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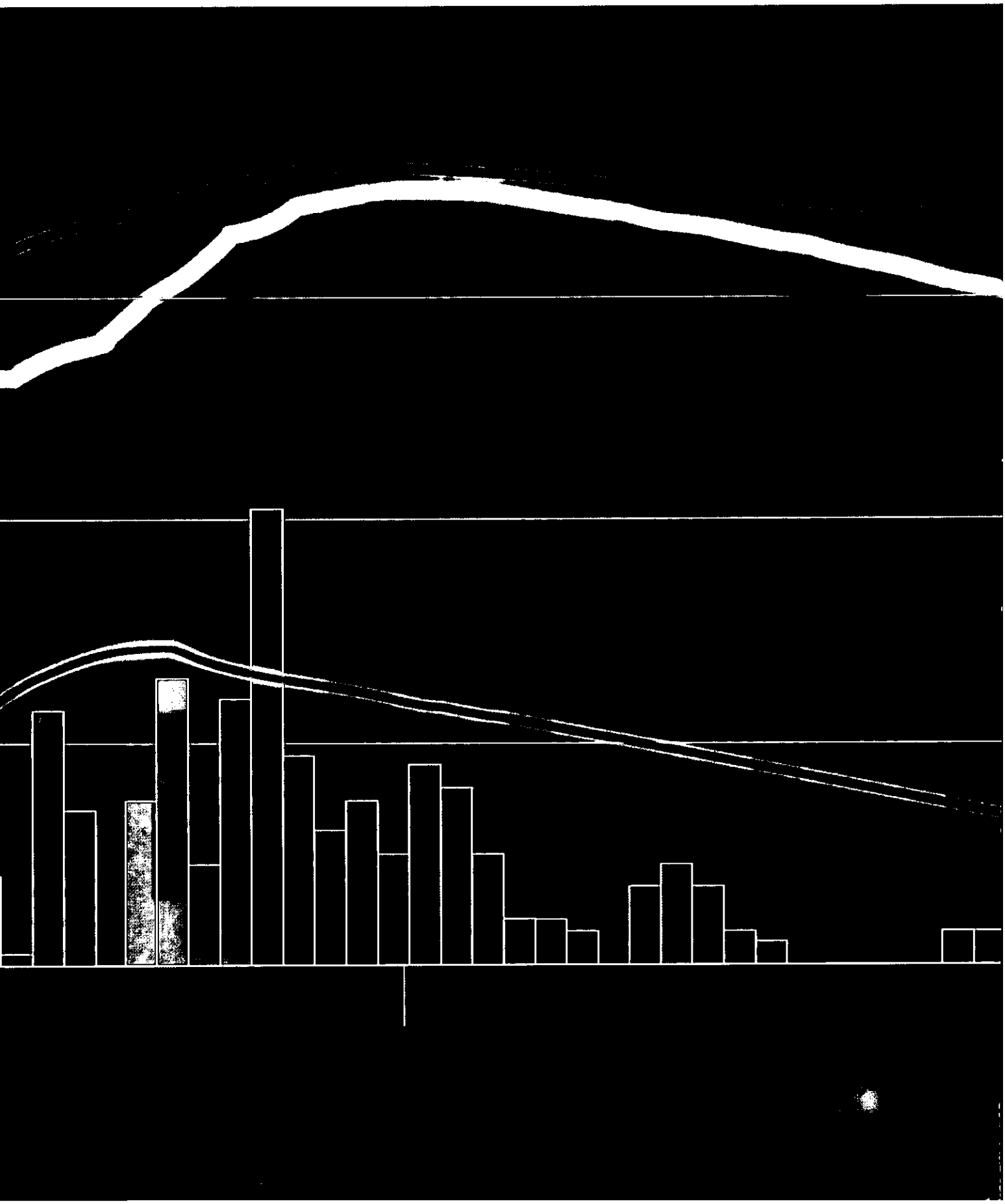

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The Australian Journal of Emergency Management

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The journal endeavours to provide an information sharing forum for all those involved in emergency management. Contributions relating to Australian and international emergency activities, articles identifying and discussing issues, policies, planning or procedural con-cerns, research reports and any other information relevant to the emergency and disaster management community are welcome.

The aim of this publication is the exchange of information and views across the Australian emergency management community, therefore, the views expressed in this journal should not be taken to be the views of Emergency Management Australia.

This journal incorporates a review process. Three levels of review—refereeing, editorial board review and editing—are conducted. Material submitted for publication should be on disk and reach the Editor by the following dates: Summer – October 15th; Autumn – January 15th; Winter – April 15th; Spring – July 15th. The editorial committee reserves the right to determine the suitability of all material submitted and where necessary to edit submissions.

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Editorial

Perspectives on Emergency Management

In March an inaugural meeting was held in New Zealand of selected representatives from USA, NZ and Australia to consider the future of emergency management in the next decade. The 'Impact 2010' conference, which was a far-sighted initiative of the United States of America and New Zealand, was attended by 55 delegates.

Australia was represented by a member of each State and Territory emergency management committee, the Bureau of Meteorology, the Australian Geographical Survey Organisation, the Insurance Council of Australia, the Natural Hazards Centre of Macquarie University and EMA.

In each of the three main sessions, one country took the lead with a keynote paper and other countries provided supporting papers. Major themes were the *Philosophy of Emergency Management* (NZ), *Developing the Necessary Tools* (USA) and *Developing the Necessary Skills* (Australia). The papers were challenging and those from Australia resulted from national collaboration between EMA and State and Territory emergency management committees.

The expectations of the Australian delegation were that:

- we would learn from each other of activities that are being done better elsewhere
- we would achieve consensus among key Australian emergency management players of priority directions to be pursued
- we would explore ways in which to motivate governments to be as serious about disaster mitigation as they are about response capabilities
- we would identify means of changing community attitudes and behaviour about the risks they face
- we would look to the coming decade to see how we can organise and provide emergency management information to those who need it and in the form required
- we would have time to get to know each other better and to be in 'receive' as well as 'send' mode.

In one way or another, these expectations were met. The Australian delegation was certainly challenged. However, we recognised that while we in Australia have no monopoly on good ideas, we can undoubtedly hold our own internationally. The directed, yet free-flowing, activity enabled us to shape our views and reassess priorities. We came away with a determination to continue to develop and refine our approaches as part of the national emergency management committee system and in more informal situations.

The wide representation at the meeting reinforced that emergency management is not the exclusive domain of practitioners. Saving life and property and protecting the environment is a whole-of-government, whole-of-community function. The significant challenge for the next decade in Australia is for emergency managers to ensure that there is broader ownership within both governments and the community.

Alan Hodges, *Director General, EMA*

National studies program

EMA is involved in the development of prevention, preparedness, response and recovery strategies for all hazards that pose a significant risk to Australian communities.

EMA sponsors a national studies program consisting of workshops, seminars and study periods conducted annually at the Australian Emergency Management Institute at Mt. Macedon, Victoria. The program addresses multi-disciplinary aspects of emergency management to enhance capabilities or to further community understanding.

Each event may be attended by up to 50 people. EMA will fund travel for participants within Australia, administration of the event and accommodation for participants at the Institute, to a limit of $20,000 per event.

Nominations are invited for topics to be considered during the period of July 2000–June 2001. Submissions must identify the type of event proposed, its aims and outcomes, the target audience, and how the event will strengthen emergency management capabilities. Preference will be given to multi-disciplinary topics. Proposals for jointly-funded events may also be viewed favourably.

Application forms and selection criteria are obtainable from the Director, Australian Emergency Management Institute, Mt Macedon Vic 3441, tel: (03) 5421 5100, fax: (03) 5421 5272.

Integrating emergency services

How WA is merging fire and emergency services agencies

by Bob Mitchell, CEO,
Fire and Emergency Services
Authority of WA (FESA)

Commonwealth and State Government policy directions are driving major change throughout the public sector. As a result, public sector organisations have to look deep within their operations, identify core services, services they provide well and ones they do not. In a nutshell, the message 'is shape up or be shipped out'! In Western Australia, the *Bush Fire Service*, *State Emergency Service* and the *Fire and Rescue Service* are being brought together under the umbrella of the *Fire and Emergency Services Authority of WA*.

For organisations to gain control of their futures, it is necessary to clearly identify where they are going, manage stakeholders effectively to meet their changing expectations and to achieve results in terms of increased customer service delivery and in meeting the demands of government within tight budgetary constraints. Most will be aware that some significant changes have been occurring in the fire and emergency services portfolio in Western Australia and that a new structure has been created to accommodate these changes. However, many will not be aware of the details. As the CEO of the new *Fire and Emergency Services Authority*, or FESA as it is now commonly known, I am pleased to be able to share our experience in Western Australia in bringing three agencies under the one umbrella.

FESA: the background

In June 1997, the Minister for Emergency Services announced the establishment of an Emergency Services Taskforce to progress the implementation of a new structure to improve coordination and planning across the Emergency Services portfolio.

The Minister identified four key outcomes the Government wished to achieve:

- overall improvements in the effectiveness and coherence of policy development and implementation
- a coordinated approach to planning and management matters across agencies
- improvements in the delivery of service to the community and volunteers
- savings through the rationalisation of corporate services, which will be redirected to operational areas.

The Taskforce submitted its Report on 1 October 1997 containing 63 recommendations and as a result FESA was created as a Department under the Public Sector Management Act on 1 January 1998.

The establishment of FESA has effectively brought together, under the auspice of one Chief Executive Officer and one Board of Management, the *Fire and Rescue Service* (FRS), the *State Emergency Service* (SES) and the *Bush Fire Service* (BFS).

Emergency services in WA

The FRS consists of both career and volunteer firefighters, whose roles include prevention, structural and bush firefighting in gazetted fire districts and attending road rescue and hazardous material incidents throughout the State.

The FRS has career firefighters throughout the metropolitan area and the larger regional centres of Albany, Bunbury, Geraldton, Kalgoorlie and Northam. These areas are funded 12.5% each by State and Local governments and 75% through a fire service levy on insurance premiums. Albany, Geraldton, Bunbury, Kalgoorlie and Northam have a mix of both career and volunteer firefighters. There are approximately 100 towns throughout regional WA that support a volunteer FRS brigade. These brigades are funded 100% by State Government. There are approximately 720 volunteer bush fire brigades throughout WA. These brigades provide fire prevention and suppression services to the remainder of the State including the outer metropolitan areas of Perth. Funding and equipping these brigades is the responsibility of the relevant Local Government Authority under the Bush Fires Act 1954.

There are 82 State Emergency Service units that assist the community in times of crisis such as storms, floods, cyclone and earthquake. The SES is funded through a variety of sources, including the State and Federal Governments, and relies upon the support of local government authorities.

So it is a complicated task consolidating the emergency services in Western Australia and there was, and still is, a number of key issues that needed to be addressed.

FESA budget and staff

The new authority now manages a substantial budget. The cost of services provided by the three agencies is $85 million per annum. This does not include the contribution of volunteers, which is estimated to be well in excess of $15 million per annum. The agency receives funding from a variety of sources, including the Federal, State and local governments, the insurance industry and donations.

FESA is in a sound overall financial position with liabilities of $50 million against assets of $109 million. There are 1100 permanent staff and 20,000 volunteers between the three operational divisions.

The key issues

Planning for the future

The establishment of FESA on 1 January, 1998, has provided an opportunity for the organisation to establish a planning process across its constituent divisions that provides direction and focus for emergency services in WA.

We have now commenced organisational strategic and business planning to take FESA into the 21st Century. Our planning process is designed to be highly consultative process to ensure ownership of the strategic direction.

It is widely debated that there are at least two well used approaches to implementing the developmental process: top-down or participative. The top-down approach involves the imposition of objectives that are established by senior management without meaningful consultation, greater concentration of authority, narrowly prescribed levels of discretion and reliance on hierarchy, and imposition of managerial performance standards. My view is that for an emergency service organisation this is wrong. We have adopted the participative approach that involves widespread employee and other internal and external stakeholder participation.

FESA's mission, vision, values, services and strategic intentions were developed through workshops with the FESA Executive and then through forums involving each of the divisions and a number of focus groups. Feedback was received and changes made to reflect these changes.

FESA's draft mission, vision and values are:

- *Mission:* Working together to achieve a safer community through delivery of the

highest quality of service to Western Australians through advice, emergency prevention, preparedness, response and recovery.

- *Vision:* A safer community by minimising the impact of natural and man-made hazards.
- *Values:*
  - Put the community first.
  - Work together as a committed team.
  - Respect and value each other.
  - Continuously improve our services.
  - Act with integrity and honesty.
  - Have open and honest two-way communications.

The development of the FESA strategic plan, as stated previously, is one borne out of forced change. It also needs to be easily adaptable to rapidly changing circumstances. The selected planning process is one that sets a compatible direction to existing divisions yet still allows the cohesion and planned economies of scale designed in the merger of the separate organisations.

As successful planning and commitment requires the input of, among others, the internal stakeholders, this plan allows the input of its people. It is imperative that the internal stakeholders take ownership of the plan to ensure the plan is implemented and outcomes are achieved. The input of its people is also seen to be a process that needs to reflect the planning events of recent years. It is contended that the tendency for cynicism or scepticism is better treated by a less intrusive approach than previously attempted.

Underpinning our planning process will be the adoption of commonly agreed values, which is something we have already placed great emphasis on within the Fire and Rescue Service.

The present structure

The management of the two fire services has been streamlined down to regional level. Mr Bill Forbes has been appointed to the position of Executive Director of Fire Services. The Director of Operations and Regional Director positions have been advertised and appointments will be made during September. FESA will also assume responsibility for the Emergency Management Unit, which is currently under the Police Service structure.

Stakeholder management

Each organisation has a different set of internal and external stakeholders. To be successful, particularly when undertaking major reforms, stakeholders must be part of the ongoing communication and participation strategies. Throughout the establishment of FESA, our internal and external stakeholders have been included in our strategies. Quarterly meetings with major external stakeholders have also been established, to hear their views, concerns and positive reactions to initiatives we are introducing.

To give examples of our major stakeholders they are:

- Western Australian Government
- Minister for Emergency Services
- Western Australian community
- Staff and volunteers
- Local Government authorities
- Representative unions
- Volunteer associations
- Insurance industry
- Industry interest groups (pastoralists and graziers etc.)
- Australian emergency services agencies
- Other Government departments and agencies

Legislation

Once legislation to formally establish FESA is enacted, there will be one Board comprising no more than ten persons. There are more than 20,000 volunteers in the Fire and Emergency Services organisation. Under the proposed structure, the importance of the contribution of volunteers from all the agencies to the decision-making of the new authority has been clearly recognised and will be catered for.

In addition to the Board, each of the three emergency services divisions will have a consultative committee that will include volunteer and employee representatives and the chairpersons of these consultative committees are also members of the new Board. Additional volunteer input to the decision-making of the new Authority will come from a proposed twice-yearly volunteer forum.

To provide an appropriate legislative framework for FESA's operations we have identified a legislative program that will be progressed over the next two years. As many Acts as possible will be consolidated into the same framework. These include:

- FRS funding arrangements amendments
- Review and consolidation of the Bushfires Act 1954 and the Fire Brigades Act 1942
- Emergency Management Legislation
- Volunteer Insurance Legislation
- SES establishment Legislation

Funding

The funding of the various divisions of FESA is varied and complex and is an issue that will need to be addressed to provide the organisation with greater flexibility. The most pressing issue is to resolve the inequitable method of funding the FRS permanent fire districts.

Approval has been received from Cabinet to introduce a new system of funding for the FRS based on a GRV value and collected by local government authorities. FESA is currently working with stakeholder groups to finalise the model and communications strategy. It is anticipated the new system will come into operation on 1 July 1999. This new system will provide a more flexible arrangement for funding within FESA

Reducing duplication of services and facilities

This was one of the major incentives for the establishment of FESA. The new structure involves a reduction in corporate services personnel of 6%, from 172 to 162 staff.

The Bush Fire Service headquarters has moved into FESA headquarters at 480 Hay Street, freeing-up the BFS premises at Kent Street for use by the Swan region, which was on the look-out for new premises. SES headquarters will move into FESA House in the near future. Further rationalisation of our properties is being looked at, as are collocation options to further reduce the duplication.

Salary savings from reductions in corporate services personnel of around $0.5 million have been realised. This saving is being made be available to the divisions to increase regional staff to improve service to our volunteers and communities.

Other areas that will realise savings include asset management, improved information technology, purchasing power, collocation, maintenance and rationalisation of regional services.

Leadership

The three divisions of FESA have over the years adopted differing leadership approaches. We have agreed that while different situations will call for different approaches, the predominant leadership style must be of a collaborative and participative nature. The involvement of all our people in the decision-making processes for the future is seen as a basic requirement.

In recognising the importance of leadership to our future, a leadership program has been developed in conjunction with Curtin University (a leading Western Australian tertiary institution). It is a demanding program conducted over a 3-month period. To date 55 of our management team have completed the program, with another 42 part way through. By early 1999 nearly 150 will have completed the program.

Regional alignment

The existing boundaries of the three divisions have the State of Western Australia divided into nineteen regions with little

alignment between them. This has caused disfunctional communication and coordination between the divisions, resulting in a lowering of overall service delivery to the community.

FESA has undertaken an extensive review of regional boundaries, involving widespread consultation with stakeholders. There are now seven regions in the state, with all divisional boundaries and management structure aligned across the three divisions. This has been a major change for the divisions but again has been received positively and will lead to a significant improvement in service delivery to the community.

Plans have been established and agreed for all Regional Offices of the FESA divisions to be collocated. This will be completed over the next 18 months.

Cultural differences

Culture is very important to any race or creed and to any long established group. Each of the three FESA divisions has a strong culture based on service to the community, voluntarism and, in the case of the FRS, mateship. However, as similar as they may seem from the outside, each has its own culture, and in bringing together the three cultures the acceptability and tolerance of each must be encouraged.

FESA is not out to destroy any individual culture. However, the different cultures need to be effectively linked within the new organisation. It is very important in bringing groups together to acknowledge and accept they are different and not to assume that what may be the right way for one will be the right way for all.

Identity

Commitments have been given that the divisions will retain their own identities. This ensures the local units and brigades will retain their community identity, and has gone some way in alleviating the concerns of a take-over by one of the new divisions. This does not of course prevent local units or brigades being collocated or even amalgamating into a common unit, if that is their choice.

Collocation

Since the establishment of FESA, we have advised all divisions that building projects will only be considered on a collocation basis unless there is an extremely good reason why a collocated arrangement is not feasible. This is more applicable at this point in time to country locations. However, we have commenced collocation involving regional offices within the metropolitan and country areas. There are already a number of successful projects either completed or underway, such as Kulin, Bruce Rock, Onslow, Kalbarri, Morawa, Mundaring, Toodyay, Broome and Geraldton.

These projects include buildings, housing volunteers from the Bush Fire Service, Fire & Rescue Service, State Emergency Service and St John Ambulance and regional employees of the FESA divisions.

Information technology

Each of the three divisions had a number of systems that were different, in terms of scope, sophistication and success. There was a need for many of these systems to adopt a standardised approach or model to ensure consistency of information and a more coordinated and efficient service.

One of the important points in this process was to ensure that although there was a need for a more standardised approach, the needs and information requirements of the divisions needed to be carefully addressed. Some of these included:

- Information Technology is being significantly upgraded to meet the demands of the new agency. The Emergency Services Computer Aided Dispatch and Communications (ESCADCOM) is a major shared infrastructure project to provide call-taking and dispatch and communications for fire, rescue, police and ambulance services.
- New financial, human resources and records systems are currently being introduced to manage the activities of all divisions.
- Planning for common standards and systems for acquisition of computer facilities, networks and administrative applications is well underway.
- A joint e-mail directory has been produced and is available on-line.
- We are currently in the process of researching ways to develop new or link existing volunteer databases to enable us to develop and maintain accurate information regarding equipment, training, age and number profiles for volunteer groups.

Communication

When going through any major change process it is important to establish effective and meaningful two-way communication. Resistance to change can be reduced by effectively and honestly communicating with employees, volunteers and stakeholders to help them to see and understand why the change must occur. Strong communication reduces the risk of mis-information. Most people just want to be told what is going on. In establishing FESA, many of the internal and external stakeholders were included extensively in the development phase and this has continued in the implementation phase. Regular newsletters and videos were circulated to staff, volunteers and external groups during this process.

Human resource management

Human resources functions for each division are now undertaken by the FESA HR section.

Existing HR staff from each of the divisions have assimilated into one to address the needs of the organisation and are currently working on their business plan.

An example of the success in this area is demonstrated in the aftermath of this year's Brookton–Pingelly major bushfires.

Both the BFS and the FRS manage their own insurance, compensation, counselling etc. when dealing with the recovery process of an incident. This was evident at this particular fire—BFS supported one town and FRS the other.

As many know, it takes months for a community to get back on its feet after a devastating bushfire, particularly when there has been the death of a local girl, four people seriously injured and around 20 volunteers requiring medical attention. This process is not helped by an uncoordinated approach in the recovery process by emergency services agencies. What we have now put in place at FESA is a coordinated approach.

Volunteers

In compiling their report and recommendations, one of the things that was uppermost in the minds of the Taskforce members was the immense contribution of volunteers The importance and value of volunteers should never be underestimated. If volunteers were no longer available, the community and government would not be able to afford the cost of replacing their services with paid staff.

