas (see Oakland Fires, 1992; Los Angeles/Malibu Fires, 1993 and current October 1996 Fires).

The author would suggest another reason as to why there is a significant increase in the risk associated with disaster:

- Increased risk aversion, which in itself is a function of increasing wealth. We now have more to lose and we are also more convinced of our ability to control and/or manage risk.

A consequence of increased vulnerability, is that most Australian States and Territories have questioned their organisational capacity to deal with the threat and impact of disaster. For example, Queensland, creating a single bureau of emergency services, identified (see QES, Strategic Plan 1991-1996) a number of external and internal issues which demonstrated the need for organisational restructuring on the part of emergency service organisations:

External issues included:

- The rapid population increases in the south-east corner of the State and in the Townsville and Cairns regions;
- The declining growth rate west of the coast and to the north-west of the south-east quarter of the State;
- The tourist development on the north-east coastline;
- The increase in the number of high-rise buildings in the south-east quarter of the State and provincial cities;
- The increase in the number of storage sites for flammable and toxic substances in and around major cities;
- The concentration of the majority of specialist health services in Brisbane;
- The optimum emergent health care transport outside metropolitan areas is via air aerial services;
- The population of Queensland expect emergency services to be highly responsive to demands which range from routine services to minor “emergencies” to disaster situations;
- The general public expect that fees and levies will not rise significantly more than the cost of living increase on an annual basis;
- The less than optimal public awareness and knowledge of prevention and self help mechanisms and procedures; and
- The environmental issues such as the “greenhouse effect” on weather and tidal patterns.

Internal issues included:

- That there is need for an integrated QES strategic management plan, to facilitate the establishment of program management, performance indicators and performance evaluation in all units of the Bureau;
- That common regional boundaries within the QES Divisions needs to be established. A lack of common administrative areas is an impediment to developing close working relationships;
- That operational plans for joint emergency service operations need to be reviewed;
- That need to develop common terminology and common systems of management for use by all QES Divisions;
- That state-wide public education programs and State-wide corporate public relations programs are needed which ensure the public is aware of the emergency services available and the activities of the QES;

- That coordinated approaches required for the development, training and support of auxiliary and volunteer emergency workers across all QES Divisions;
- That not all QES Divisions enjoy fully coordinated and technologically up-to-date mobilisation systems;
- That coordination needs to be increased among QES staff training programs;
- That greater coordination of public awareness programs is required to encourage prevention and community self help in emergency situations; and
- That there is potential for duplication of services and facilities.

Clearly, changes are being forced on governments and disaster management systems because of the growing awareness of how vulnerable society is to the vagaries of both nature and technology (Kroll-Smith & Couch, 1991). Changes may also be driven by increasing risk adverseness. Disaster impact is creating potentially serious political ramifications for governments (Pavlak, 1988). The growth and movement of populations increases the potential risk exposure (Alexander, 1993). Changes in ideas about who is responsible for the protection of the people and increasing recognition that traditional preventative mechanisms are not working as effectively as had been anticipated are reinforcing the need for re-evaluation of disaster management programs (Wright, 1996). Combined, these changes underline the need for governments to economise in developing their disaster management system(s); not least because of competing public demands on declining government resources.

Furthermore, cross-discipline searching and learning is important in the search for a comprehensive and integrated disaster management system. This means that an element of subjectivity may be brought into the future research agenda. The author questions, however, whether this is such a negative thing? Certainly, in some academic circles such an approach would challenge the notions of clear, objective, and rational disaster research. Nevertheless, the future success of disaster research most probably lies in the application of disciplines not yet realised.

CONCLUSION

This Chapter examined the nature of disaster, and more specifically, addressed the question: "What makes an event a 'disaster'?" It is clear that disaster is a very complex phenomenon that exerts a substantial influence on modern society. Disasters are manifestations of risk and vulnerability.

Increasingly, there is realisation that disaster causation is the result of failure in organisational systems to cope with complexity and uncertainty (Horlick-Jones, 1990; Toft & Reynolds, 1994). In this regard, the aetiology of disasters is typically comprised of a complex combination of technical, individual, group, organisational, and social factors (Toft & Reynolds, 1994). This accounts for Hood & Jackson's (1991) observations that the distinction between natural disasters and socially created disasters is not always clear.

When compared globally, Australia does not appear to have had many events that could be considered 'disasters', particularly, if significant loss of life, total destruction of social processes, widespread destruction of functional infrastructure, and significant economic losses are key measures. Having said this, some notable Australian events have been characterised by significant economic losses.

Cross-discipline searching and learning is important in the search for a comprehensive and integrated disaster management system. The future success of disaster research most probably lies in the application of disciplines not yet realised.

In Chapter Two we examine the current Australian disaster response system.