Not long after FESA was established, a dedicated officer was assigned to coordinate and advance volunteer issues across the divisions. FESA takes a close interest in the progress of volunteer issues. In May a Volunteer Forum was held to enable the volunteers from the three divisions to get together to look at issues that were common to volunteers and their future in FESA. Commitment to volunteers must be more than just words. FESA must provide adequate training, equipment and support to enable them to undertake their role in the community effectively.

Employee remuneration inequity

Currently there is inequity between the operational divisions—the BFS and SES tend to be paid at a lower level than the FRS.

This has created a great deal of debate within the three divisions. As a result, a review of the current positions and salary levels has been initiated. This resulted in the Bush Fire positions being reclassified to the same level as the FRS. In view of the change of salary and role of these positions, all will be declared vacant and advertised with selection being based on merit through a competitive selection process.

In addition, work has commenced on developing a unified workplace agreement for all corporate staff employed by the new Authority.

Thought for the day

Like many organisations, FESA is now experiencing rapid change. This thought is very relevant to our change program:

We must accept the things we cannot change,
Courage to change the things we can
And the wisdom to know the difference

About the author

Bob Mitchell is the Chief Executive Officer of the newly established Fire and Emergency Services of WA (FESA).

He is a Certified Practising Accountant who has worked in the public sector for more than 27 years and has extensive experience in management.

Prior to joining the Fire & Rescue Service as Director of Business Services in 1995, he was the Director of Financial Services at the Building Management Authority, where he had worked in a range of positions since 1985.

Book review

Water in Australia: resources and management

Author: David Ingle Smith

This is not primarily a book about emergency management. It is a book about water in 'the driest inhabited continent—its geography, its quality, its utilisation and, in the broadest sense, its politics. In short, it is a comprehensive work on water and its management in Australia.

Only a portion of it is genuinely and centrally relevant to emergency managers. This is the flood section of Chapter 5, 'Of Droughts and Flooding Rains'. Australia's largely hazard-based emergency management systems of combat agencies for particular threats have no specific place for droughts—under present thinking, this creeping hazard has to be dealt with by individual farmers who must factor in water shortages as part of normal business management. Flooding, though, is different.

As the nation's most serious natural hazard, flooding bulks large in our emergency management systems and structures. The State and Territory Emergency Services all have significant roles in relation to floods. The precise nature of those roles varies somewhat from jurisdiction to jurisdiction, but all of the State and Territory Emergency Services have substantial responsibilities in relieving the pain and damage which flooding wreaks.

Being the lead agency for managing floods confers on that agency a requirement to become 'expert' in the task—which means that the various State and Territory Emergency Services must understand the flood hazard itself and how it can be managed to the community's benefit. In turn, this should mean that the State and Territory Emergency Services will study flooding and work out in advance what can be done to alleviate the problems which it imposes. State and Territory Emergency Service people must have some knowledge of the science of flooding and the impacts floods have on communities if they are to plan their management strategies effectively. It is no longer enough to simply *react* to floods when they occur: our communities now demand a higher standard and one which incorporates real expertise.

Herein lies the potential value of Smith's book to emergency managers. It provides in readily digestible form a summary of the problem of flooding and it deals with the evolution of Australian approaches to managing the utilisation of floodplain land. Emergency managers can play a role here, but to do so they need to be able to deal credibly with others who have flood expertise—notably the hydrologists and engineers who are employed by local councils, water agencies and floodplain management consultancies. To talk to experts, it helps to have expertise yourself.

Smith does not deal directly with the myriad tasks which flooding generates when it is actually occurring—that is, tasks like warning, rescue, resupply, evacuation, property protection and information provision. Accordingly this book will inevitably be a backgrounder to State and Territory Emergency Service personnel rather a text in the management of floods: this latter work has yet to be written in an Australian context. Nevertheless key State and Territory Emergency Service people should read *Water in Australia* for its insights into the nature of the costs which flooding imposes and the problems which have accompanied attempts in the various states to mitigate those costs.

The book will have a much wider audience, of course. Anyone interested in the politics of blue-green algae or the relationship between irrigation and salinisation will find much rich comment on these sensitive issues. Those interested in environmental sustainability generally or the implications of the enhanced greenhouse effect for water futures will also find material of value, as will students of water policy. The book ranges widely, and it deserves a readership of diverse interests and persuasions.

The author's views on the more controversial issues in Australian water management, incidentally, are clear. He regards our developmental history, in terms of water quality, as 'appalling', and argues that much of the Murray-Darling Basin should be retired from irrigation before the problems of land and water degradation 'become terminal'. Such opinions will be shared by many policy analysts but their acceptance by regional communities will be problematic in an age in which such communities feel assailed on all sides by what they see as unsympathetic governments and hostile policy prescriptions. There are, it seems certain, some major battles looming here.

by Chas Keys, Deputy Director General, New South Wales State Emergency Service

The Pacific Cities Project: a SOPAC regional initiative

by Dr Graham Shorten,
Coastal Engineering Geologist,
South Pacific Applied
Geoscience Commission (SOPAC)

Introduction

Most capital cities of the Pacific are at risk from a wide range of natural and man-made hazards. However, a critical lack of basic data in the region threatens to undermine current hazard mitigation efforts.

The picture of hazard assessment, risk analysis and disaster management in the Pacific during the current International Decade of Natural Disaster Reduction has been a rapidly evolving one. Two articles in the Winter 1997 edition of AJEM paint a part of that picture, describing how National Disaster Management Offices are now coming to maturity in a great many of the Pacific Island Countries. Prior to this development, investigation and mitigation of natural hazards had traditionally fallen to the various Pacific Island government departments dealing with geology, water, coastal matters, lands and natural resources.

The first phase of the South Pacific Disaster Reduction Program (SPDRP) under the management of UNDHA-SPPO (now UNOCHA-SPO) has concentrated on developing in-country capacity for disaster management and relief activities. Unfortunately, the level of understanding of the hazards and risks facing these very countries still remains dangerously inadequate. There seems little point in pouring aid funds into community awareness programs at this stage while the degree of threat or vulnerability has yet to be established.

Development of the Pacific Cities Project

Enter the South Pacific Applied Geoscience Commission (SOPAC) which this year celebrates its twenty-sixth anniversary of service—much of it directed towards the understanding and mitigation of the many hazards facing Pacific countries.

SOPAC is an intergovernmental organisation with a membership of fourteen independent island nations and two French Territories in the Pacific. In the past ten years the organisation's area of interest has expanded progressively inshore and landward from its original emphasis on oceanographic matters. SOPAC's work has provided an essential extension to the geological and marine science, coastal development and information management capabilities of its member states.

By 1995, SOPAC was already undertaking, managing, or collaborating in a wide range of hazard projects in the Pacific. This process was then formalised with the creation of a Commonwealth Secretariat-funded position for a three-year period, and the establishment of the Hazard Assessment Unit. A decision was taken at that time to link these projects through the common theme of risk assessment and mitigation under the banner of *Pacific Geo CitiPlan*.

At the October 1996 SOPAC meeting in Rarotonga, the Australian Geological Survey Organisation (AGSO) proposed a new collaboration with SOPAC in the Pacific. AGSO is sponsoring the *Australian Cities* project which is currently assessing the vulnerability of selected Australian cities to a wide range of geohazards, climatic and meteorological hazards, and is looking to extend the *Cities* operation to the international arena. SOPAC's pre-existing *Pacific GeoCitiPlan* was the ideal adjunct vehicle to take forward AGSO's initiative into the Pacific.

The newly-emerged, all-hazards concept, the *Pacific Cities* project, supplants *Pacific GeoCitiPlan*, and has been set up initially in eight major Pacific cities which are at very high risk from a range of hazards.

At present the collaboration with AGSO is on an informal co-operative basis recognising, though, that development of a fully-funded collaborative project in hazard assessment would give a tremendous boost to the self-reliance of Pacific cities in handling their own town-planning and disaster-response activities. The *Pacific Cities* scheme which is managed by SOPAC's Hazard Assessment Unit, is fully operational in Apia, Honiara, Nuku'alofa, Port Vila and Suva, while Lae, Luganville and the Nadi-Lautoka conurbation wait in the wings for a start, dependent on funding.

The final scene for an even higher level of integration within the disaster management network was set only this year following the incorporation of UNOCHA-SPO within SOPAC as the Disaster Management Unit, together with much closer, formal links with the South Pacific Tropical Cyclone Warning Service Upgrade Project. These new units fully augment the existing disaster mitigation activities of the Hazard Assessment, Coastal, Water Resources and Human Resource Development Units, extending the relevant contact group for SOPAC considerably.

Risk Management Database

The *Pacific Cities* initiative—a move to bring an all-hazards assessment under one banner in high-risk urban areas of the Pacific—has matured quickly over the past couple of years. The risks facing cities in the Pacific arise from a variety of hazards including earthquake, slope failure and cyclone and related hazards, drought and flooding and the man-made hazards of pollution.

Pacific Cities not only conceptually ties together existing projects having disparate origins and funding agencies, but also promotes the development of an all-embracing Geographic Information System (GIS) database as a tool for providing a framework or infrastructure for the management of spatial data. Information from fields as diverse as geology, meteorology, physiography, engineering and population distribution is stored on a single database in multiple layers. Interactions between layers are possible, and the results of numerical modelling are incorporated through the generation of various disaster scenarios.

One of the cornerstones of the project has been the building assets survey for each city which seeks to individually assess each building for a series of characteristics related to its potential performance under earthquake, cyclone, flooding or unfavourable foundation conditions. Attempts are now being made to link this information through to the various city council and census demographic databases.

Ultimately, the risk to population and property can be measured through the GIS by considering the way in which hazards interact with, and affect, these community assets.

The geographic information system should ideally be able to answer any

question posed it by a user of the system such as a town planner or disaster manager. The reality of course, is that the basic data must first be input into the system.

GIS databases will be made available to national disaster management authorities in the respective member countries, and regularly updated by SOPAC and the country concerned. The databases have the potential to be used to assist town planning, post-disaster rehabilitation, the insurance industry, aid donors and reconstruction authorities, amongst other users. The *Pacific Cities* databases will form part the new generation of information transfer; less emphasis placed on written reports, and more on visual representations of hazard and risk in two and three-dimensional graphics. Information arising from this program will be contained on compact disks rather than on the printed page.

Associated projects

The current health of the *Pacific Cities* scheme and the input of data to the system owes much to the support provide under several major sub-projects within the *Pacific Cities* project.

In late 1996, the Danish Government provided a large grant to purchase *MIKE 21* circulation and wave-modelling software and a four-week training course for SOPAC and member country staff. The software from the Danish Hydraulics Institute (DHI) is used for computer-modelling of the movement of water, contaminants and sediment to help answer the problems of coastal erosion, pollution, storm surge and tsunami impact.

The French Government initiated the project *Seismic Zonation of Suva Central City and Simulation of Tsunami Risks in the Harbour* last year involving the Mineral Resources Department of Fiji (MRD) and SOPAC with their own organisations, BRGM and A2EP based in Noumea, to produce a 3D digital elevation model (DEM) and assess the effects of earthquakes on Suva City, including a subproject by the French Laboratory of Detection and Geophysics (LDG) to predict and model the effects of a tsunami in Suva Harbour.

A three-year project currently being undertaken by Dr Avi Shapira and his team from the Geophysical Institute of Israel (GII) is investigating seismic response in buildings related to foundation conditions the four cities taking part in the USAID-funded project *Seismic Microzonation in Capital Cities of the South Pacific* underway in Honiara, Nuku'alofa, Port Vila, and Suva.

Avi and a team of technical experts set up computers and seismological systems in the cities to measure and interpret seismic events. They also provided the equipment and training to enable local staff to be able to undertake Nakamura seismic site response measurements around the cities. SOPAC carried out mapping for hazard zonation with counterparts in each of the cities, and appropriate locations were determined for Nakamura response measurements. These measurements were subsequently incorporated in the characterisation of each site with regard to its response to damaging earthquake frequencies.

New Zealand ODA provided funding for the costs of the development and execution of the building assets surveys –a critical aspect of the work - in the four Pacific capitals studied to date.

In recognition of the fact that many of the hazards facing Pacific cities originate or impact in the near offshore area, bathymetric and seismic reflection surveys are planned for the harbours of each city. Hazard assessments have already been completed or are underway for Suva, Port Vila and Apia harbours.

Digital elevation models will be developed for both the onshore and offshore city precincts to enable modelling and visualisation of the areas affected by hazards. Funding is currently being sought to complete these areas of the project as they now have become the rate-controlling step for further progress.

Counterparts from each country are involved in each and every aspect of the work of *Pacific Cities*, and field work is succeeded by training attachments to SOPAC in Suva where each counterpart can follow through on modelling aspects and the development of the hazard and risk assessment GIS for his particular city. An IDNDR-AGSO sponsored Spatial Data Infrastructure Workshop was held in conjunction with SOPAC in Suva this month with the aim of strengthening the partnerships between counterparts, national disaster managers, and GIS experts from countries involved in *Pacific Cities*.

The newly emerged partnership between SOPAC and UNOCHA will ensure that the nature of the hazards and the results of risk assessment for each of the Pacific cities are fully understood before they are transmitted to the respective communities through appropriate awareness programs and education activities.

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He has a BSc, MSc from the School of Geology, University of Queensland, and a PhD from the School of Civil and Mining Engineering, University of Sydney, together with 28 years of experience in engineering geology and geotechnical engineering.

Graham has published a number of internationally-refereed scientific papers on geotechnical problems in Pacific Island countries.

His current work is focussed on developing a comprehensive GIS database/risk assessment tool for all the major Pacific cities.

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Disaster management for public health training course

Cairns, 10–15 October 1999

This course aims to mitigate the impact of natural disasters and emergencies on the Australian community by ensuring that public health and other professionals are adequately prepared for a disaster in their community.

Participants will be trained to prepare and implement a disaster management plan for their community, and reduce the physical and social impact of disasters on the environment and community.

Topics include potential public health disasters (particularly cyclones, storm surge, floods and earthquake), public health disaster plans, environmental contamination, provision of safe and adequate food and water supplies, vector control, media relations, practical relief and recovery, medical disaster planning, community vulnerability, and case studies.

Registration includes comprehensive course notes, field trip (Skyrail), lunches, dinners, morning and afternoon teas. The venue has all resort style facilities and is close to the city centre.

Registration packages can be obtained by contacting the course convenor Paul Endres, e-mail: endresp@health.qld.gov.au or telephone (07) 4050 3616. Details can also be obtained from Anne Outram (07) 3854 1113 or George Hapgood (07) 3234 0948.

From efficiency to risk sensitivity: reconstructing management capabilities after economic rationalism

Management thinking has, for a long time, been pre-occupied with efficiency. The Efficiency versus Effectiveness debate rarely encompassed consideration of strategic and operational uncertainties associated with risk and crisis management situations. Efficiency, in the form of aggressive least-cost strategies, has continued to dominate management thinking through capture by Economics; particularly by a brand of Economics called Public Choice Theory which has dominated Anglo-Saxon management and public policy schools for some two decades.

From out-sourcing, an over-reliance on 'templating' management consultants, down-sizing and information technology (IT)-driven re-engineering, management action has further focused on short-term efficiency considerations and has exacerbated longer-term susceptibility to vulnerability and crisis-proneness within corporations and public sector agencies alike. The implications for risk and crisis management sensitivities of excessively 'lean' and 'mean' focal organisations continues to go undiscussed, even unrecognised. With an inherent proclivity to simple mechanistic and functionalised thinking, management urgently requires to re-discover uncertainty, complexity, vulnerability and social dynamics in order to render current over-economised management prescriptions more strategically intelligent.

by Alexander Kouzmin, Professor and Foundation Chair of Management, University of Western Sydney, and Dr Nada Korac-Kakabadse, Senior Research Fellow, Cranfield School of Management, UK

Introduction: from efficiency to risk sensitivities

The neo-conservative ideology of neo-classical welfare economics underscores the linking of public agency efficiency to managerial ability, authority and accountability by the adoption of managerialist private-sector practices (such as strategic planning, re-engineering, customer service, quality assurance, performance management and even accrual accounting), creating what has been described as the 'managerial meta-myth' (Adams and Ingersol, 1990:285). A resultant managerialism is thus defined as the pursuit of result-oriented systems of management, through streamlined processes of decision-making, designed to allow greater autonomy and also greater responsibility for the program manager—managerialism stresses efficiency, as against process and equity, advocates private sector management practices in the public sector, shifts accountability from inputs to outcomes and creates a competitive public administration for those agencies responsible for the delivery of services (Uhr, 1990:22).

Managerialism fosters the proposition that 'good organisation results from deliberate intentions, detailed plans and consistent decisions' (Prasser, 1990: 194). Public sector business practices are said to create appropriate structures, processes, culture and incentives to deliver programmes most efficiently operating within outcomes-centred budgetry and accountability systems. The managerial belief is that there is a body of sound, universal management practice applicable to the private sector that, in its generic nature, is also directly transferable to the public sector. In essence, managerialists expect public managers to improve organisational efficiency, so as to reduce costs, while, at the same time, enhanced organisational performance by meeting competing priorities within a political climate that punishes mistakes and rewards risk-averse behaviour, regardless of the costs and effort involved in avoiding unacceptable or intolerable outcomes (Dixon, Kouzmin and Korac-Kakabadse, 1998).

Globalisation, innovation, continuous improvement, organisational networking, technology alignment, growth, mergers, acquisitions, down-sizing, re-organisation, de-layering, re-engineering and work-force profile adjustments—all imply *organisational design*, change and elements of risk management (Korac-Boisvert and Kouzmin, 1995b; 1995c; Kouzmin and Korac-Boisvert, 1995; Kouzmin and Korac-Kakabadse, 1997). These changes are seen as necessary processes in response to prevailing ideological imperatives, managerial fads, economic climate, technological advances, fluctuating marketplace and fluidity of the work-force. These innovations also take place within a social environment and, as such, are influenced by 'formative context' (Unger, 1987).

Crisis management is clearly one inter-disciplinary and inter-agency policy arena of 'wickedness' (Rittel and Weber, 1973: 155–169) needing a considerable *epistemological* breakthrough in governance, policy and planning capacities in developed and developing economies (Dror, 1986; Jarman and Kouzmin, 1993; Kouzmin and Johnson, 1998). In the context of prevailing economistic consciousness characterising administrative agencies, whether variants of economic rationalism, privatisation, radical IT-based administrative reform, re-engineering and downsizing have anything to contribute to the theory and practice of crisis governance, enhancing risk sensitivities, decreasing institutional vulnerabilities or improving crisis management capabilities are questions of increasing salience.

In increasingly sophisticated information societies, potential risks from 'normal' accidents, 'soft-core' disasters, 'creeping' crises and cognitive managerial failures are, paradoxically, both more numerous and more obscure than ever before (Cannell and Otway, 1988). The increased crisis potential of organisations and society at large is striking—in the period between 1900 and 1987 there have been twenty-nine major industrial accidents in the world (Shrivastava, 1987), the largest of which having become household names. Tylenol has been the worst case to date of a nation-wide product tampering incident. Bhopal was the largest industrial accident in history, Chernobyl the largest nuclear accident and the space shuttle disaster threatened to cancel the entire US manned space program (Mitroff, 1988; Jarman and Kouzmin, 1990; Jarman, 1994). Furthermore, for every one of the headline disasters, there are countless others that do not make the news but could be nearly as devastating to organisations (Mitroff, 1988). Understanding how these *non-routine* situations are manifested, mitigated and then re-constructed relies increasingly on synergistic information and

the inter-disciplinary knowledge of experts (Kouzmin and Jarman, 1989; Rosenthal, Hart 't and Kouzmin, 1991; Kouzmin, Jarman and Rosenthal, 1995).

Large-scale crises are partly the result of unintended and misunderstood interactions between managerial limitations in thought and action and planning constraints in organisational response mechanisms (Kouzmin and Jarman, 1989; Mitroff, 1989; Jarman and Kouzmin, 1994a; 1994b). Often, control mechanisms, such as *IT-mediated communication*, are not currently up to the task of managing the complex technologies they are supposed to oversee (Mitroff, 1989); especially where inscrutable technological processes are involved with little or no direct experience of recognisable design limitations (Cannell and Otway, 1988; La Porte, 1994; Perrow, 1994; Sagan, 1994). In many cases, the potential for large-scale disaster is built into the very design of complex technologies (Perrow, 1984; Mitroff, 1989; Sagan, 1994), as evidenced by Bhopal, Chernobyl and Exxon Valdez. Although appropriate technologies can help control other complex technologies, they must be adequately integrated with the human side of organisation or the technology control systems, themselves, can lead to crises (Mitroff, 1989; Korac-Boisvert and Kouzmin, 1994). Institutional and organisational actors need to become familiar with a whole new range of control and communication technologies if they are to keep pace with the new and expanding field of *vulnerability management* (Wildavsky, 1988). However, the tools, concepts and frameworks must be 'formative context'-sensitive (Ungar, 1987; Kaufmann, 1991; Korac-Boisvert and Kouzmin, 1995a; 1995b; Kouzmin and Korac-Boisvert, 1995; Kouzmin and Korac-Kakabadse, 1997).

Notwithstanding that risk assessment and the repertoire of possible responses to perceived threat are influenced by 'formative contexts', effective communication concerning the magnitude, nature and control of risk is essential to the functioning of society operating on democratic principles (Cannell and Otway, 1988; Wildavsky, 1988). Since the concept of risk (representations of the probability of undesirable physical and socio-political consequences) has a different meaning in different contexts and because communication occurs in different forms before, during and after crisis situations, being crucial for crisis management, risk/crisis communication must take into account the knowledge and experience of the audience it addresses as well as the formative context. Some scholars have argued that, more often than not, a crisis situation is, 'to a large extent, an *information* and *communication* crisis' (Pearson and Mitroff, 1993; Garnett and Kouzmin, 1995), where a key variable in determining vulnerability to crisis is communication (Pearson and Mitroff, 1993). Pearson and Mitroff (1993) further contend that crisis-prone organisations tend to miss or ignore signals indicating potential weakness in operations or structure and that, in some cases, crisis-prone organisations even exert considerable effort to *block* warning signals.

Furthermore, experience with disaster-related strategic planning and operational forecasting often have a degree of managerial problems (Garnett and Kouzmin, 1995); much of conventional thinking about planning, policy design, implementation and governance (Kaufmann, 1991; Kouzmin, 1992) being made more difficult by socio-technological change and an ever increasing repertoire of crisis experience rendering the understanding of crisis planning and communications problematic (Garnett and Kouzmin, 1995; Kouzmin, Jarman and Rosenthal, 1995; Kouzmin, Sainsbury and Jarman, 1995).

The practical challenge for designing vulnerability audits and crisis-relevant communications is to promote public understanding of, and appropriate responses to, actual hazards in instances of:

- the aftermath of 'normal' accidents (Three Mile Island, Bhopal, Chernobyl) (Perrow, 1984; Shrivastava, 1989; Sagan, 1994).
- the mitigation of 'soft-core' disasters (such as corporate failures and IT development fiascoes) (Korac-Boisvert and Kouzmin 1994; 1995a; 1995b; Kouzmin and Korac-Boisvert, 1995);
- the prevention of routine response situations in the face of new risks and the occurrence of the 'creeping' environmental crises (Jarman and Kouzmin, 1994a; 1994b) and "chronic" situations such as in-effectual re-engineering of institutions (Korac-Boisvert and Kouzmin, 1995b; 1995c); and
- prevention of cognitive failures in policy design (governance or a choice of a new technology policy) (Dror, 1987; Jarman and Kouzmin, 1993; Korac-Boisvert and Kouzmin, 1995b).

Organisational design parameters in a global IT dynamic

The dynamic aspect of IT may be conceived as a process of increasing complexity in the organisational landscape (Ahrne, 1990) within which organisational actors must act. The kind of IT employed influences the patterns of independencies within the organisation and, hence, the power relations between different actors and groups in the organisational landscape (Morgan, 1986; Ahrne, 1990). New IT creates possibilities of multiple points of access to common data bases and the possibility of local, rather than centralised, information systems (Boettinger, 1989). This, in principle, can increase the power of those at the periphery or local level by providing actors with more comprehensive, immediate and relevant data relating to their tasks, thereby facilitating self, rather than centralised, control (Korac-Boisvert and Kouzmin, 1994).

In practice, IT is often used to increase power (at the centre) by decentralizing certain activities while centralizing ongoing surveillance over performance (Morgan, 1986; Huber, 1990). In either instance, with increased centralisation of managerial power or, alternatively, with greater de-centralisation of managerial power depending on the intent of the organisation's strategy (Huber, 1990), IT has an effect on leadership roles and organisational design. Significant IT advancement eventually leads to the recognition of an implementation of new organisational design options (Boettinger, 1989; Forester, 1989; Korac-Boisvert, 1993; Limerick and Cunnington, 1993). For example, IT communication links, based on an e-mail or bulletin board-type infrastructure, facilitate communication between non-linearly-connected actors and increase the level of coupling between previously uncoupled entities in a 'network structure' (Malone, Yates and Benjamin, 1987; Johnson and Lawrance, 1988; Boettinger, 1989; Korac-Boisvert and Kouzmin, 1994).

Information technology and telecommunications linked together increase the emphasis on value-added services such as local and wide-area computer networks, electronic mail and video or teleconferencing, as well as electronic funds transfer at point of sale (EFTPOS) and interactive database services. The new generation information technology has increased transmission speed, quality and, often, reduced costs. To capitalise on these new facilities, providers have had to combine resources through loose associations, alliances and acquisitions. For example, new forms of inter-organisational links, represented by coordinated contracting, coordinated revenue links, joint ventures, co-making and spot-networking, have now emerged. Some of these extend across national boundaries, notably in aerospace and automative production, while in others, these new linkages increasingly form the central core of the industrial system.

These new patterns of interaction are as much *processes* as they are emerging *structures*; being continually shaped and reshaped by the actions of actors who are, in turn, constrained by the structural position in which they find themselves within a social space and time (Korac-Boisvert and Kouzmin, 1994; Kouzmin and Korac-Boisvert, 1995). Sometimes these changes are clearly demonstrated by organisational restructuring. At other times, the changes occur very slowly, more in substance than in form. Whatever the mode of alteration, however, the process of re-design will be accompanied by periodic or evolving changes in the types of organisational structure. However, these changes do not inherently imply organisational democratisation. Often they are only pseudo-devolved structures, where strategic control is centralised at the same time as operational decision-making is being decentralised; replacing top-down power relationship with a centre-periphery one which is less easily recognised (Huber and McDaniel, 1986; Kouzmin and Korac-Boisvert, 1995).

The proliferation of new IT that facilitates cross-functional and intra-functional integration (Boettinger, 1989), or 'networks' (Powell, 1990), creates changes in the leadership role and in hierarchical differentiation. Leaders are faced with making the difficult call between what is local to their function and what is global to the business - to differentiate decisions that are operational for their tasks and strategic for the organisation. The increase of stakeholders and, thus, inter-dependencies, creates a need for the increased sharing of tasks, information, roles and decision-making accountability (Boettinger, 1989; Fairholm 1991). These, in turn, produce changes in the planning and operational parameters, further promoting a need for leadership interaction with a wider range of stake-holders within the organisational landscape. Furthermore, IT provides *real-time information*, generating a more rapid and frequent need to adjust to new situations. With actors' growing awareness, IT development and distributed decision-making accountability over a wide variety of organisational stakeholders, a mutation of traditional managerial prerogatives is likely to occur.

The IT potential to transform hierarchical organisations into 'information-based organisations' (Drucker, 1988, 1990a) or 'network organisations' (Powell, 1990) is at least four-fold. First, IT makes possible the reduction of management levels by providing a dramatically enhanced potential for control (Beniger, 1986). Secondly, network structures facilitate fluid, flexible and dense patterns of inter-connections that cut across various intra- and inter-organisational boundaries (Drucker, 1988, 1990). Thirdly, IT provides real-time communication across social time and space (Sproull and Kiesler, 1991a). IT also improves communication between systems, thus blurring the boundaries of organisations beyond market or hierarchical exchange (Malone and Rockhardt, 1991). Fourthly, IT contributes to flexibility through electronic storage and data manipulation (Walton, 1989). Emerging 'network organisations' (Powell, 1990) are characterised by relations that are based on neither authority nor market transactions (Powell, 1990), but on the network structure of ties (relationships) among actors in a social-context. As such, they are radically different from the Weberian bureaucracy (Baker, 1992; Nohria and Eccles, 1992) and effective vehicles for enhanced *inter-agency* capacities in crisis management and responsive strategies.

While bureaucratic organisations are created in response to particular problems, networks are not necessarily built around an identity of interest; rather, the requirement is that there be a basis for some form of mutually beneficial exchange (Morgan, 1986). Furthermore, bureaucracies attempt to resolve the tension between actor's obligations to perform tasks with universalistic principles and particularist relationships, while networks must be able to combine the virtues of universalism with those of particularism (Heimer, 1992). The currency of network building is one of mutual dependency and exchange (Morgan, 1986; Kouzmin and Korac-Boisvert, 1995). Network actors are positionally—or *structurally*—proximate to the extent that they occupy the same roles and, thus, share sets of obligations, status and expectations (Burt, 1982) through the pattern of relationships, both present and absent, achieving structural equivalence and organisational proximity (Hartman and Johnston, 1989). The network's structural equivalence facilitates the participants to talk more openly, candidly, without fear and to build trust (Davis, 1991; Galagan, 1992).

IT facilitates that process and makes it more accessible to a more diverse range of actors; reflecting wider potentialities. While the nature, degree and conditions of its effects remain problematic, IT has been shown to affect structure, shape interactions and influence the personal characteristics of organisational actors (Hunt, 1973; Kouzmin, 1980a; 1983; Korac-Boisvert and Kouzmin, 1995a; 1995b; Kouzmin and Korac-Boisvert, 1995). IT influences social life in both material and discursive ways.

While materially IT increases the potential for a wide range of data gathering, storage and processing, to the extent of *data overload* or *soft-core crisis* (Korac-Boisvert and Kouzmin, 1995a; 1995b; Kouzmin and Korac-Boisvert, 1995), its discursive presence, particularly in relation to the centralisation or decentralisation of the social life, is an on-going debate (Forester, 1989). An organisational network, supported by IT, has the ability to collapse problems of time and space through electronic mail (Crawford, 1982; Nyce and Groppa, 1983; Sproull and Kiesler, 1991a) and video-conferencing (Fulk and Dutton, 1984). For example, IT enables both the simplification of internal structures, by reducing the number of hierarchical levels, and the re-integration of critical external dependencies and agencies which, together, lead to a blurring or re-definition of existing organisational boundaries (Keen, 1991; Malone and Rockhardt, 1991; Scott-Morton, 1991; Venkatraman, 1991). IT makes it possible to reduce the No. of management levels in the hierarchy since processing of information up and down the organisation is no longer needed (Korac-Boisvert and Kouzmin, 1995a; 1995b). Although, the reduction of management levels reduces the levels of structure separating senior executives from employees (Beniger, 1986), IT may greatly increase the span of control, especially in routine situations (Kouzmin, 1983).

The adoption of new IT has an impact on organisational design and relates to the core functions of an organisation in its symbolic, sanctional, international and social aspects (Forester, 1989; Powell, 1990; Korac-Boisvert and Kouzmin, 1994; Kouzmin and Korac-Boisvert, 1995). Furthermore, IT is linked to personal dimensions such as morality, purpose and meaning. How well the organisational roles are redefined will depend on the type of organisational design choice which, in turn, depends on human, socio-cultural and economic factors as well as the perceived real benefits (Boettinger, 1989; Korac-Boisvert and Kouzmin, 1994). Thus, the outer most significance of IT choice is not methodological in any narrow sense but also moral (Apter, 1965).

Economic rationalism: reviving simple functionalism in management

The highly bureaucratic management model, as evolved from the manufacturing industry, has dominated management and administrative philosophy this century

(Kouzmin, 1980a: 1980b; 1983) and, at same time, facilitated organisational growth based on high-volume, low-cost strategies for more than 50 years.

In the US, for example, big business preceded, at least coincided with, the welfare state (Adams, 1992). Unionism, job security and worker participation were strenuously opposed. The artificial separation of 'thinkers' from 'do-ers' resulted in lower quality and productivity, chronic absenteeism and in-difference (Reich, 1989; 1993). In an attempt to up-grade management as a means of increasing productivity, Anglo-American praxis adopted concepts of quality circles, work groups, encounter groups and teams, without, however, fundamentally changing underlying organisational assumptions. These attempts were exemplified by *Theory Z*, or how American business could meet the Japanese challenge (Ouchi, 1982), and 'how to' books in the 'best' US tradition (Pascale and Athos, 1981). However, these adaptations could not meet operational praxis while business was dominated by professional managers indoctrinated with traditional coercive management theory (Kouzmin, 1983; Kouzmin and Jarman, 1989).

Two major categories of management practice and institutional arrangements are instrumental in producing functionalist outcomes favoured by management: on the one hand, practices and arrangements that affect the social organisation of production; on the other hand, practices and arrangements that, at the same time, give rise to particular labour-management relationships (Nurse, 1988). The former deal with the structural organisation of production— departmentation, hierarchy, the establishment of job boundaries, work roles and rules, the use of different kinds of technology, production methods, and so on. The latter deal with the organisation of labour power itself and the features of an organisation's internal and external labour market, performance evaluation and promotion policies, supervision and systems of discipline, compensation structures and management.

Organisational theorists, of course, differ in terms of their assessment of the nature of, and rationale for, the use of such mechanisms and praxis, economists do not. Such differences in outlook are not the product of idiosyncratic thought. They reflect the influence of the fundamental assumptions that structure and inform social theory and research. Functionalist organisation and management theory and research constitute a distinctively dominant intellectual enterprise when contrasted with work located within other paradigms. This body of work is concerned with 'functional rationality', disciplined permanence, efficiency and profitability. As such, it views managerial action in a highly instrumental fashion (Kouzmin, 1980a; 1980b; Nurse, 1988; Reich, 1993). It assumes that the task of managing can best be accomplished if organisational roles are appropriately 'engineered', allocated and coordinated. To effect these outcomes, and as a means of promoting disciplined performance, structural patterns, institutional arrangements, rules, procedures and administrative practices all work towards a *least-cost* goal accomplishment. These practices and institutions constitute the basis of organised action and, at the same time, act as obstacles to innovation and learning. They are the *sine qua non* of organizing activity in a functionalising economic rationalism.

Organisation action that is geared towards managerial outcomes is theorised in purely functionalist, increasingly economically rationalist, terms. Functionalist theorists argue that the forms it takes are both indispensable and inevitable, as they are seen as being limited by the size of the organisation, the nature of its technology, vertical and horizontal configuration and the need to manage the 'business of management' (Kouzmin, 1980a; 1980b; Nurse, 1988; Reich, 1993). Such an approach to organising and, by inference, such a concept of management's role, leads organisation analysts to theorise the structural and internal labour market features of organisation in terms of contributions to goal accomplishment (Georgiou, 1973), organisational stability and rationality; albeit technical rationality (Kouzmin, 1980a; 1980b; 1983).

For example, one of the more enduring myths of organisational theory is that a formal hierarchy of authority is indispensable for coordination (Kouzmin, 1983: 237). The assumption that hierarchy is a functional and technical pre-requisite for organisation complexity (Wilson, 1975) still persists today. Possible irrationalities attributable to hierarchical control are looked upon as inevitable costs of complex organisation, ones that may be considerably reduced through the rhetoric of delayering, out-sourcing and re-engineering, but not eliminated (Kouzmin, 1983; Kouzmin and Jarman, 1990; Korac-Kakabadse and Kouzmin, 1996; Kouzmin, Korac-Kakabadse and Jarman, 1996).

Growing numbers of academics and practitioners recognise that this functionalist, and now increasingly economistic, legacy of prescriptive, engineered and consensus-oriented, rationalistic administration does not conform with empirical reality. Nor does it sit easily with the ideological canons of liberal, participatory democracy (Urban, 1978; 1982; Thompson, 1981; Rosenthal, 't Hart and Kouzmin, 1991). The organisational design advantages of complexity, redundancy, duplication, overlap and conflict (Kouzmin, 1980b; Lerner, 1986; Kouzmin, Korac-Kakabadse and Jarman, 1996) have now been extensively elaborated and the notion of polycentrism is not only being tolerated but increasingly being insisted upon as a realistic alternative to centralist and coercive bureaucratic administration (Chilsom, 1990; Kouzmin and Scott, 1990).

Under functionalist perspectives, actors employ a particular brand of metaphor and language of discourse that speaks of the need for regulation, order, integration and stability (Wilson, 1975). The *machine* and *organic* metaphors structure modes of inquiry into organisational phenomena. The manager's role is cast in terms of either a 'structural' or 'social' engineer, or both. Work structures and practices are regarded as rational, objective means for attaining highly-valued organisational and social goals, independent of the structure, ownership or control issues in wider society. These structures and praxes are assumed to constitute universal principles of globalising organised action. Functionalist and economistic organisational perspectives assume a largely 'passive' role for employees and highly 'pro-active' ones for managers. The role of the former is determined by the latter.

Even the doctrine of devolutionism denies that there is any organisational politics, and the loosely woven net imagery supports this because it is difficult to identify the power centre (Korac-Kakabadse and Kouzmin, 1997b). However, in praxis, devolutionism depends on the powerful, but indirect, regulatory mechanisms of corporate culture, incentive structures and management information systems. Through these three mechanisms, strategic centralisation (at the same time that operational decision-making is being decentralised) leads to praxis that is usually no more than pseudo-devolutionist (Muetzelfeldt, 1992; Korac-Boisvert and Kouzmin, 1995a). Organisational politics continue but follow new and less visible trajectories. Thus, in the conjuncture of organisational theory, economic rationalist ideology and information technology, each contributes to coercive discourse and praxis through which control is produced and reproduced (Muetzelfeldt, 1992; Kouzmin, Korac-Kakabadse and Jarman, 1996).

Structural-functionalist and, lately, economistic approaches to organisation introduce many kinds of assumptions, concepts and models for describing a social system that often has *never* existed and is not likely to come into being (Dahrendorf, 1968). Changing a legacy of positivistically-inclined functionalist administrative theory requires shifting paradigms and shifting these paradigms means fundamentally changing the epistemological assumptions and ontological values that lie at the centre of contemporary managerialism today. Contrary to long-shared hopes that organisational and administrative theory have, at last, witnessed conceptual plurality, an epistemological tension, under economic rationalism, such theory has yielded, it seems, to the globalised economic imperative of a 'New Functionalism'.

Economic models in which productivity inherently assumes a manufacturing connotation of the low-cost production of physical products may not have the same relevance in the information-age where the focus is not on the low-cost production of information but its transmission and interpretation (Korac-Kakabadse and Kouzmin, 1997; Kouzmin and Korac-Boisvert, 1995a). The critical scarce resource is knowledge—composed of information, intelligence and expertise. Unlike capital, knowledge is most valuable when it is controlled and used by those at the front line of the organisation, that is, at 'grass roots' levels. In the 1990s, knowledge is the primary resource for individuals and for the economy overall while the traditional economic factors of production become secondary (Drucker, 1990a; 1990b). Many corporate leaders perceive that the challenge lies in harnessing the power of data processing when it really lies in understanding IT's potential for developing and defusing knowledge as a source of competitive advantage. They manage information they way they manage capital, as a scarce resource, collected, stored and allocated arbitrarily (Bartlett and Ghoshal, 1995).

The vulnerability of 'lean' and 'mean' organisations

'Buffering', or the notion of sealing off environmental influences, is construed as an intervening mechanism that insulates an organisation from critical environmental disturbances (Thompson, 1967: 19). Both resource-based buffering and institutional buffering insulate the 'core' technology from disturbance in the organisation's task environment (Thompson, 1967; Aldrich, 1979; Kouzmin, 1983). Resource-based buffering refers to insulation based on access to material resources, information or technology and may arise from a variety of factors, including inter-organisational arrangements, government support, assistance from social or political elites (Aldrich, 1979) or access to outside financial resources and information networks (Quinn, 1980). Institutional buffering, in contrast, refers to the insulation organisations have through legitimacy or legislation (Peres, 1968), which can arise from prior compliance with general social expectations, professional norms or government regulations (Aldrich, 1979) and from identification with, and protection of, organisational values that already carry high legitimacy (Selznick, 1957; Peres, 1968; Galaskiewicz, 1985).

Downsized, restructured or re-engineered organisations without buffering mechanisms and perceived as especially 'lean', make up a 'refined risk set' because they are more at risk from immediate failure, having optimised minimal cost parameters for on-going *routine* performance—a form of 'corporate anorexia' (Scott, 1995: 27). The social dimension in the lean organisation is especially crucial because the type of coordinated action is often more non-routine than in the buffered organisation (Perrow, 1967). Lean organisations, however, still need to be novel and imaginative in volatile, uncertain and changing environments perceived as confronting the organisation (Thompson, 1967). For this kind of coordinated action, actors must act under conditions of ambiguity of both purpose and means to achieve ends (Hackman and Morris, 1978; Kouzmin, 1980a; 1983).

Furthermore, in situations where there is an absence of organisational 'slack', hidden reserves of 'fat', 'cushions' or resources that are not intentionally concealed but built into the structure of organisational technology ('buffers'), any additional disturbance in the form of further resource cuts or 'normal' accidents that one part of the organisation may be able to absorb, at least for a time, can spell a quick dis-integration for another part of the organisation (Hood and Meg Huby, 1988). Lean organisations are especially *vulnerable* to crises, especially ones where technology imposes an on/off threshold (outputs are nil if inputs drop below a certain level); where there can be no buffer stocks between production capacity and demand; where fixed recurrent expenditures are high in relation to total budget; and where the work cycle is short.

Depletion of buffering capacity through re-engineering, downsizing or delayering produces the 'survivor's syndrome'—low morale, lack of trust and a decline in commitment to the organisation amongst 'survivors' (Brockner et al, 1993; Cascio, 1993; Korac-Boisvert and Kouzmin, 1995c). These outcomes have multiple and ripple effects on virtually every aspect of business or agency activity as survivors find themselves in 'new, and not necessarily friendly, environments' (Cascio, 1993: 95). As a result, the terms of the 'psychological contract' in the "lean" organisation are fundamentally altered (Cascio, 1993: 103; Korac-Boisvert and Kouzmin, 1995c; Korac-Kakabadse and Kouzmin, 1997a). Worry-laden actors, with low self-esteem, direct their motivation to keeping their jobs, not to achieving inter-organisational goals so vital in crisis management response capacity (Brockner et al, 1993; Hequet, 1995; Korac-Boisvert and Kouzmin, 1995c). If such conditions and exposure to high levels of uncertainty are left unattended for a prolonged period of time, actors undergo a changed 'world-view' (Erikson, 1994), often leading to a mistrust of organisation and manifested in the fostering of conservative, inward-looking management styles which act in a counter-entrepreneurial drive. Alternatively, there develops an institutional insensitivity to longer-term organisational requirements which, with time, can lead to 'creeping crises' (Kouzmin and Jarman, 1989; Jarman and Kouzmin, 1990; 1994a; 1994b).

For example, the American Management Association's survey of downsizing in 1993 found that 80 per cent of surveyed organisations that had down-sized reported decreased employee morale; 13 per cent reported no change in employee morale; and 2 per cent reported increased morale (Fillipowski, 1993). Similarly, an Australian study found that 95 per cent of organisations that had undertaken structural changes through 're-engineering' had not achieved projected benefits (Saker, 1995).

Accomplishing *coordinated* action in lean, inter-agent-oriented organisations means a more critical

role for social structure, trust and personal engagement (Kiesler, Seigal and McGuire, 1984), all requiring *quality dialogue* and increased *face-to-face* interaction. Extra resources and slack that normally insulate the firm or agency in periods of dis-continuous transformation (Galbraith, 1973), redundancy mechanisms and capacity for adaptation are not available to lean organisations. In crisis, change and turbulence, lean organisations cannot utilise concurrence of design (Kouzmin, 1980b), where both old and new ways of doing things can co-exist, because

such processes require *additional* resources in order to maintain performance, reliability or safety (La Porte, 1994; Perrow, 1994; Sagan, 1994).

Inter-organisational linkages in delayered (lean) organisations may reduce vulnerability to environment uncertainty by providing the required extra resources between inter-dependent units but, at other times, may also simultaneously create vulnerability if two units are competing for the same (limited) resources with equally important priorities in the network of inter-organisational linkages.

IT-Mediated communication versus dialogue for crisis organisations

Considering that IT-mediated communication is increasingly gaining acceptance at all levels of organisations and that such utilisation has potential for changing group and inter-organisational interaction (Sproull and Kiesler, 1991b; Korac-Boisvert and Kouzmin, 1994), *audits* of how IT communication affects group and organisational outcomes, especially since IT actually supports the communication process rather than the decision process itself (Pinsonneault and Kreamer, 1990), become of crucial importance, especially in crisis management contexts.

Although, overall, IT-mediated communication has the propensity to increase participation and decision time at lower cost (in terms of time and effort) (Turoff and Hiltz, 1982), it also has the potential to decrease cooperation and confidence in decisions (Pinsonneault and Kreamer, 1990; Sproull and Kiesler, 1991b). IT-mediated communication produces intangible impacts such as the potential to increase task focus, significantly reduce people's inhibitions and, in new groups (born in electronic *vitro*), equalise participation (Siegel, Dubrovsky, Kiesler and McGuire, 1986; DeSanctis and Gallupe, 1987; Dubrovsky, Kiesler and Sethna, 1991; Weisband, 1992; Korac-Boisvert and Kouzmin, 1994; Kay, 1995). Thus, IT-mediated communication appears to remedy several of the dys-functional psychological and group communication processes in new groups (Rutter, 1987) by promoting a more task-oriented focus, with proportionally more discussion time devoted to the problem at hand and less to social maintenance. Its less personal and confrontational nature provides a 'cooling' effect on conflict with the focus on ideas and issues, rather than personalities (Dubrovsky, Kiesler and Sethna, 1991; Weisband, 1992).

On the other hand, IT-mediated communication may also have de-stabilising effects on established groups (Turoff and Hiltz, 1982), as relatively stable status structures (Shaw, 1982) change rapidly by manipulation of individual and group feedback (Smith, 1972) or member's task-specific abilities (Watson, DeSanctis and Poole, 1988). Vigorous debate within a more de-personalised atmosphere of IT communication (e-mail, electronic meetings) usually leaves members of new electronic groups less cohesive, less confident and supportive of group decisions (Waston, DeSanctis and Poole, 1988; Pinsonneault and Kreamer, 1990). IT inherently lowers capacity to transmit subtle messages of communication and lower group cohesiveness can lead to decreased cooperation, which also decreases opportunities for organisational actors to clarify inaccurate perceptions as negotiation proceeds (Fisher and Ury, 1990; Fells, 1993).

The absence of direct visual contact can promote aggressive behaviour and can lead groups to take *riskier* or more *extreme* positions (Shah, 1990). IT-mediated communication provides a 'lean' channel of communication as it eliminates a wide range of visual and verbal cues which, in negotiations, may result in a reduced ability to transmit valuable, even critical, task information regarding priorities and preferences (Shah, 1990; Sproull and Kiesler, 1991b; Korac-Boisvert and Kouzmin, 1994; Arthur, 1995). The unusual capacity of face-to-face dialogue to capture the entire spectrum of human interaction (multiple cues), its opportunity to interrupt and repair relationships, as well as to elicit immediate *feedback* and *learning*, are lost in IT-mediated communication (Goffman, 1963; Trevino, Lengel and Daft, 1987), leaving especially public sector and crisis-mediating agencies increasingly vulnerable (Korac-Boisvert and Kouzmin, 1995a; 1995b).

Due to its unique capacity in establishing and maintaining multi-dimensional and *resilient* relationships (Schlenker, 1980; McKenney, Zack and Doherty, 1992), face-to-face dialogue is often the choice for difficult and ambiguous dialogue (McKenney, Zack and Doherty, 1992) and specific personal relations in networking (Granovetter, 1985; Korac-Boisvert and Kouzmin, 1994).

In situations and relationships that call for high levels of trust, IT is conceptualised as a support mechanism and not a substitute for face-to-face dialogue (Nohria and Eccles, 1992; Korac-Boisvert and Kouzmin, 1994). Robustness and trust, critical to quality of dialogue, are severely weakened in IT-mediated communication. Lying, fraud, sabotage and other anti-social actions are harder to detect in IT-mediated exchanges (Korac-Boisvert and Kouzmin, 1994). Without the full benefit of face-to-face communication, it is almost impossible to recognise whether actors are being profoundly sincere or totally deceptive (Stone, 1991). For example, increased white-collar crime and other 'soft core' (Kouzmin and Korac-Boisvert, 1995) and 'creeping' crises (Jarman and Kouzmin, 1990; 1993; 1994a; 1994b) illustrate cases in point.

'Lean' communication within 'lean' organisations

Although the 'cooling' effect of the 'lean' IT communication medium can enhance conflict management and strengthen support by keeping the expression of emotionality at a more moderate level (Rice, 1984; Poole, Holmes and DeSanctis, 1991), it can be unsuitable for consensus building on highly equivocal tasks (Daft, Lengel and Trevino, 1987) such as competing for scarce resources within organisations with lean-buffers or inter-agency driven crisis mitigation efforts (Comfort, 1993; 1994). Although dialogue is more 'egalitarian', it is also more 'dis-organised' (Williams, 1977), as its openness makes it difficult to resolve issues and establish who has authority to make critical decisions. Furthermore, the spatio-temporal distance that IT interaction provides can lead to an open display of anger and escalating conflict or 'flaming' behaviour (Kiesler, 1986; Solomon, 1990). Thus, IT-mediated dialogue can help in enabling information flows useful for mobilising action (Comfort, 1993), but face-to-face dialogue is vital to actually taking action (Nohria and Eccles, 1992: 297; Korac-Boisvert and Kouzmin, 1994) and reducing potential organisational vulnerability. As the amount of IT-mediated communication increases, there is a need for a corresponding increase in the amount of face-to-face dialogue in order to maintain and build robust social infrastructure of relationships between actors (Nohria and Eccles, 1992: 297; Korac-Boisvert and Kouzmin, 1994). One mechanism for improving quality of interaction and dialogue is *feedback* (Kakabadse, 1991).

In the organisational setting, communication is the mutual exchange of meanings between active participants. Complex organisations consists of many social and cultural groupings and communication between them is likely to involve not only shared meanings but also contradictory and contested ones, thus requiring value and conflict resolution (Selznick, 1957) as well as quality dialogue (Kakabadse, 1991).

Further, participants in communication may be equally active in (re)producing meanings, but they frequently do so from positions of unequal power (Korac-Kakabadse and Kouzmin, 1997a). For example, in most contemporary liberal-democratic societies, an actor's access to information and ideas can often depend on class, gender, age and ethnicity (Korac-Kakabadse and Kouzmin, 1997a). Similarly, in organisational settings, actors' access to information and ideas can often depend on their position within organisation and networking opportunities. Thus, quality dialogue is a resonance between the beliefs and cultural experiences of the participants, expressed through a shared familiarity with the *codes* in use (Kouzmin, Leivesley and Carr, 1997).

While managers should take advantage of emerging electronic and telematic technologies, they should use them in *addition* to face-to-face dialogue. Technology is only a support mechanism and not a substitute for personal contact (Korac-Boisvert and Kouzmin, 1994). Empirical studies show that some of the best communicators spend about 40 per cent of their time in face-to-face encounters, only because they do not have more time to give (Rice and Aydin, 1991). Irrespective of how actors develop, feedback is required to help individuals be more responsive to addressing *contingencies* within organisational contexts (Kakabadse and Myers, 1995a; 1995b), enabling them to negotiate and share understanding of contexts and, thus, through learning, transcend proclivities for 'cognitive failures' (Kouzmin and Jarman, 1989; Kouzmin and Korac-Boisvert, 1995).

Uninformed organisations overly sensitive to 'other-oriented' managerialist actions (Kouzmin, Dixon and Wilson, 1995) are vulnerable to threats from the outside and missed opportunities within (Barnard, 1938; Selznick, 1957; Peres, 1968; Wick and Leon, 1995). In learning organisations, information flows with speed and honesty between all organisational actors. Openness is a linch-pin of an organisation's ability to scan and position itself in market and political space. By equalising the power between leader and followers, leaders are often able to gather information about what really is going on instead of what they hope might be going on in organisations. Learning organisations structure themselves and utilise IT in a way that speeds the flow of internal information. They create cultural norms that place a high value on honesty, even in the face of difficulties. Instead of covering up problems, learning organisations make problems visible in order to encourage participation in finding solutions quickly (Wick and Leon, 1995).

Vulnerability management, on the other hand, requires of leaders long-range planning capabilities, strategic policy making capabilities, high-quality generative learning and new ways of policy reasoning sensitive to 'formative contexts' (Dror, 1987; Unger, 1987; Garnett and Kouzmin, 1995; Korac-Kakabadse and Kouzmin, 1997a). These crisis-specific capabilities and requirements are, however, continually limited 'by micro-issues dependent, in the main, on an economic rationality—one lacking historical and comparative depth, ignoring psychological and communicative factors and suffering from additional features such as limited and simplistic notions of rationality which make policy and planning in governance and crisis communication contexts narrow' (Dror, 1987: 92).

The reasons for 'creeping' crises occurring and the conditions under which they are likely to occur have largely gone unidentified by many organisations, especially public agencies (Rosenthal, Hart 't and Charles, 1989; Kouzmin and Jarman, 1989; Jarman and Kouzmin, 1990; 1994a; 1994b; Kouzmin, Dixon and Wilson, 1995). Although many creeping crises may be justifiably explained as the result of misperceptions of context, inter-agency default, incompetence, improper socialisation, lack of leadership understanding (Selznick, 1957), employee intransigence or other non-rational determinants, in some cases 'creeping' crises can be associated with the contextual conditions in which problematic workplace and organisational design and jurisdictional allocation occurs (Kouzmin and Jarman, 1989; Rosenthal, Hart 't and Kouzmin, 1991). Many organisations are un-aware of their vulnerabilities to 'normal' accidents, 'softcore' fiascoes and 'creeping' crises *contextually* and *managerially* defined.

Many of these un-thinkable events (Hewitt, 1983: 10), although not all preventable, require the stimulus of organisational vulnerability audits in order to *develop* leadership strategies and organisational designs for effective coping and building resilience to crisis (Wildavsky, 1988). Complex organisations often create the crisis they face in the 'special sense that the kinds of early warning, prevention, damage limitation, recovery and learning mechanisms they institute are the most important factors affecting what kinds of crises will occur' (Mitroff, 1988: 20). Because actors adjust their perception of environmental uncertainty to match their own level of tolerance for ambiguity, mildly discrepant information is incorporated into actors' perception (McCaskey, 1974).

Unless agency leadership adopts active action plans to anticipate the *inter-agent* and internal antecedents of creeping and latent crises, they are unlikely to perceive the beginning of possible decline. In crisis situations, organisations will attempt to learn and adjust to return to the 'original' state of operations—single loop learning, instead of learning how to prevent critical incidents precipitating crisis processes - generative or double-loop learning (Argyris, 1982). Vulnerability audits and proactive crisis management sensitivities require sophisticated reconstructive policy logics (Kouzmin and Jarman, 1989; Jarman and Kouzmin, 1990) and institutional leadership behaviour (Selznick, 1957) rather than managerial or executive action (Barnard, 1938)—leadership here conceived as critical reflection and critical action within the dialectic of enactment, structure and power in critical events.

Conclusion: towards effective vulnerability management

Administrative reform, around the world, is increasingly dependent upon IT transformations (Estabrooks, 1995; Kouzmin, Korac-Kakabadse and Jarman, 1996). Issues of departmental self-regulation and contract management, financial management, information management, networking, de-centralisation and privatisation have come into existence, in part, because of enhanced IT capacities. Information management, for instance, has become necessary because current IT provides so much diverse information that central coordination, collection and supervision is needed. Networking is a development which, because of the assistance of IT, has become more wide-spread in and between organisations.

The central feature of these administrative reforms is the separation of policy conception and its implementation. The political decision-maker is, in reality, linked to administration, now built up of competitive agencies, via service contracts. This political agency construction leaves little room for mutual adjustment and learning, especially in the policy-sensitive area of IT system development for crisis management capabilities (Korac-Boisvert and Kouzmin, 1995a; 1995b).

The administrative reform movement, in turn, has led to the proliferation of networks within organisations. Although networks possess a number of positive aspects, outlined above, they carry a number of negative aspects, articulated here as the potential of fraud, sabotage and

the inability to facilitate trust and dialogue in crisis situations (Korac-Boisvert and Kouzmin, 1994).

Thus, globalisation and the IT revolution have helped spawn radical transformations of increasingly *vulnerable* administrative systems (Rosenthal and Kouzmin, 1996; Korac-Kakabadse and Kouzmin, 1997b). These reforms have been buttressed by an ideology of economic rationalism (Kouzmin, Leivesley and Korac-Kakabadse, 1997; Dixon, Kouzmin and Korac-Kakabadse, 1998; Korac-Kakabadse and Kouzmin, 1998). Traditional public administration, seen through the prism of IT-driven process re-engineering, urgently requires to review some of its prescriptive and behavioural canons of public administration (Dixon, Kouzmin and Korac-Kakabadse, 1998; Korac-Kakabadse and Kouzmin, 1998). The emergence of 'virtual' accountability, as a result of largely misunderstood or ignored IT developments, creates new IT-behavioural issues and problems at the top as well as the bottom of public sector agencies. At the top, IT-related default is increasingly being charted. At the bottom, 'digital' communities have just begun to create awareness of new information-behavioural realities.

Vulnerability management needs to specifically address the learning or feedback phase of critical incidents, providing critical assessments of what functioned effectively and in-effectively before, during and following crises. Learning phases receive the *least* attention from scholars, practitioners, managerialists and the media, because organisational learning efforts are costly in time and effort and are the least dramatic and visible in the short term (Argyris and Schon, 1978; Argyris, 1982; Rosenthal, Hart 't and Charles, 1989; Korac-Boisvert and Kouzmin, 1995a). Yet it is, arguably, the most crucial stage of crisis (after mitigation, prevention and planning) for improving actors' understanding and capacity to cope with crisis dynamics (Argyris and Schon, 1978; Argyris, 1982; Rosenthal, Hart 't and Charles, 1989; Korac-Boisvert and Kouzmin, 1995a). It is the phase where IT, for example, can be effectively used to improve understanding and the learning capabilities of a large number of actors. Simulation crisis scenarios (real and perceived) and crisis databases are just some examples of learning facilitated by IT. Learning in simulated environments allows for the reduction of organisational and procedural rigidities that hinder learning during crises and allows only for organisational adjustments or reaction learning (single-loop learning). Simulation allows for experimentation and *post hoc* generative learning.

Bringing in new, crisis-sensitive ideas to eliminate ingrown management cognitive biases and old economistic consensus at the time of ever-diminishing agency resources and threat pose genuine leadership challenges to organisations as they require new learning strategies sensitive to *ideology, crisis vulnerability* and *context* (Unger, 1987; Dixon and Kouzmin, 1994: 62-67).

Vulnerability audits by institutional leaders help to analyse and predict how organisational disturbances (re-engineering, downsizing, crises) might affect organisational performance (Hood and Meg Huby, 1988). For example, during re-engineering, organisations use vulnerability analysis to predict how cutbacks of resources will be distributed—what disappears, what survives, what prospers? Organisations may be resilient against spending cuts but be highly vulnerable to staff cuts, marketing strategy, IT adoption, inter-agent-driven crisis management capacities or management training, to mention just a few longer-term vulnerabilities. Identifying these vulnerabilities is necessary but equally important is the effective management of identified vulnerabilities and learning how to be prepared for the unthinkable (Kouzmin and Jarman, 1989). In many ways, these vulnerabilities transcend the IT variable and are inherent in crisis-illiterate administrative systems, developed or developing alike.

Risk analysis and risk communication within, and between, agencies are emerging as two critical policy issues as current understanding of crises moves beyond causality attributable to 'externalities'. To the extent that risk is a 'person-made hazard', with the creators of risk effectively devolving their created risk onto others, risk analysis requires urgent re-focusing. If society distributes risk disproportionately, then risk analysis can be seen as the privilege and the propaganda of the powerful, rather than the concerned voice of crisis victims. Highly ideologised visions of 'efficient' and competitive organisation and charismatic entrepreneurial authority are dangerous illusions in this context of understanding contributing factors to risk, vulnerability and preventable crises.

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The problem – finding the problem: Canada's ice disasters lessons for Y2K

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In January 1998, a series of ice storms struck Eastern Canada and parts of neighbouring US states. The ice build-up was so great that branches, trees, telephone and power lines and even steel transmission towers collapsed under the weight. Eventually, 16 per cent of Canadians were left without electric power and Canadian insurance companies paid out $1.44 billion in claims, the largest insured loss in Canadian history. In Eastern Ontario, the damage was so bad that 66 separate municipalities declared a state of emergency, among them 10 of the 11 municipalities that make up the Regional Municipality of Ottawa Carleton, a region that includes Canada's capital city, Ottawa.

The response to the ice disaster involved volunteers, local, regional and provincial governments and utilities and the largest peacetime response by the Canadian Army in its history. That response ran into an unexpected dilemma: the ice storm had not only created problems, it damaged the systems that normally detect these. Finding out what was wrong required a massive commitment of personnel. This may be a portent of what will happen at the start of the year 2000.

In discussing the ice storm, this article focuses on one part of the impact area – the urban-rural Regional Municipality of Ottawa Carleton (RMOC). That is because even before the RMOC shut down its Emergency Operations Centre (EOC), it commissioned a small task force to review its response. That report was finished in six weeks (Scanlon, 1998c) unlike other reports which are still being written or researched. It is the main source of information for this article. However, it was only later that some implications of what happened became evident. For that reason, the issues discussed here were not analysed in RMOC report.

Setting the scene

The 1998 ice disaster was the result of three consecutive storms during a six-day period. Throughout that period the temperature remained slightly less than 0 Celsius. If it had been warmer, it would have rained. If it had been colder, it would have snowed. Instead, ice from the second storm piled up on top of the ice from the first, and ice from the third storm piled up on top of that. The ice build-up in the Ottawa area was 69.6 millimetres, three times the historic high. It was far worse along the St. Lawrence Seaway, an hour's drive from Ottawa. In some places, the build-up was more than 100 millimetres, five times the record for a six-day period.

The Regional Municipality of Ottawa Carleton (RMOC) is responsible for policing, transportation, health, social services, water, liquid and solid waste and regional roads. The 11 local municipalities in the Region look after their own fire service and several have their own power utilities. In some areas, power is provided by the provincially owned utility, Ontario Hydro. Telephone service and gas is supplied by private utilities. Although the ice storm did not hit the region as severely as it struck other places, 10 per cent of the trees in the Region were destroyed and 70 per cent were damaged. There were telephone and power lines down everywhere. Roads and sidewalks were covered with ice and debris. However, the RMOC had back up generators at all lift stations in the liquid waste system and at the liquid waste processing plant. It also had generators for all its pumping stations and wells in its fresh water distribution system. There were no failures in either system. By working extended overtime, Regional Roads crews also kept the major arteries open. Solid waste collection, however, halted. Plastic garbage bags were frozen in place and roads made movement treacherous.

Although the Regional plan calls for the Region to open shelters in an emergency, all 11 local municipalities opened their own centres before the Region could act. One of the Region's main functions became supplying those facilities. Regional staff collected food and other supplies and shipped them out. The Region also collected and shipped generators, firewood, camp stoves, water, flashlights, batteries, beds, cots, blankets and other supplies to fire halls, which became the main distribution point for supplies. (Some supplies came from federal depots placed strategically for just such emergencies.) Since its own services were functioning, the RMOC became mainly a service centre, assisting local municipalities. It also became the main centre for public information, with its twice-daily news conferences—these were broadcast live— and its superb telephone answering system. A person answers all calls to the RMOC and no callers are forced to leave voice mail unless they choose to do so: calls reaching a recording return to an operator.

The RMOC's response was run from the offices of the Emergency Measures Unit at Regional headquarters. The unit consists of a small secretariat, one office and two meeting rooms. During the disaster, the outer meeting room was used for the Control Group, which included the elected Regional Chair, the Chief Administrator Officer and senior officials including the Medical Officer of Health and the Chief of the Ottawa Carleton Regional Police Service. The inner meeting room—equipped with cubicles and special phones—was used as an Emergency Operations Centre (EOC). It was staffed at first by persons from emergency agencies and OC Transpo, the Regional transit system. Later they were joined by persons from the *ad hoc* groups formed to deal with specific problems and by officers from the Canadian Army.

Communications to and from the EOC generally worked well. The phones, unlike the rest of the phones in the Region, did not require power to operate. They also had no capacity to receive voice mail. That meant no messages were lost. Lost messages did become a problem when some field per— sonnel acquired cell phones and passed these around. Often the person with the phone was unaware that messages were piling up and that messages sent to an earlier user of that phone had never been heard. (There were some problems the evening the state of emergency was declared: the RMOC's cell phone system went down where power went out at the main tower.)

Although the initial staffing of the matched what is usually done for emergencies — present were fire, police, ambulance, health, and social services — the ice storm was an unusual disaster. Since the storm had hit the entire region, there was no site and no need for site control, nor-

mally a police function. Since there were few accidents – the few drivers there were, were very cautious – and little crime, that also reduced the need for police services and the demand for ambulances. In any case, few went to hospital in such treacherous conditions. The busiest emergency agency was fire: its vehicles were continually on the road dealing with downed trees and power lines. As a result, most activity in the EOC was not by emergency agencies but by the *ad hoc* emergent groups hastily put together to deal with generators, food and other supplies and firewood. These groups were run by persons selected by the Control Group and they quickly fitted in with those already at the EOC (Scanlon, 1998a).

Despite the power outages, most residents stayed in their homes. They made do with camp stoves, wood stoves and fireplaces or by piling on extra clothing in the daytime and extra blankets at night. Only a handful elected to sleep at the shelters. Concerned that residents especially the elderly might not realise how risky it was to stay in a cold house in mid-winter, firefighters started going door to door (Scanlon, 1998b). Those checks expanded until house calls were made by teams that included not only firefighters but also Regional police, Health and Social Service workers and military personnel (including medics). Eventually about 300 persons were identified as at risk and persuaded to leave home. Force was never used. (The Chief of Police told the Control Group that in Ontario police do not have the legal power to force persons from their homes.)

Military assistance

In Canada military personnel are under federal control. However, peacetime emergency response is a provincial responsibility. Thus military involvement in disaster usually occurs only when a province requests the federal government for assistance. While such requests are not uncommon, they rarely come from the largest province, Ontario. Armed forces personnel, for example, provided accommodation, food and transportation when a flash flood hit the Saguenay region of Quebec and helped build levees and patrol flooded communities during the 1997 floods in the Red River Valley. They were called out after two terrorist kidnappings in Quebec and when aboriginals blocked highways and a major bridge in and around Montreal. But Ontario rejected military assistance when a toxic chemical spill led to the evacuation of 217,000 persons in Mississauga and when 14 million rubber tires burned for 18 days in Nanticoke.

In the wake of the ice storms, however, the RMOC and other Ontario communities decided they did not have sufficient personnel to deal with the enormous problems of cleaning up the debris left by the storm. They asked for military help. Those requests went first to the Provincial Operations Centre of Emergency Measures Ontario, then to Land Forces Central Area (LFCA), finally to the 2nd Canadian Mechanised Brigade (2CMBG) at Canadian Forces Base (CFB) Petawawa. As a result of those and similar requests from neighbouring Quebec, 15,000 troops were sent to assist disaster-stricken communities: 4500 of those were sent to Eastern Ontario.

Although it was anxious to assist, 2CMBG ran into problems when it was asked to respond to the ice disaster. First, most of its soldiers were on Christmas leave: it had to recall them. That worked so well that 70 per cent arrived back the same day. Second, the roads between CFB Petawawa and the RMOC were dangerously icy. The RMOC had to divert some of its salt trucks to make the highway passable for the troops. On arrival at Regional headquarters, the 2CMBG advance party received a middle of the night briefing from Regional staff, and then officers toured both the Region and some neighbouring rural areas in police cars. They reported back with two observations: the situation was far worse then they had expected; and it was far worse in the rural areas *outside* the Region than it was in the rural areas *in* the Region. From then on, the Army brought its officers in to Regional headquarters each evening for an up-to-date assessment, meetings that soon provided the best overview of what was happening.

The day after arriving, the Army learned something else: on January 1st a number of boundary changes had taken place in rural areas of Eastern Ontario. Many new municipalities had yet to organise when the ice storm struck in early January. In some areas, there was no municipal government. No new community had an emergency plan. (Things were so confused that the province had had to send police cars to try and locate some local governments.) The RMOC had been sending personnel and supplies to its rural neighbours as soon as it opened its EOC. Now, at the Army's request and with permission from the Premier of Ontario, it sent administrators to help re-establish civilian government. The Army said that was crucial: it had come to assist, not to take over. (Scanlon and Kerr, 1998) The persons sent were all bilingual French-English: residents in the area outside Ottawa are substantially French speaking.

Monitoring problems

Something else was becoming gradually apparent. That was that a major problem in responding to the ice storm was not *correcting* the situation but *discovering* exactly what was wrong. Like most developed societies, Eastern Ontario relies on sophisticated systems to monitor various activities. When many failed, it was unclear how bad things really were. Determining this required large numbers of personnel.

The RMOC, for example, keeps its roads clear during winter by applying appropriate amounts of salt and sand. The precise mixture is determined not by the air temperature but by the pavement temperature (there can be as much as 11 degrees difference). That is monitored by electric sensors in the pavement. Ice covered those sensors, forcing staff to find bare spots and check the temperature using infra-red guns. Fortunately, Regional roads had the required equipment and the staff to do this.

The system that monitors traffic lights also failed. That made it impossible to tell whether the system alone was down or whether lights were out at intersections. That could be determined only by sending out personnel from the RMOC's Traffic Operations Branch. They found that the lights were out at 80 intersections. They managed to get most lights back in operation during peak hours but had to mark some with warning signs and barricades. Because the branches, trees and lines did not all come down at once, these crews were forced to visit intersections more than once. However, within 24 hours, the situation was restored and these crews could be sent to assist others. (Most have electrical skills and carry portable generators: their services were in great demand.)

The private utilities providing gas ran into problems similar to those with traffic lights. They, too, had failures with their monitoring equipment and they, too, had to send service personnel to see if these reflected failures in monitoring or problems with gas distribution. Their checks, done entirely by their own staff, showed no failures in the entire gas distribution system. Only the monitoring system was having difficulties.

The handling of these problems followed a pattern. Because there were problems in monitoring what was going on, personnel had to be sent to gather data or do individual checks. Sometimes these checks showed action was necessary. Sometimes all was well. Whether or not action was needed, determining that required calling in personnel and sending them out to look. Responding to failures of monitoring

systems, in other words, leads to a labour-intensive response. The need for this became much more evident as the phone company and the power utilities tried to cope with their problems.

Telephones and power

The systems that provide telephone service and electric power are comparable in the sense both involve complex systems that link various locations, whether these involve satellites or microwave links or huge steel transmission towers. Eventually, however, both connect to individual customers though what might be called automated localised service centres. In the telephone service these are known as remotes, in the power system these are called sub-stations.

If a remote or a sub-station fails, then telephone or power service stops for each individual customer served by that unit. Since both services know how many customers each unit serves, they know how many customers are without telephones or power when one fails. However, the reverse is not true. The fact that a remote or sub-station is working perfectly does not mean that a single customer is getting service. The individual drops or connections that link customers to the system may be down. To put it another way, when these companies restore service at a telephone remote or power sub-station they can't be sure how many customers are back on line.

When there is a partial failure of service, the telephone and power utilities become aware of its extent in two ways. First, their monitoring systems tell them what has gone down. Second, individual customers call in to report loss of service: the pattern and volume of those calls helps pinpoint the location and extent of those calls. Since most Canadian telephones operate even when power is out, the power utilities are usually besieged by phone calls when only the power service fails. The situation after the ice storms was different. First, remotes and power sub-stations were out throughout Eastern Ontario. Second, the connections to thousands of individual customers were also down. Even when the localised service centres—the remotes and the sub-stations—were up and running, customer service was not restored. It was still necessary to check each individual customer and that, once again, required an enormous commitment of personnel. That problem was compounded by the fact that with phones out, many customers were unable to report their power problems. (Despite that the power call-in centre was besieged by phone calls: its phones were jammed for days.)

Telephone response

The first step the telephone company took to restore service was to round up portable generators and use these to power up the batteries at various remotes. When the only problem was a power failure at the remote itself, that restored service. That alone put about 25,000 customers back in service. There was, however, one difficulty. Although crime rates fell in the wake of the ice storm, the telephone company's generators proved too attractive a prize. So many generators disappeared that the telephone company had to chain them in place and arrange for security guards to do special patrols. Sometimes the guards would go from remote to remote then return to find a generator had disappeared while they were elsewhere. (In most cases, these generators were returned once power was restored.)

Next, by calling in crews from across the province, the telephone company tried to restore service where the problem was not the remote but the 'drop' or individual connection to a customer. Considering this a major priority, the company cut back on new installations and routine maintenance across the province. However, some telephone service depends on lines strung on wooden poles (these are often called 'telephone poles' but they carry telephone, power and TV cable service). Since this restoration work was being done by power crews, restoration of some telephone service had to wait until those crews got poles back in place—a time consuming task since thousands of poles had been dragged down by the weight of ice. During the response, Ontario Hydro alone shipped in 84,932 insulators, 21,151 transformer and 2804 kilometres of wire and cable and no less than 11,647 power poles (Scanlon, 1998c, p. 40)

Since the problems were so great and telephone resources stretched to the limit, the telephone company asked the Army to help, not just to clean up debris and dig holes for new poles but to have soldiers use their technical skills to restore service. At first reluctant to do work normally done by unionised civilian specialists, the Army agreed to assist when it became clear that the situation was a widespread disaster, not a problem that could be handled with by normal response or even with extensive mutual aid.

Although its public affairs staff urged telephone company management to announce where and when service would be restored, the telephone company did not do so. It stated that it was running an all-out 'blitz' with all available personnel and that service would be restored as fast as was possible. The company's rationale was that as soon as you announce that Community A's or neighbourhood B's phones will be restored next, that makes it obvious to other communities or neighbourhoods that they are lower in priority. By not making promises, the company did make anyone feel they were less important than someone else was. Because the media were focusing on the power problems, they never challenged that approach. The strategy paid off when restoration took much longer than expected. By not creating false expectations, the telephone company avoided disappointing customers.

Power Situation

While telephone restoration went quietly and aroused few complaints, the restoration of power became a highly controversial public issue. There were a number of reasons for this. First, in Eastern Ontario alone, the power system involves 45 different utilities that, to some extent, are in competition with each other. Second, loss of phone service is far less a problem than loss of power. Many persons could communicate with cell phones or use a phone elsewhere. (The telephone company installed banks of free phones by the various shelters though they had to put on controls when some persons made overseas calls.) In any case, losing a phone does not leave you cold or thirsty. Finally, Ontario Hydro kept making public forecasts it was unable to keep.

The first priority for each individual power utility was restoring service to its own customers. Most utilities did that by using their own personnel and by calling for mutual aid from utilities outside the impact area. While all utilities made their own decisions about power restoration priorities, most kept in touch with their local government's EOC to make certain there was mutual understanding about what was going on. That was certainly true for the five utilities within the RMOC – Ottawa, Nepean, Gloucester, Kanata and Richmond Hydro. Nepean, for example, had a liaison officer from the Nepean EOC at its headquarters. Cumberland had daily meetings with Ontario Hydro.

In many urban areas, power was back in hours although in one or two places it took a week. (In one or two neighbourhoods, the overhead power lines are strung behind stately homes on tree-covered properties.) The utilities kept in touch with each other and asked the crews to move on to assist other local utilities once their services were no longer needed. In the urban areas of the Region there were few complaints about the speed or efficiency of restoration of power.

The situation was far different in the rural areas, both within the Region and outside its borders. First, there had been a greater ice accumulation so the damage was far greater. Second, many rural power lines are strung across fields rather than along roads. Accessing them was not easy. Third, customers are much further apart: moving from one place to the next took much longer. Fourth, power is more important to rural residents. In the city, water kept running, as did the sewage system. In rural areas, residents had no water and no sewage – both require pumps – and many dairy farmers were finding it impossible to milk their cows. The Army helped one farmer by sending two soldiers who had grown up on a farm to milk his cows by hand. It was far from enough: in Ontario, an estimated 2000 dairy farmers were forced to dump 10 million litres of milk, worth $6 million Canadian (Lecomte, Pang and Russell, 1998, p. 18).

There was a further problem stemming from the uneasy relationship between Ontario Hydro and the 45 local utilities. As the province's only significant producer of electric power, Ontario Hydro supplies power to all other utilities. It also has its own individual customers. That means that in many areas it is a competitor with the utilities it is supplying with power. In Goulburn township, for example, the power in the town of Richmond is supplied by Richmond Hydro but the power for the rest of the township is supplied by Ontario Hydro. This dual role—wholesaler and retailer—has led to an uneasy relationship between Ontario Hydro and the other utilities. Because of that, some utilities declined to provide information to Ontario Hydro about the extent of their problems (that meant the province had trouble getting an overall picture).

There were also public disputes among the utilities. One arose when Ontario Hydro refused to let crews from Kanata Hydro work with its crews. (Kanata is one of the 11 municipalities in the region.) Kanata Hydro workers informed the media that this was because Ontario Hydro was unionised and its were not: it portrayed the dispute as union resistance to use of non-union workers. There were some problems with Ontario Hydro unions during the response. However, the refusal to accept Kanata assistance stemmed from something else: Ontario Hydro provides detailed safety briefings to all of its crews and contractors every morning. When the Kanata crews arrived, those briefings were finished. Ontario Hydro did not want to anyone in its response operations who had missed the safety briefing.

Negative reaction

However, Ontario Hydro's real problem was its inability to provide the public with satisfactory information. That stemmed from two things. First, Ontario Hydro spokespersons used jargon: as a result, their announcements were confusing. Second, the situation was far worse than anyone suspected: Ontario Hydro's forecasts were unduly optimistic. The problem with jargon was that Ontario Hydro kept announcing the target date for restoration of power to its *sub-stations.* It would say, for example, that power would be back in 48 hours at the 'Manotick' sub-station. Because the Manotick substation is not necessarily in Manotick the name 'Manotick' did not necessarily mean the community called Manotick. Even if the 'Manotick' sub-station *was* in Manotick that did not mean that once the *sub-station* was back on line, power would be restored to Manotick customers. Each individual customer still had to be re-connected. That might and often did take several more days.

Ontario Hydro's most serious failure was explaining what it was doing and what it hoped to achieve in a way that could be understood ... Ontario Hydro could not seem to understand why this kind of miscommunication left local officials and the public frustrated and enraged. (Scanlon, 1998c, p. 42)

In addition, the situation was far, far worse than anything previously experienced. Over all (there are no separate figures for Ontario) more than 1000 transmission towers and 30,000 wooden utility poles came down (Lecomte, Pang and Russell, 1998, p. 14). Not only the sub-stations but most customers served by those sub-stations were directly impacted. Ontario Hydro had to find ways of determining where service was out. Without that information, it had no idea how long restoration would take. Quite often, that information had to be obtained not from skilled technical personnel—it doesn't require skill to see if a line is broken—but from anyone who could go and look. Military reconnaissance became an essential ingredient in the response.

There was another difficulty. Ontario Hydro has the right to run power lines across fields and—in the wake of the ice storm—got permission to put some lines along country roads. However, in many cases, it does not have the right to reconnect lines on private property. That's the job of an electrical contractor. Ontario Hydro crews would come down a road restoring power and keep going past a home that was still in the dark. That infuriated customers. Later, Ontario Hydro got special permission to make those connections but by then it had already managed to upset many of its customers.

Unfortunately for Ontario Hydro, the decision to keep the public informed—and the fact its announcements were often misunderstood—led to public criticism from local politicians, from Regional government, even from its own personnel. Ontario Hydro eventually agreed to send senior engineers to Regional headquarters to meet with the Regional Control Group. From then on, its public announcements were made as part of the Region's twice-daily news conferences. Ontario Hydro also sent service personnel to the various shelters to meet with individual customers. They called this approach their 'hug a customer' service. By then Ontario Hydro had become the scapegoat.

After the chair of the RMOC told the chairman of Ontario Hydro's Board that he was having trouble getting answers from Hydro, the Hydro chairman told a news conference he was having difficulty getting answers from his own staff. From then on it was open season on Ontario Hydro. (Scanlon, 1998c, p. 43)

Hydro staff called that news conference the 'news conference from hell'

Significance of what happened

Initially, problems created by the 1998 ice storm seemed straightforward. Branches and trees were down everywhere, telephone lines and power lines were down. As time passed, it became clear these were only the outward and visible signs of the extent of the emergency. Before the full extent of the problems could be determined, there had to be on-the-spot checks by personnel, not only to see where power was out but also to check on road temperature, gas lines, traffic lights individual telephone and power connections. The problem in responding to the ice storm, therefore, was not just fixing what went wrong, it was finding out what was wrong so that it could be fixed. And that required enormous numbers of personnel.

Governments and business have become increasingly dependent on computer-based systems to monitor what is happening and to warn them if something goes wrong. The 1998 ice storm shows that those monitoring systems can fail. The ice storm, in other words, revealed the sort of problems predicted by Yale professor Charles Perrow in his book *Normal Accidents: Living With High Risk Technologies* (Perrow, 1984). The storm also showed that in addition to multiple failures in *one* system at one time, there could be multiple failures in *many* systems at the same time. It seems

reasonable to suggest that may be an indication of the sorts of things that might go wrong at the end of this century.

In recent years, the Canadian government, like many governments has been cutting back. Private companies have been doing the same. There have been moves towards deregulation, freeing the way to greater competition. As a result, both government and business have fewer spare resources, resources that are vital to an emergency response. This is particularly acute when a wide area is affected—as it was in the wake of the ice storm and may well be at the end of the century. When this happens, mutual aid systems do not fill the gap.

In Canada, during the response to the ice storm, two resources proved to be especially important. One was Bell Canada, which despite deregulation and increased competition was still able to assist many of those who are no longer its customers. (It provided extra support to the RMOC, for example, although the Regional phone and cell phone contracts are both with rival firms.) The second was the Army. That was partly because it had personnel who could do whatever was required. It was also partly because to a considerable extent it was self-sustaining. However, it was mainly because it had reserves of personnel who were capable of finding out what the problems really were, doing in other words what the military called reconnaissance, a term officials at the Regional Municipality of Ottawa Carleton came to appreciate.

Role of government

One problem that was not resolved in the wake of the ice storm was the appropriate role for government. At the local level, there was considerable discussion between municipalities and power utilities about appropriate priorities for restoration of power. All power utilities including Ontario Hydro responded to municipal suggestions when these were made. This did not happen at either the provincial (state) or Regional level—not because the power utilities resisted suggestions but because those levels of government didn't make any: while provincial and regional government tried to keep track of what was happening they left decision making to the utilities. The task force report on the RMOC's response argued that both levels of government failed in their responsibility by not playing a role in setting priorities. It said that during a disaster government has a responsibility to play a leadership role even in areas where it does not normally have jurisdiction.

Another lesson that needs to be learned from the ice storm is that, in a disaster, the government must step in and take the responsibility for coordinating the response and for acquiring the expertise to do that effectively. That did not happen in Ice Storm '98 when it came to electric power. (Scanlon, 1998c, p. 72)

Given the political climate at the time of the storm, the decision by both levels of government to stay out of power issues may have been wise. The province, for example, has been trying to maintain an arm's length relationship with Ontario Hydro because of some recent problems with that utility. It was better off politically to let the blame fall on Hydro than to start issuing directions and risk being blamed for what went wrong. In the Region, there are suggestions that the local municipalities may be abandoned and integrated into what is known as a one-tier government. If the RMOC had tried to interfere with the local utilities it would have been seen as trying to push ahead with that political agenda:

The task force recommendation that the Region get involved in setting power priorities may have made administrative sense but the Region's approach was more politically sensitive as demonstrated by the fact that the only strong negative reactions to the task force report came from local utilities and the municipalities with such utilities. They saw the recommendation that the Region get involved in setting power priorities as setting the stage for a Regional takeover of electric power. (Scanlon, 1998a)

It is hard to see, however, how such a stand aside position—politically wise or not—could be taken in a similar future emergency, especially one caused by widespread failures in all monitoring systems, such as could happen at the start of the next millennium.

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Simplifying disasters: developing a model for complex non-linear events

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Introduction

All disasters are complex events. If this complexity can be reduced, a disaster becomes less severe and thus less traumatic, disruptive and damaging. A first step toward reducing complexity is to better understand how the different facets of a disaster relate.

This understanding can be developed through the use of a model of the process of a disaster event. The focus here is not on models to predict specific types of events. It is on a generic, process-oriented model which applies to the unfolding of all types of disasters, and which may be used in monitoring and guiding disaster management efforts.

Why a model?

There are a number of reasons why a disaster process model can be useful. First, a model can simplify complex events by helping to distinguish between critical elements and noise. This is particularly useful in a high-pressure disaster response environment, when little time is available to think about events or to identify critical issues. Second, contrasting actual conditions with a theoretical model can lead to a better understanding of the current situation, and how a disaster may evolve. This facilitates planning and helps make plans more complete.

Third, having available a model of the disaster process is an essential element in quantifying disaster events, itself key to reducing the complexity of disasters. Without models, efforts at quantificaiton have no base from which to organise the data collected.

Fourth, a written disaster process model helps establish a common base of understanding for all involved. Whether consciously or not, everyone uses some kind of model as a guide for decisions and actions. These models are developed from, and colored by, experience, formal learning and prejudices. Some of the complexity and confusion of a disaster can be attributed to the different cultures, languages and avocations, and thus the different mental models, of those involved in a disaster event.

A written model serves as a common ground and makes possible better integration of indigenous relief and recovery efforts with outside assistance. An accurate and clear model helps victims and assistance providers play the same game in the same ballpark.

Finally, and in a similar manner, a disaster process model can be useful to disaster managers in explaining the course and possible future outcomes of a disaster to non-specialists. If the model is clear (a major condition), then its presentation to select or general audiences can facilitate securing support for disaster management efforts.

Disaster process models

An overview

To date, the development of a disaster process model has been based on identifying the stages, events, actions and time frame which make up the course of a disaster (see Neal, Haas *et al.* and Frerks *et al.* for different perspectives on the disaster process). Of the three elements, the time element is easiest to define. It can be quantified down to seconds, but more often it is measured in hours, days and then years (e.g. a log scale).

Disaster stages identify periods in the unfolding of a disaster. Each stage serves to classify the nature of impacts that occur or actions which take place to address impacts of a disaster. Events are interlinked, as are actions, and events and actions. These linkages can be tight or loose. They are often the most difficult part of a disaster to identify, define, and understand.

Finally, the idea of defining stages in a disaster suggests some intrinsic order over time. The reality is that the disorder within and between the events and actions defines the existence of disastrous conditions (see Kiel). To be useful to disaster managers, a disaster process model must go beyond a simple definition of disaster stages and shed light on (and provide a conceptual organisation for) the basic events and actions which constitute a disaster.

The simplest disaster model is probably the sequence *Pre-event, Disaster, Post Event.*

More detailed variants of the linear model are provided below. The first is the standard process model of a disaster composed of stages involving *Preparedness, Response, Recovery, Mitigation* (Neal, 1997).

Currently, this model is presented as a continuum from disaster to development, '...a linear progression from a state of crisis through rehabilitation to development' (Macrea, 1997).

The second variant of the linear disaster process model comes from Harrald and Stoddart (1998) and '... characterises the phases of a disaster by the evolution of internal functions and tasks of the organisational structure': *Initiation/Mobilisation (storming, forming), Integration (norming), Production (performing), Demobilisation (transition).*

Although using different terminology, both models cover the same pre-event, event, post-event sequence noted above.

This linear sequencing of disaster stages has been subject to criticism. Neal (1997) highlights three points, among others. First, different stages occur at the same time for different segments of a population. Second, some events are relevant to more than one stage. Third, stage '... divisions are arbitrary, and are only useful in distinguishing the major functional activities of a period' (Haas et al, 1977). Other criticism has been that a view of the disaster process, moving from pre-disaster to disaster and out-of-disaster conditions, incorrectly supposes a separation between disasters and non-disaster (i.e. development) periods (see DHA, 1995).

To address the complex relation between disasters and development a circular model was proposed (see *Figure 1*).

The realisation that disaster phases and development were often linked and could exist at the same time led to the proposition that disasters and development exist on a 'Mobius strip' (see *Figure 2*, Anderson, 1985). The Mobius strip was proposed by Cuny and Beaumont before the 1993 model in *Figure 1*. Here it is presented as the stage after the simple circular model, which was also put forward in an earlier form by Cuny and others in 1985 (see Anderson, 1985 and Cuny, 1985).

Although the Mobius model clearly presents the link and concurrent nature of disaster and development, the model's circular form a basic question: Is disaster history doomed to continually repeat itself, running like a dizzy rat around the tread wheel of a Mobius strip?

A more optimistic approach is to see disaster and development as linked in an upward spiral or, pessimistically, in a downward spiral (Kelly, 1998). While a spiral has the advantage of being able to show positive or negative change, it lacks the ability to portray the concurrent nature of disaster and development, so physically demonstrated in the Mobius model.

Although the models presented above all attempt to set out an organisational structure for the disaster process, they are broad statements. These models may help in understanding the general nature of the disaster process, but provide little insight into actual unfolding of a disaster. What is needed is a disaster process model which starts with the basic events and actions of a disaster and serves as a functional tool in guiding the disaster management effort. A model specifically for this purpose is presented in the following section.

Reconsidering the form of a disaster process model

In reconsidering the form for a disaster process model several points need to be taken into account. First, rapid change is probably the single greatest contributing factor in events becoming disasters. Rapid change also adds to the demands on the disaster manager. Simplifying how change is present is critical to simplifying the disaster process model.

Second, underlying the issue of change is the nonlinear nature—the chaos—of a disaster (Keil, 1996). This chaos '...looks like random behavior but is really unstable behavior over time that stays within clear boundaries'. Importantly, chaos is probably a '... necessary and desirable condition which accommodates adaptations, cross-communications... and other such emergent behavior essential to an efficient response' (Priesmeyer and Cole, 1996).

Finally, as Haas et al. suggest, dividing disasters into stages is only useful in a general sense (see quote above). It is the actual events of a disaster which are important and need to be the focus of disaster management efforts: it does not matter what disaster stage you are in if you don't have a handle on what is happening.

One approach to disaster process modeling which takes these points into account is to use a two-dimensional Cartesian plane. On this 'phase plane,' the 'x' and 'y'

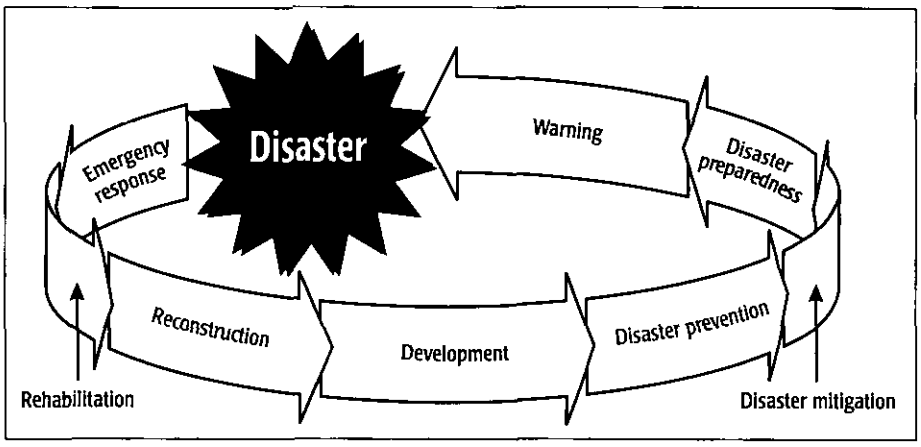

Figure 1: Circular model of disaster

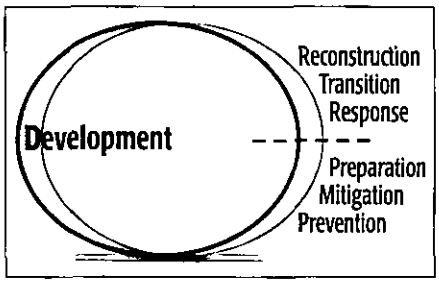

Figure 2: Cuny-Beaumont Moblus strip model

lines represent two factors and each of the four quadrants a relationship between the two factors (see *Figure 3*, Priesmeyer and Cole, 1996).

The center of the phase plane represents no change. Changes in the x and y factors can be plotted over time and used to monitor the status and progress of a disaster response. (Priesmeyer and Cole discuss phase planes and their use as disaster management tools in detail.)

The phase plane concept has three advantages for disaster process modeling. First, each phase plane incorporates three factors, 'x', 'y' and time of the phase, and four areas of interaction (quadrants). Other models generally cover only one area/quadrant and normally only two components, 'y' and time (usually the 'x' axis.)

Second, phase planes can be sandwiched. Theoretically, an unlimited number of planes, representing all basic events of a disaster, can be centered along a single axis, representing no change in status (the juncture of the x and y).

Third, phase planes are only representations of reality. Thus, the position (x-y coordinate) of two factors in a phase plane can be related to the status of other factor relationships in other phase planes without being influenced by intervening planes.

This is accomplished by making the x-y coordinates of two phase planes the x or y factor of a new phase plane. Although only two factors can be compared in each phase plane, increasingly more complex situations can be created by progressively forming phase planes for increasingly complex pairs of factors (i.e. the product of relating the results of two phase planes).

To create a generic model for disaster response, a disaster process phase plane can be organised with Response/Input along the y axis and Event/Impact along the x axis (see *Figure 4*).

The upper right quadrant represents conditions when both inputs and impacts are increasing. The lower right quadrant represents conditions when inputs are falling behind impacts. The upper left quadrant indicates conditions when inputs exceed the needs for dealing with an event, and the lower left quadrant shows conditions when both inputs and impacts are diminishing.

The normal course of a disaster moves from the lower right quadrant to the upper right, then to the upper left and finally to the lower left. An efficient response should spend little time in the lower right and upper left, and move as quickly as possible from the upper right to the lower left quadrants. A preemptive response (or mitigation activity) would be indicated by an increase in input in the upper right quadrant with little rightward movement

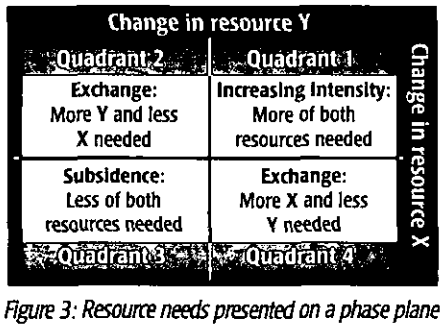

Figure 3: Resource needs presented on a phase plane

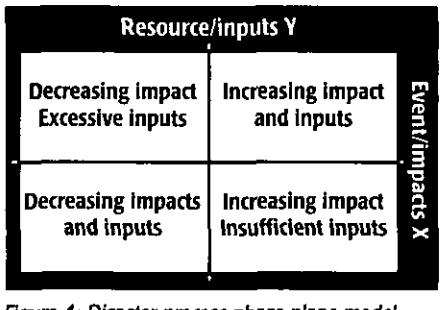

Figure 4: Disaster process phase plane model

along the impact axis, followed by a shift into the lower left quadrant as the threat of a event diminished. Movement to the left on the plane indicates a reduction in the level of activity related to the specific impact/input combination covered by the phase plane.

Going a step further, phase plane activities (i.e. the type of input in response to a specific type of event) can be organised according to the general stages used to describe a disaster process (see previous sub-section). The locations of the input/impact relationship on the phase planes in these groupings (left or right of the y axis) indicates whether an associated stage of a disaster is of increasing (moving right on the plane) or deceasing (moving to the left of the plane) importance. This in turn helps the disaster manager identity and define what progress is being made in dealing with the disaster.

Phase plans can be reorganised as needed to present the range of activities which are taking place at any time period in a disaster. In this way, the phase plane groupings enable a flexible definition of the stages of a disaster (Haas *et al.* 1977)

It is important to highlight that the centre point represents a static, but not necessarily a positive, situation. Just because there is no change does not mean there is no problem, only that it has not gotten worse (or better). Since disasters are characterised by constant change, this type of static situation is probably rare and only applicable to a limited number of phase planes (i.e. input/impact relationships) at any one time.

Turning the phase plane-based disaster process model into a practical tool for disaster managers is both simple and complex. The simplicity comes from the ease with which the plane-and-quadrant format presents the core challenge in dealing with a disaster: the provision of sufficient inputs to reduce impact.

The phase plane model does this without regard for questions of response stage, the nature of specific inputs or perceived severity of an event. This simplicity and versatility in handling many different aspects of a disaster has advantages in both developing consensus among professionals on the management of a disaster and in explaining the evolution of a disaster to non-professionals.

The complexity develops in trying to build the phase plane model into a stand-alone system useful to disaster managers in developing specific plans and decisions. While the phase plane approach can easily identify changes in disaster conditions, the real complexity exists in three areas:

- identifying all the relevant input/impact associations
- establishing a system for collecting, quantifying and presenting data
- defining the complex interactions of phase plane factors which exist in a disaster.

The current capacities of relational data base programs, as well as the possibility of managing phase planes through a geographic information system approach, suggest that the development of an operational disaster process model is less of a technical than a sweat-of-the-brow problem. The fundamental organisation of the model is simple. The challenge is to detail out the complexity of a disaster so it can be represented in the simple x/y parameters of the model.

Conclusion

Reducing the complexity of disasters is key to reducing their negative impacts on society. This paper provides a generic model for the disaster process which can help reduce the complexity of disaster and also handle the non-linear nature of disaster events. The model is more focused on practical disaster management needs than other disaster models. The strength of the model lies in an ability to help the disaster manager or researcher define and understanding the relationship between inputs and impacts starting from the comparison of two factors, rather than beginning with the imprecise disaster stage classification approach.

The immediate benefits of the disaster process model approach come from its simplicity and ability to indicate trends in the disaster response process. Using the model as a formal decision support tool requires developing a comprehensive data base of disaster impacts and input requirements, managed through a computer-based manipulation and analysis system. The challenge in developing this system is in defining and organising the disaster impact and input relationships. Management of the resulting data is feasible with available computer programs.

Moving from the simple phase plane approach of the basic model to a highly automated process may not be totally necessary. The basic model approach need be implemented only for those events/impacts and related resource/input requirements which are identified as being most critical to the success of the disaster management operation.

A minimalist approach to using the model can provide useful information without cumbersome, complex and time consuming procedures. This fits well with the basic intent to develop a model to make it easier to deal with the non-linear complexity at the core of a disaster.

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Shifts in emergency management service provision: a case for new innovative leadership

by Dr Robin Pagram
Perth, Western Australia

Introduction

Delivering services that will better meet the needs of communities has required shifts in emergency management service provision. Recent research has reinforced the importance of adopting a comprehensive approach to emergency management that goes beyond a simple focus on response considerations. Being concerned with 'risk and its management' has raised many important questions concerning: vulnerability, the development of partnerships and community participation in decision making processes. These changes have impact on the design, management and culture of emergency service organisations. Innovative leadership is needed to cope with such changes.

It is the aim of this article to show that intelligent organisational design coupled with innovative leadership is needed in dealing with changes in emergency management service provision. Developing a capacity for self-evaluation and self-learning is a very important means of assisting the development of inter-organisational cooperation and coordination. As an innovative leadership tool, it can be argued that a program of mentoring can provide an important means of developing shared understanding and commitment, thereby providing a powerful means of spanning organisational cultural barriers. Emergency service organisations can do much to create a climate of shared meaning and understanding both within their respective organisations as well as between relevant network members.

Responding to disaster

Developing collaborative models is important in responding to disaster. Hodgkinson and Stewart (1991) reinforce the necessity for an intelligent flexible and innovative mind-set and approach to disaster decision making:

> '...[disaster represents] challenges to the process of effective decision making. Organisations find themselves taking decisions which they have not anticipated, and many of the immediate decisions which are taken irrevocably shape the pattern of response for good or for ill. Organisations are forced to take crucial decisions in areas where they have little knowledge, and in the heat of the crisis when they themselves are undergoing extremely rapid organisational change (p.66).'

Quarantelli (1995) has further argued that since disasters, as a whole, differ significantly from everyday emergencies, to plan for and to manage them requires new or innovative as well as traditional behaviours. Identifying disaster pre-conditions that demonstrate the requirement for innovative thinking, Quarantelli highlights the important shift from rigid traditional command-control patterns towards improvisation and flexible new initiatives. In response to pressures for change, Australian emergency management is reinventing itself to deliver services that will better meet the needs of the community. Salter (1997) summarises (see *Table 1*) these apparent shifts in service provision.

Clearly, the issue set involves the notion of vulnerability, developing partnerships, and community participation in decision making. Australian emergency management should be aware of the likely inhibitors to effective coordination that could impact upon performance.

Inhibitors to effective coordination

In an unpublished doctoral thesis, Pagram (1997) tested the proposition: that the development of cooperative inter-organisational relationships among Australian emergency service organisations is critical for effective disaster management practice. A mailed questionnaire and follow up interviews were used as the investigative technique to develop an understanding of inter-organisational coordination between designated emergency service organisations in Queensland and New South Wales.

Questionnaire findings identified a number of inhibitors to effective coordination between emergency service organisations. The majority of respondents in Queensland and New South Wales from a list of twenty-six inhibitors to effective coordination, selected: Perceived threat and competition; different leadership approaches and authority; imperfect knowledge of the environment; and disparities in staff training.

Contrastingly, questionnaire findings identified a number of facilitators to effective coordination between emergency service organisations. The majority of respondents from a list of twenty facilitators to effective coordination, selected: Positive attitudes, informal contracts and exchange of information and resources, occupational diversity and group-centred approach to problems.

Developing an effective working relationship between participating organisations is thus an important consideration in achieving effective coordination and collaboration. Questionnaire respondents in Queensland and New South Wales were given the opportunity to identify organisations and evaluate the cooperation received with regard to carrying out counter-disaster management responsibilities. Of concern (see *Table 2*) is the large percentage of respondents in both States who indicated that cooperation was far from satisfactory.

From	*To*
Hazards	Vulnerability
Reactive	Proactive
Single agencies	Partnerships
Science driven	Multi-disciplinary
Response management	Risk management
Planning for communities	Planning with communities
Communicating to communities	Communicating with communities

Table 1: Shifts in Emergency Management Service Provision (Salter, 1997)

Overcoming inhibitors to effective coordination requires intelligent and sensitive organisational design that takes into account existing organisational structures and respective cultures of relevant network members.

Intelligent organisational design

Intelligent organisational design are criteria that utilise and combine the concept of delayering and team-based networks, alliances and partnerships. Pinchot and Pinchot (1993) provide examples (see *Table 3*) of intelligent organisational design criteria.

Bahrami (1992) considers that a key advantage of using team based networks is their intrinsic flexibility. Such networks can be formed, re-formed and disbanded with relative ease; they can bypass the traditional hierarchy; and their com-

	Very high %	High %	Neither high nor low %	Low %	Very low %	Total	N=
New South Wales							
State Emergency Service	25	25	25	25	0	100	4
Fire Services	17	50	33	0	0	100	6
Ambulance Service	0	100	0	0	0	100	3
Police Service	14	29	43	14	0	100	7
Health Service	0	0	0	100	0	100	1
Public Utilities	0	0	0	0	0	0	0
Local Govt Authority	33	33	34	0	0	100	3
Other	0	20	60	20	0	100	5
Queensland							
State Emergency Service	31	8	53	8	0	100	13
Fire Services	36	36	28	0	0	100	14
Ambulance Service	21	50	29	0	0	100	16
Police Service	0	36	55	9	0	100	11
Health Service	0	0	0	0	0	0	0
Public Utilities	50	50	0	0	0	100	2
Local Govt Authority	10	20	60	10	0	100	10
Other	40	0	40	20	0	100	22

Table 2: Evaluation of cooperation received across a group of select organisations (Pagram, 1997)

A capacity:

- to deal with more than one issue at once, such as caring for one another, customers, the town, and the community
- to face many competitors simultaneously and deal more effectively with all of them
- to implement whole-systems thinking without robbing units of local flexibility
- to better identify core issues and address them rapidly
- to determine from experience how to do new things, not just what not to do, and better remember what was learned
- to rapidly apply what was learned in one place to others
- to integrate learning across the organization and use it creatively and flexibly
- to attend to all the details and supporting competencies that add up to cost-effectiveness, superior performance.

Table 3: Intelligent Organisational Design Criteria — (Pinchot & Pinchot 1993)

position can evolve over time in order to blend skills and address changing priorities. Moreover, while bureaucracy is a system that achieves coordination by confining people so narrowly that there is no chance for most to use a broad range of talents (Pinchot and Pinchot, 1993), the intelligent organisation, by contrast, is designed to tap the intelligence and the variety of talents in every individual.

The building of strategic alliances and collaborative relationships is a fundamental part of pooling complementary, addressing rapid changes, reducing risk and providing strategic flexibility (Bahrami, 1992). The emergence of semi-permeable boundaries would take the form of access to partners' internal information systems through electronic mail networks; workers assigned to joint development projects become a temporary employee of a partner organisation for a limited period of time, thereby forging crucial relationships and gaining access to vital information about a partners culture and modus operandi (Bahrami, 1992).

The building of strategic alliances and collaborative relationships within and between emergency service organisations also requires innovative and sensitive leadership.

Intelligent leadership

Intelligent organisational design is inspired by innovative leadership. Innovative leadership orchestrates the vision, shared meaning and 'cultural glue' which creates the necessary synergies that ensures a unity of mission in responding to a disaster. To this end, Drabek (1990) has argued the need to maintain organisational integrity in disaster management by identifying the key personal attributes of what defines a successful disaster manager. *Table 4* outlines these attributes.

These key personal attributes defining the successful disaster manager reinforce the idea of developing a productive mind-set, where people who feel good about themselves, produce good results; people are assisted to reach their full potential; and the best minute spent is one invested in other people (Blanchard and Johnson, 1994). Quite clearly, the disaster manager who takes the time to set clear goals, praise and encourage workers and guide workers (and as necessary, reprimand) towards accomplishing goals will create mutual cooperation and understanding. To this end, as an innovative leadership tool, a program of mentoring has the capacity to strengthen and bond further the employer-employee relationship.

Mentoring

It has been argued, that mentoring:

> '... is a complex, interactive process occurring between individuals of differing levels of experience and expertise which incorporates interpersonal or psycho-social development, career and/or educational development, and socialisation (Carmin, 1988 cited in Bush *et al.* 1996).'

As a multi-faceted concept, mentoring incorporates the idea of personal support and more importantly, the notion of professional development leading to enhanced competence. Typically, an accomplished manager will identify in a new recruit natural apprehension and uncertainty with regard to their particular role and responsibilities, and actively seek to provide direction and encouragement. The manager is in a unique position to pass on practical insight derived from experience, as well as assist the new recruit to set realistic expectations and steer them in the right direction as far as career aspirations are concerned. Mentoring is made easier if the mentor views the mentee as a protege who must be appropriately nurtured. Moreover, mentoring can, and should be a mutually rewarding experience (Thomson, 1993 cited in Bush *et al.* 1996). That is to say, the mentor can also benefit from mentoring in terms of the opportunity given to reflect on and question their own subconscious practice, as well as share new ideas and information that newly appointed recruits bring to an organisation.

Effective mentoring programs produce benefits for the organisation as a whole. For example, in schools, teachers may develop collaborative models of working which enable them to share ideas and problems

Think through your philosophy
- ascertain agency mission
- establish credibility
- keep a long-term perspective.

Expand your knowledge base
- study the community
- obtain more training
- self-initiated education.

Be aware of your managerial style
- invite, don't order
- management is a social, not a technical job.

Nurture positive attitudes
- enthusiasm is contagious
- develop communication skills
- your work — not just a job (convey intense level of commitment).

Build community support
- establish personal linkages
- show how you can help others
- bring people together
- increase community support.

Participate in a professional group

Table 4: Key personal attributes defining a successful disaster manager (Drabek, 1990)

and enhance the collective competence of the staff:

> '...[Mentoring] proliferates organisational norms and culture, ensures hard-learned knowledge and skills are transferred to younger colleagues [and] improves the overall performance of the work group.' (Chong *et al.* 1989 cited in Bush *et al.*,1996.)

There is no reason why emergency service organisations cannot derive the same benefits and successes from developing similar collaborative models of working through effective mentoring programmes. This would constitute a very interesting future research topic because very little has been investigated in this area.

Conclusion

Delivering services that will better meet the needs of communities has required shifts in emergency management service provision. Recent research has reinforced the importance of adopting a comprehensive approach to emergency management that goes beyond a simple focus on response considerations. Being concerned with 'risk and its management' has raised many important questions concerning: vulnerability, the development of partnerships and community participation in decision making processes. These changes have impact on the design, management and culture of emergency service organisations. Innovative leadership is needed to cope with such changes. As an innovative leadership tool, it can be argued that a program of mentoring provides an important means of developing shared understanding and commitment, thereby providing a powerful means of spanning organisational cultural barriers.

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Refereed

Shore safety pamphlet

A Shore Safety pamphlet has been produced by the Australian Geological Survey Organisation (AGSO) in collaboration with Surf Life Saving Australia.

Accidents involving rock falls, cliff collapse and sand cave-ins around the Australian coastline have cost 11 lives and at least six injuries over the past four years. More than half of the victims were children. It is hoped that the pamphlet will reduce this tragic and avoidable loss of life.

The Shore Safety pamphlet is specifically targeted at children. It uses bright colours, colour photos, and a minimum of text to illustrate dangerous geological features including cliffs, caves, overhangs, unstable boulders and digging or tunnelling in sand.

It is available free of charge from the AGSO Sales Centre, GPO Box 378, Canberra ACT 2601, and Surf Life Saving Australia.

It is accessible on the Web at www.agso. gov.au (then click on 'Geohazards' or 'New'). For more information, contact Dr Marion Leiba at AGSO, tel +61 2 6249 9355, fax +61 2 6249 9986, or email: mleiba@agso.gov.au.

The Katherine-Daly flood disaster 1998

by Allan Skertchly and Kristen Skertchly
(SMILE – Success Management International Learning Enterprises)

The Katherine-Daly region (area 22,500km^2) is located approximately 300 kilometres south of Darwin, in Australia's Northern Territory. Katherine (pop. 10,809), the regional centre and hub for government services and industry, is located on the Stuart Highway, and is the only substantial township and service centre. There are several Aboriginal communities (e.g. Beswick, Barunga, Nauiui Nambiyu, Peppimenarti and Ngukurr), and a selection of agricultural and pastoral properties (Florina, Manbulloo, Willeroo, Dry River and Delamere). Nitmiluk (Katherine Gorge) National Park is a major tourist attraction.

Other settlements within the Katherine District are the RAAF Tindal Base (15 km south-east of Katherine), Nitmiluk–Katherine Gorge (28 km north-east), the Katherine–Edith Farms development (20 km west) and the Katherine Rural College (17 km north-west). The population of the entire flood-impacted Katherine-Daly region would be in excess of 12,000 people.

The general topography of the district comprises the rugged terrain of the Arnhemland escarpment and low-lying river flats or floodplains. Vegetation ranges from densely-wooded, inaccessible areas common to the escarpment, to sparsely vegetated grazing and agricultural land. The Katherine district is characterised by the number of rivers and creeks that feed into each other, draining the catchment during the wet season. *Figure 1* shows the Katherine River catchment and flood forecasting station sites. Some stations were not robust enough to cope with the flood. Similar remote telemetric river level gauge stations are located along the Daly River. Professional analysis of river level data takes place at Palmerston, near Darwin.

The main watercourses are the Katherine, Edith, Flora and King Rivers, all of which feed into the Daly and the Victoria Rivers, which flow south-west. Water within the catchment also contributes to smaller watercourses to the south-east of Katherine which eventually feed into the Roper River, which passes to the east of the district and ultimately into the Gulf of Carpentaria.

The region's climate is monsoonal, and therefore, experiences a distinct 'Wet' and 'Dry' season. The Wet season typically extends from November through to May. The average rainfall experienced throughout the District is approximately 950 mm per annum. Localised flooding is experienced within the Katherine District from monsoonal rains and decaying tropical depressions that pass over and delugethe Katherine River catchment.

Unique January 1998 Katherine features

There are a number of distinctive factors in Katherine that markedly influenced the flood response. Katherine is a regional centre whose functionality is vital to a number of smaller communities. It is a north-south and east-west electronic and transportation crossroads and node of critical commercial, government, military and community significance. For the effective functioning of the Darwin region (pop. 100,000) to the north, Mataranka in the south, Borroloola in the east and Kununurra in the west, Katherine's infrastructure and resources are essential.

Just 15km south of Katherine is RAAF Tindal, a major strategic airforce base. Tindal Creek, which crosses the Stuart Highway 10km south of Katherine, is susceptible to flooding and may thus cut off the base from the town, as happened in the 1998 flood. Normally, Katherine and its

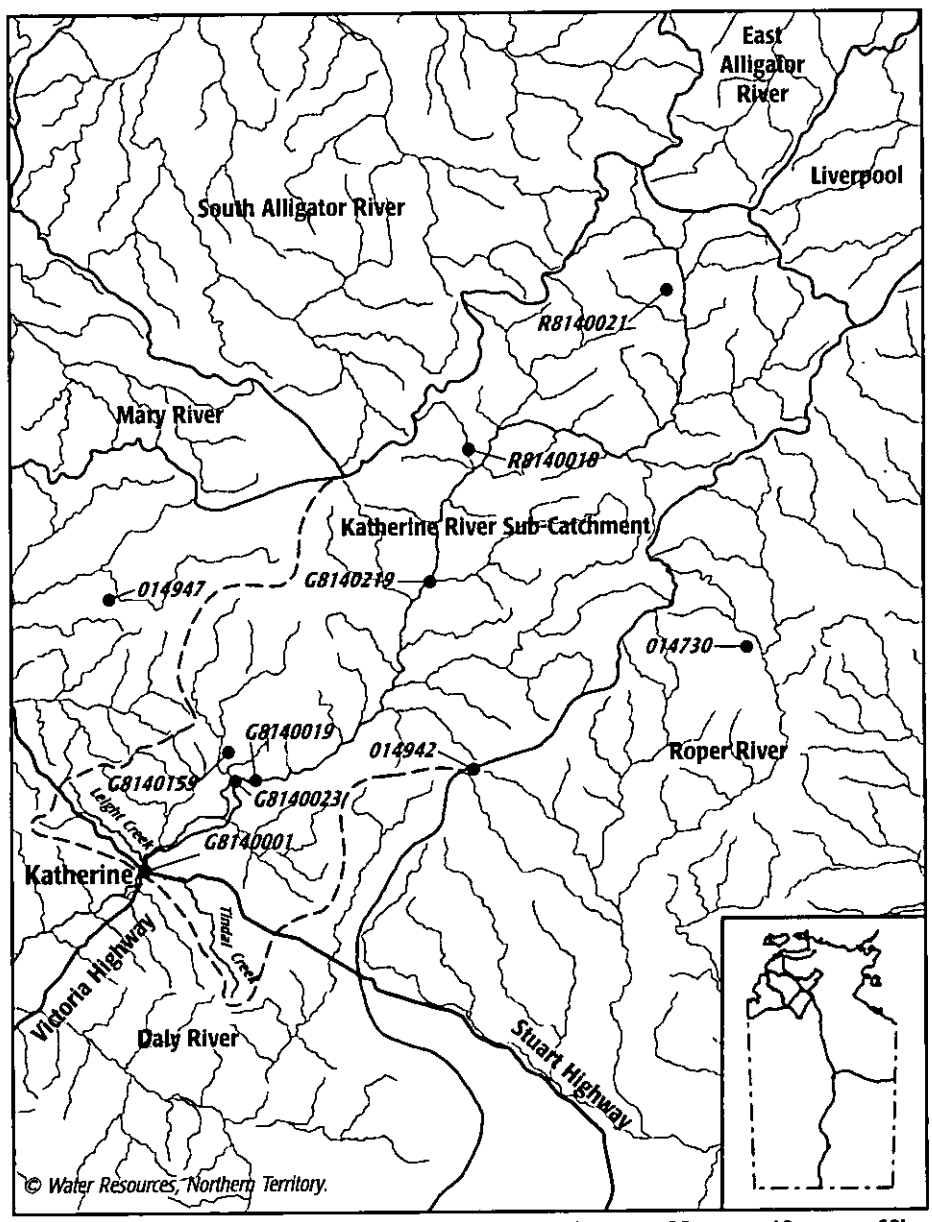

Figure 1: Katherine River catchment flood forecasting sites.

resources, services and amenities add invaluably to Tindal's capabilities. There is reciprocal synergistic support between each entity. Maintaining RAAF Tindal at the highest possible levels of operational efficiency, at optimal costs, depends on a robust Katherine. The quick offer of many of RAAF Tindal's human and other resources at the time of the 1998 flood was a major component of Katherine's immediately effective emergency management interventions.

The adventitious presence in Katherine of two outstanding RAAF CO's added their capabilities to those of an experienced Regional Police Chief and Emergency Services management team, joined early on by a top Darwin bureaucrat. This group was backed up by technocrats, and provided, *in situ*, a 'world-best practice' emergency management team.

Katherine also possessed, as their local member of the Northern Territory Parliament, the Honorable Mike Reed, Deputy Chief Minister, Minister for Police, Fire and Emergency Services and Treasurer. Minister Reed expedited ready access to powerful politicians, bureaucrats and the counter-disaster capabilities of both the Northern Territory and Australian Governments.

The disastrous 1998 flood

In January 1998, the Katherine-Daly River region experienced a devastating flood disaster of unprecedented proportions. Total disruption to life and property was experienced in urban, rural and isolated settlements within the region in the aftermath of tropical Cyclone Les (Bureau of Meteorology, 1998). Cyclone Les was one of the worst recorded rain-bearing depressions to impact the Northern Territory.

Extensive flooding of the Katherine and Daly Rivers during late January and early February 1998 occurred as a result of a record rainfall in the catchments in the 48 hour period up to 0900 CST on January 27. Cyclone Les developed in the central Gulf of Carpentaria on the morning of January 24 1998. As it moved across the Top End of the Northern Territory, Cyclone Les weakened from a Category 2 cyclone into a tropical low which produced between 300-400 mm of rainfall both, in the Katherine and upper Roper River catchments, and in Katherine itself, during January 25 and 26. *Figure 2* depicts the track of Cyclone Les (Bureau of Meteorology, 1998). *Table 1* depicts daily rainfall for a number of locations on 26 and 27 of January 1998.

The water level in the Katherine Basin commenced to rise on 25 January in the Katherine Gorge, and moved downstream to Katherine township by 27 January and

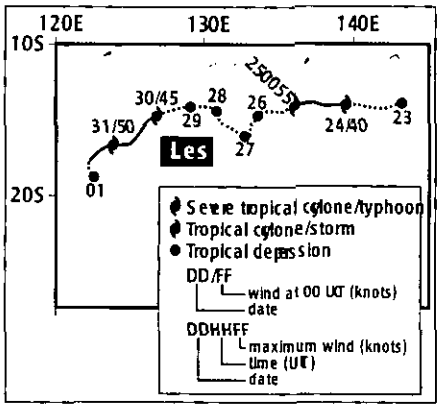

Figure 2: Operational track of Cyclone Les, Jan 1998

Station	26 January	27 January	2-day total
Katherine	221	153	374
Tindal	147	239	386
Sleisbeck	171	112	283
Eva Valley	149	282	431
Upper Ferguson	176	218	394

Table 1: Daily rainfall records Katherine and catchments.

subsequently onto the Daly River. The upper reaches of the Roper and Waterhouse Rivers were also substantially flooded, affecting the communities of Beswick, Mataranka and Ngukurr (Roper River).

The Katherine River continued to rise above its 'normal planning peak' flood level of 16.0 metres (recorded at the Katherine Railway Bridge) and remained high between 26 and 31 January. The Katherine River reached its maximum level of 20.4 metres at 1630 CST January 27, exceeding the previous 1957 maximum recorded level by 1.1 metres. On January 28, the Daly River rose above its 'normal planning peak' flood level of 11.5 metres at the Daly River Police Station, with runoff from further rainfall between January 27 and 30 in the Daly region contributing to the floodwaters. The Daly River reached its maximum level of 16.8 metres on 3 February. The water remained near this level until 6 February.

Figure 3 depicts rainfall and river levels during the 1998 flood. Notable is the rapidity of the rises in river levels.

The lowest curve (2) depicts the river level at the Katherine Gorge, which was used as an advance flood warning for Katherine. The premature 'false peak' on January 26, as the Katherine River at the Gorge temporarily fell a little, is clear. Curve (3) beginning at the lower left of the figure at 3.5 metres on January 25, and rising to 20.4 metres on January 27–28, depicts the river level at the Katherine Railway Bridge, the fiducial flood level benchmark. The river level at Katherine Gorge provided a 12 hour advance warning of potential flooding in Katherine. Recently installed gauges in the Gorge increase Katherine flood warnings to 24 hours. A more sophisticated warning system is currently being devised. The other curves (4,5) depict flood water level profiles around Katherine after the river banks were breached. The scales for these water level profiles differ.

As a result of the extensive flooding of the Katherine and Daly River Systems, and flooding in the Upper reaches of the Roper River and Waterhouse River, around 5000 residents in the Katherine–Daly region district (including Katherine township and the Mataranka, Daly River and Beswick communities) had to be evacuated. Important lifelines were severed—notably, the

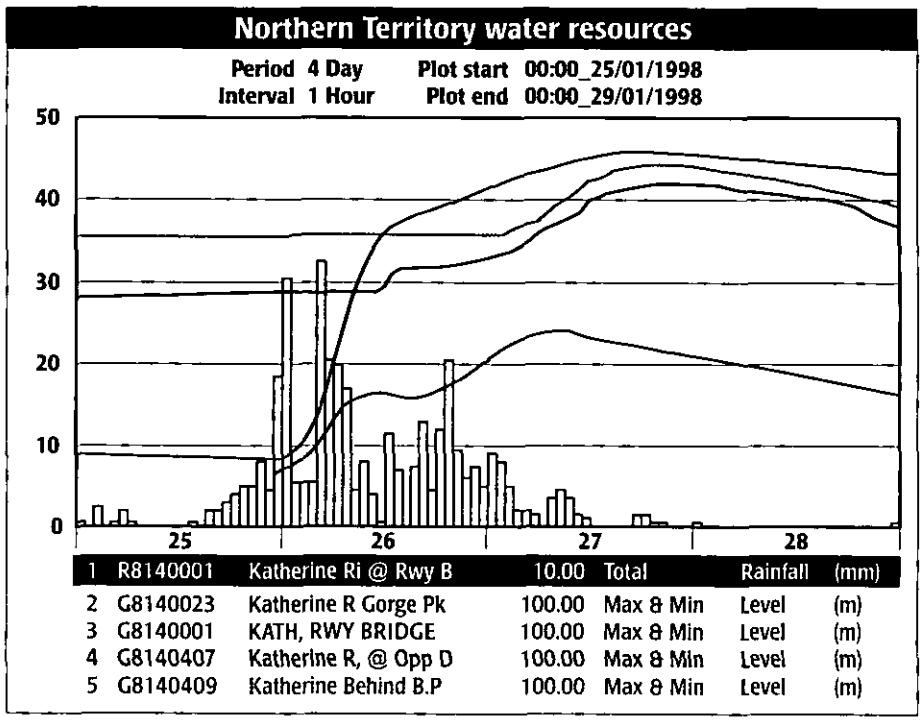

Figure 3: Katherine rainfall and river levels.

EMA UPDATE

Autumn 1999

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Australian Emergency Management Institute
Main Road, Mount Macedon, Victoria 3441

Edited by Rob Fleming

A new course at AEMI

Events overseas in the last few years has seen an increased interest by emergency service agencies in the deliberate use of chemical, biological and radiological (CBR) material against innocent civilians. The Sarin gas attack in the Tokyo subway in March 1995 finally confirmed our worst fears.

NSW is well on the way to developing a capability to respond to incidents of this type, not only for the Olympics, but also beyond. By the end of June 1999 over 150 personnel will have completed a four-day training program, providing them with the skills and knowledge to instruct others in their departments.

EMA has distributed training material to the States and Territories and intends to publish medical guidelines for CBR hazards later this year.

Commencing in this year, EMA will conduct two courses per year at the Australian Emergency Management Institute titled 'Consequence Management to Chemical Biological Radiological, Incendiary and Explosive (CBRIE) Emergencies'. The first course is planned for 20–24 September 1999. Vacancies will be primarily for Police, Fire and Ambulance/Paramedic, and Health personnel who could be involved in CBRIE incidents. Participants will come away with an instructional package so they can then pass on their knowledge.

Further information can be obtained from Don Patterson, tel: (02) 6266 5165 or e-mail: dpatterson@ema.gov.au.

Development of guidelines on Community Information Gathering

A writing group convened at the Australian Emergency Management Institute from 27–29 April 1999 to develop an Australian Emergency Manual — *Guidelines on Community Information Gathering*. The document will provide guidance to emergency managers on the use of various survey techniques to obtain information from the community which can be used to develop, enhance and evaluate programs tailored to community needs. The information gathered may include perceptions of risk, risk reduction practices, satisfaction with service delivery, and community expectations of services.

For further information contact David Winterburn, tel: 6266 5009 or e-mail: dwinterburn@ema.gov.au

Development of land use planning guidelines

Bob Graham from the University of Tasmania and Russell Blong from the Natural Hazards Research Centre at Macquarie University have been awarded a contract to develop an Australian Emergency Manual — *Land Use Planning for Natural Hazards* which will be one of the first in the series dedicated to disaster mitigation. The primary audience for the guidelines is local government land use planners and officials. The secondary audience includes State planning departments and State, regional and local emergency managers. The project aims to:

- document best practice examples of land use planning for natural hazard
- summarise land use planning policies and practices relevant to natural hazards in Australian communities
- provide guidance on how these can be effectively implemented.

For further information contact Jonathan Abrahams, tel: (02) 6266 5219 or e-mail: jabrahams@ema.gov.au

Tropical Cyclone VANCE

EMA played a lead role in coordinating Federal Government assistance to Tropical Cyclone VANCE which devastated Exmouth and caused severe damage to other Western Australian towns in March this year. EMA's National Emergency Management Centre was placed on full alert as the cyclone approached the Australian coast and in the four days following landfall, processed seven requests for assistance for the Western Australian Government.

The Australian Defence Force was called upon to undertake all tasks which consisted of the movement of relief stores (tarpaulins, plastic, sandbags, generators), vehicles, relief personnel and packaged water to Exmouth and the evacuation of personnel from Exmouth to Perth. Around 400 personnel including 250 evacuees and in excess of 128 tonnes of cargo were moved by the RAAF during the relief effort.

Further information can be obtained from Don Patterson, tel: (02) 6266 5165 or e-mail: dpatterson@ema.gov.au.

Year 2000

EMA is continuing to play a key role at the Federal level in planning to deal with Year 2000 service failures. EMA has recently reported to Federal Government on the adequacy of national emergency management arrangements to deal with multiple Year 2000 service failures.

To assist with the passage of information between responsible Ministers, States, Commonwealth agencies and key national utilities providers, EMA's National Emergency Management Coordination Centre will be established as a central information centre. Alternative means of communicating with the key players in the event of catastrophic telecommunications failures are being investigated. EMA's plan to deal with the situation will be published as a subplan to the Commonwealth Government Disaster Response Plan (COMDISPLAN).

EMA's overall plan for dealing with the Year 2000 issue is summarised in a Strategy document which is available from Rod McKinnon, tel: (02) 6266 5328 or e-mail: rmckinnon@ema.gov.au or Barry Stanton, tel (02) 6266 5505 or e-mail: bstanton@ema.gov.au

National urban search and rescue exercise

A national Urban Search and Rescue (USAR) tabletop exercise was held at the Australian Emergency Management Institute during the period 29–31 March 1999. The exercise was designed to investigate issues associated with the activation and deployment of USAR resources. It was attended by 27 national USAR practitioners from around Australia.

A number of issues requiring further development were identified. These included communications, containerisation of stores, deployment and sustainability of teams, development of the resource database and training standardisation.

Further information can be obtained from Trevor Haines, (02) 6266 5169 or e-mail: thaines@ema.gov.au

Impact 2010 Conference

In early March 1998, emergency managers from the United States Federal Emergency Management Agency, the New Zealand Ministry of Civil Defence and Emergency Management Australia met in Christchurch New Zealand to discuss the future direction of emergency management into the new millennium. A number of specialists from related disciplines from all three countries also participated.

Sessions covered the Philosophy of Emergency Management, Developing the Necessary Tools, and the Necessary Skills. This was the first time that such a meeting had been held and, due to the vigorous exchange of ideas and information that occurred, it was unanimously agreed that future meetings should be held.

A number of working parties were established to progress the meeting outcomes for discussion at the next meeting to be hosted by the USA in 2001.

For further information contact Jonathan Abrahams, tel: (02) 6266 5219 or e-mail: jabrahams@ema.gov.au

Inaugural meeting between EMA and the New Zealand Ministry of Civil Defence

Following the signing in May 1998 of an Arrangement between Emergency Management Australia and the New Zealand Ministry of Civil Defence for Cooperation in Emergency Management, an inaugural meeting between senior staff of the two agencies was held in Christchurch New Zealand on 11–12 March 1999.

With New Zealand currently undergoing significant change in its emergency management structure and arrangements, a wide range of topics was canvassed. These included disaster mitigation, lifelines, Year 2000, training, doctrine, information exchange and mutual aid. The key outcome was a commitment by both agencies to continue to work together to develop specific areas of cooperation under the umbrella of Arrangement.

For further information contact Rod McKinnon, tel: (02) 6266 5328 or e-mail: rmckinnon@ema.gov.au

Australia Day Medallion and Citation awarded to Phillip Stenchion

On 26 January 1999, Alan Hodges, Director General Emergency Management Australia, presented Phillip Stenchion with an Australia Day Medallion and citation in recognition of the excellent service he has provided as EMA's Overseas Emergency Management Officer.

The citation, in part, states that 'your initiative, commitment and dedication in assisting countries of the region to be better prepared to cope with disasters has brought great credit to you and Emergency Management Australia. Your contribution in Papua New Guinea to the management of the recent drought and tsunami disasters, at times in difficult circumstances, is particularly noteworthy'.

Communications in times of crisis

A working party of the National Communications and Information Systems Advisory Group was convened in March to discuss the communications issues facing the States and Territories during emergencies. The aim was to identify the issues and suggest a strategy to resolve them.

A wide range of issues were discussed including the impact of the deregulated telecommunications environment, the use of new technology, other communications resources such as local radio stations and the Wireless Institute Civil Emergency Network, the different approaches being adopted by each State and Territory and the possibility of standards for all forms of communications. A report is being prepared for consideration by the National Communications and Information Systems Advisory Group.

For further information contact Barry Stanton, tel: (02) 6266 5505 or e-mail: bstanton@ema.gov.au.

IDNDR input to AJEM/EMA update, Autumn 1999

Eleventh Session of the UN IDNDR Scientific and Technical Committee, Canberra

The Australian IDNDR Coordination Committee hosted the eleventh session of the international Scientific and Technical Committee (STC) of the United Nations International Decade for Natural Disaster Reduction (IDNDR) at the Department of Foreign Affairs Conference Centre, Canberra on 15–19 February 1999. The STC is an advisory body of 25 experts from various fields related to disaster management from around the world. Observers from the United Nations, Australian IDNDR Coordination Committee, various embassies and other government and non-government organisations attended open sessions of the meeting and a number of social functions.

The opening was held at Questacon, the National Science and Technology Centre, where Senator Abetz, Parliamentary Secretary to the Minister for Defence, represented the Minister in officially opening the meeting. Electronic copies of relevant papers including a list of IDNDR STC members, press releases, the Senator's speech, and the final declaration of the meeting are available on the EMA Homepage.

Changes to 1998/99 IDNDR projects since the last issue

Late in 1998, the Australian IDNDR Program provided funding of $10,000 to Queensland Department of Emergency Services towards the development and printing of a 48-page booklet, *Disability Preparedness Handbook for People with Special Needs*, for Queensland.

The following projects approved for funding will not proceed in FY 1998/99:

- Key Strategic Issues in Developing a Total Flood Warning Service for Remote Communities
- Development and Testing of Integrated Utility Lifeline Risk Model.

Australian Disaster Conference 1999: Disaster Prevention for the 21st Century (1–3 November 1999)

The response to the call for papers was very positive, with 118 abstracts submitted for consideration. While not all papers could be included due to programming time constraints, the conference program is filled with three days of interesting and challenging papers on risk assessment, raising awareness, reducing economic losses and social disruption, preparing for response and recovering from disaster. The conference program and registration form will be available in mid-May and early bird registrations are due by the end of July 1999. For more information, contact: Conference Logistics, PO Box 505, Curtin ACT 2605, Australia, on phone: +61 (0)2 6281 6624, fax: +61 (0)2 6285 1336 or e-mail: conference@conlog.com.au or visit the Conference site on the EMA Homepage.

World Disaster Reduction Campaign Theme 1999: Prevention Pays

The international IDNDR campaign theme for 1999 is: *Prevention Pays — Science and technology for disaster prevention saves lives and secures assets.* A 4-page brochure is available from the Australian IDNDR Secretariat. The focus is '... the evaluation of concrete results and achievements of disaster reduction in the 1990s and the design of a global culture of prevention for the 21st Century. The campaign is aimed at creating renewed support and encouragement to anticipate and mitigate the damages caused by natural hazards, in particular to reduce social and economic risks through the appropriate use of science, research and technology. The campaign also seeks to produce a forward-looking approach to fostering viable and sustainable development, in particular for the benefit of local communities at risk.'

Activities include:

- Sharing of disaster prevention experiences and cases at international, national or local level, some of which will be included in the campaign press kit and in a special commemorative volume to come out at the end of 1999.
- International photo contest on the campaign theme with a first prize of US$2,000. (Send entries illustrating disaster prevention and its significance (not just emergency or ongoing disaster photos) to the UN IDNDR Secretariat by 1 June 1999).
- World Disaster Reduction Day celebrations on 13 October 1999 when the UN awards the Sasakawa Award for 1999, announces prizes for the photo contest and holds a press conference and debate in Geneva.

IDNDR Education 2000

The new *Get Ready* — Picture Set is now available for sale. It comprises ten large full-colour discussion prints showing a range of emergency education situations. On the back of each print are suggested questions for primary and lower secondary level students, links to other prints in the set and to topics in the *Get Ready* — Emergency Awareness Teaching Program for Levels 1–4. It is packaged in a sturdy plastic folder with a copy of *Hazards, Disasters & Survival*. Promotional flyers have been sent to all primary schools in Australia. Order details are: $28.40 picture set only. $15.85 teaching program only. $40.00 for both. To order, include your name, school or organisation, address, phone, fax and purchase order numbers on a fax to West Education Centre (fax 03-9314 1075) or mail your details and a cheque to: West Education Centre, 38 Kingsville St, West Footscray VIC 3012, Australia. This resource was produced by West Education Centre with funding from the Australian IDNDR Program and the Fire and Emergency Services Branch, Victorian Department of Justice.

IDNDR sponsorship of Geography Action Week 1999

The Australian Geography Teachers Association (AGTA) has produced a 40-page booklet with IDNDR sponsorship. It is entitled *Are You Ready?*, with chapters focusing on risk management, landslide, tsunami and bushfire, and is being distributed to AGTA members around Australia by the respective State and Territory Geography Teacher Associations. Geography Action Week is celebrated at different times of the year depending on the particular State/Territory. Posters, booklets and other information published by the EMA Disaster Awareness Program

Donation of education resources to PNG high schools

The Australian IDNDR Program donated 150 copies each of *Hazard Wise* (Classroom Resource for Teachers on Natural Hazards and Disasters) and *Australia's Natural Hazard Educational Map Kits* to be included in a set of teaching resources on geological hazards being provided to all high schools in Papua New Guinea in March 1999. This is part of a cooperative AusAID-funded project between the Australian Geological Survey Organisation and the Rabaul Vulcanological Observatory.

Excellent Response for Australian Disaster Conference 1999

EMA has received an extensive list of abstracts from Australian and overseas disaster managers and researchers for possible inclusion in the *Australian Disaster Conference 1999.*

The conference, with the theme of *Disaster Prevention for the 21st Century*, will be held at the National Convention Centre in Canberra from 1–3 November.

Nominated abstracts include topics such as managing risk at local government level, insuring for risk, applying technology to risk assessment, assessing geohazard risk, reducing volcano risk–the New Zealand experience, reducing landslide and hail risk, reducing flood risk, reducing tropical cyclone impacts, involving the community in disaster reduction, reducing disasters through school curriculum, reducing disasters through community Awareness and education and preparing for response–the emergency management view.

The plenary sessions, led by Australian and international speakers, will focus on the international perspective, information management, active community involvement, national mitigation strategies and future directions, and disaster management priorities.

To receive a copy of the *Australian Disaster Conference 1999* registration brochure, contact: Conference Logistics, PO Box 505, Curtin ACT 2605, Australia, tel: +61 (0)2 6281 6624, fax: +61 (0)2 6285 1336, e-mail: conference@conlog.com.au, or visit the conference website: www.ema.gov.au/conference.htm

Publication news

New and revised publications now available from EMA

- **Bushfire Action Guides** (1/3 A4 magnetic cards)

  The last of the hazard action guides to be revised and 'facelifted'. It gives practical advice on what to do before, during and after bushfires. (Copies available from EMA and through State/Territory rural/bushfire services.)

- **Floods: Warning, Preparedness and Safety** (A5 fold-out colour pamphlet)

  This joint EMA/Bureau of Meteorology publication has been revised and features new photographs and updated information on the dangers of floods. It also covers the warning system and information on preparedness and safety precautions. (Copies available through all State/Territory Emergency Services in Qld, NT, WA and northern NSW.)

- **Australian Emergency Manual Series: Part III — Emergency Management Practice**

  Volume 1
  Manual 1: *Emergency Catering*

  Volume 2
  Manual 1: *Evacuation Planning*

  Volume 3
  Guide 3: *Managing the Floodplain*
  Guide 4: *Flood Preparedness*
  Guide 5: *Flood Warning*
  Guide 6: *Flood Response*

(Copies are available through your State/Territory emergency management organisation secretariats.)

EMA addresses for publication orders (first check above for appropriate EMA Office or State/Territory authority):

EMA, PO Box 1020, Dickson, ACT 2602, Australia
Australian Institute of Emergency Management Main Rd MT MACEDON VIC 3441 Australia.

What's on at AEMI

Safe Cyclone-prone Tourist Destinations Workshop

2–6 August 1999

The aim of this workshop is to facilitate the promotion of safe tourist destinations throughout Northern Australia. In addition it will provide the opportunity and the platform for key industry professionals and policy advisers to interact and utilize current research findings to discuss and develop guidelines and recommendations on which a national policy can be based.

Stuart (both north and south of Katherine), Victoria (west) and Arnhem (east) Highways were impassable, power and water supplies, communications and community functions were severely disrupted and there were three known deaths by drowning.

Immediate impacts and responses

There were a number of key bodies involved in managing the flood and its aftermath. The following report is a view from the overseeing body, the Counter Disaster Council, followed by some general impressions from the field in Katherine. Equally traumatic stories from other essential utilities and service bodies are not included.

View from Counter Disaster Council

After careful consideration of the weather charts and field reports on 23 January the Emergency Operations Centre of Northern Territory Police, Fire and Emergency Services, Berrimah, was raised to a high state of readiness. The emergency responses to flooding in Beswick and the rising Katherine River levels, were well in hand by the morning of Monday 27 January, a day on which the CDC met, and continued meeting until February 19. Traumatic flood and inundation situations progressively unfolded. The essence of the flood is captured (Bates, 1998) by the CDC thus:

Monday 26 January 1998

CDC were briefed that flood levels were predicted to reach 18.9–19.0 metres at Katherine and the bridge had been closed as a precautionary measure. The Stuart Highway was cut both north and south of Katherine and roadblocks established to prevent other than legitimate travellers to proceed. Evacuations had begun early on Monday morning 26 January 1998. Support was being provided by Police, Fire and Emergency Service personnel and volunteers and arrangements for further support were underway. Katherine Hospital had been evacuated, an accident and emergency centre established within the Katherine Police Station, and major power installations had been sandbagged. CDC were advised that the community of Beswick was under threat and the Daly River region could expect significant flooding in a week or so. The community may have to be evacuated. Main damage could be expected to Katherine CBD and damage to sewage treatment works expected. Military assistance will continue to be provided. Health and evacuation requirements were discussed. CDC decided that in the event that a declaration of a State of Emergency may become appropriate relevant documentation was to be prepared for the Minister's signature.

Tuesday 27 January 1998

The Minister for Police, Fire and Emergency Services, The Hon Mike Reed MLA, signed a declaration of a State of Emergency at 6 a.m. Briefings were provided on rainfall to date and the forecast. At 9 a.m. the Katherine River level was reported at 19.74 metres and rising 10 cm hourly, with an expected peak at 20 metres. The Daly River will be affected in 7-10 days. The previous Katherine flood level has been broken and Council was briefed on water flow and height, the extent of the flooding and subsequent isolation of Katherine by road. Council was also briefed on evacuations, the status of medical, sewage, welfare, water, food, fuel, power, and communications issues. Status reports on Beswick indicated that 350 people were isolated and would require supplies and may require evacuation. There did not appear to be any problems at Barunga or Timber Creek at this stage.

CDC members were again provided with an out-of-session Situation Reports on the Katherine flooding, which included the deployment of a RAAF Hercules aircraft with equipment to depart at 6 p.m. and floods updates on food and equipment supplies, power and communications, radio transmissions, sewerage, evacuation centres, health supplies, road conditions, road blocks and stranded motorists, the status of the Daly River community, and weather forecasts. Minister Reed had requested that Mr Fuller be on the ground in Katherine on the morning of 28th January as the senior public servant to coordinate damage assessment and related processes.

Thursday 29 January 1998

Chairman Bates briefed Council on his visit to Katherine with the Chief Minister and Brigadier Roberts. The minutes recorded previous briefings by the Chairman and the recommendation of Council to Government which resulted in a State of Disaster being declared at 4 p.m. Wednesday 28 January 1998. The assistance of the RAAF was acknowledged and Group Captain Benjamin offered the services of additional personnel and aircraft. The remaining briefings covered food drops and evacuations; flooding and the weather situation in the Katherine and Daly River areas; reports on Barunga, Beswick Wooliana; and a flood update on Tropical Cyclone Les.

A briefing on Departmental reports including government services re-opening in Katherine was provided; the establishment of an insurance hotline; damage to some primary industries; and health, media and communications, road and public building damage, and power and sewage systems. Commander Burke, police and Emergency Service Regional Commander, Katherine, and Mr Col Fuller (top NTG bureaucrat) to be tasked to undertake a survey of available accommodation and advise the CDC. Police roadblocks to remain in place and the CDC recommended a press release and radio bulletins to educate would-be travellers to Katherine. The Prime Ministers visit to Katherine on following day was discussed.

Monday 2 February 1998

CDC briefed that Katherine is moving from an emergency to a reconstruction stage; and police are accounting for all residents. CDC were advised the Reconstruction Office team, headed by Mr Fuller had been established in Katherine.It was further briefed on clean up procedures, the restoration of power, sewage, the Katherine Hospital and other government, commercial and banking services; water levels and flow for Katherine the Daly Rivers; and access to the Daly River area. CDC was also advised the Emergency Operations Centre has been downgraded to operating during daylight hours only and that approximately 4000 calls had been received on the public information lines.

CDC were also briefed on public information and media arrangements, Daly River flood clean-up problems and concerns by residents in relation to flood relief; evacuation arrangements for Daly River residents; and discussions with Daly River people on a location for the township. Discussion also took place around easing the focus on Katherine and moving to the Daly River region. The Administrator of the Northern Territory, Dr Neil Conn, to visit Katherine Tuesday 3 February.

Wednesday 4 February 1998

A reconstruction officer is to be appointed for the Douglas–Daly region. Executive Officer to provide advice to the ADF as to when support can cease with cleanup and cooking resources. CDC recommended to Government that the State of Disaster for Katherine be extended until 4 p.m. Sunday 8 February 1998, and also recommended a separate instrument to extend the State of Disaster for the Douglas–Daly region for 14 days, ceasing 4 p.m. Wednesday 18 February 1998.

Thursday 19 February 1998

The Chairman opened the meeting and welcomed Brigadier Alan Hodges, Director General of Emergency Management Australia. He advised that he had been kept fully informed of events as they progressed. Superintendent Van Heythuysen, who

coordinated the volunteer response, and Superintendent Gary Smith, who coordinated the response at Daly River, presented briefings and written situation reports. Further reports were received from the Department of the Chief Minister, that Katherine had returned to normal operations, and Transport and Works, that with the departure of Mr Fuller, a Transport and Works team to be located in Katherine to assess damage and reconstruction costs. Territory Health Services CDC recommended the cessation of the State of Disaster for the Douglas–Daly region from 4 p.m. Saturday 21 February 1998. Executive Council to meet 20 February. Lt Col. Douch, ADF, advised that the ADF were currently reviewing operations and post-activity analysis following the flood. He suggested that all emergency services be given an opportunity to familiarise themselves with ADF capabilities and resources.

The Chairman, Commissioner Bates, advised Council that Council should undertake a debriefing process. A special final meeting is to be held once the State of Disaster has ceased. Chairman thanked CDC members for their work in relation to formal meetings and informal meetings when business of Council was dealt with by phone. He noted that most business premises in the main street were flooded to a depth of over two meters with damage running into many tens of millions of dollars. A number of surrounding settlements were also severely flooded as far north as Adelaide River, 200 km from Katherine, and also those well to the east (Beswick) and west (Daly River). The Stuart Highway was impassable in a number of places, cutting off the vital land transport link to and from Darwin and the south. The torrential rains had continued westward towards Western Australia causing further extensive local flooding.

Council formally recorded thanks to agencies, groups and individuals involved in Katherine–Daly floods. The most-able Executive Officer of the Counter Disaster Council, Iain Rae, remarked that 'this was the most complex operation in which he had ever been engaged'.

The small group of full time Northern Territory Emergency Service staffers, directed by Mike Bowman, performed in an exemplary manner. Emergency Service personnel know-how and capabilities, and those of the Northern Territory Police and Fire divisions, were functionally outstanding. A notable feature of the operation was the extraordinary *ad hoc* capacity to handle such a unique, complex, and fast-changing, traumatic flood disaster, extending over a remote area of around 50,000 km^2.

View from Katherine

Upon a request for assistance with immediate evacuation from the Katherine hospital, RAAF Base Tindal had responded immediately with manpower and helicopter transportation. This was the first time that CO RAAF Tindal became aware of the level of flood-proneness at his base. Very soon after the complete hospital evacuation, many other key RAAF resources were being utilised to ameliorate the progressively desperate similar situations in which many other people wholly unexpectedly found themselves. Homes and businesses by the hundreds were being inundated and normal modes of communication, movement and life were rapidly curtailed. Simultaneously, Police Fire and Emergency Service workers, politicians, public and civic servants, volunteers and members of the public, undertook heroic emergency management duties in the service of many communities. Regional police HQ at Katherine, under Regional Commander, Maurie Burke, accommodated feverish activity. Sergeant Ron Millar and Constable John Bowen, 'camp overnight in an Aboriginal community under a tarpaulin between two cars with camp dogs crawling in from the rain for company' (Munday, 1998).

Within the township of Katherine, when the extent of the floods became apparent, the Deputy Chief Minister and Police, Fire and Emergency Services Minister, Mike Reed, who a little later declared a 'State of Emergency', said he was satisfied all resources had been made available. He said manpower had been sent in from Darwin to help local emergency workers, Government employees and RAAF Tindal defence personnel. 'The immediate need is to make sure people themselves are safe and after that to attend to people's property. Morale in the town is good and people were co-operating with police and emergency services' (Northern Territory News 27–30 Jan. 1998). Northern Territory Chief Minister, Shane Stone, Prime Minister of Australia, John Howard, Defence Minister, Ian McLachlan and Australian Defence Forces Chief, General John Baker, all visited the town for on-the-spot assessments.

Initially the magnitude of the flood kept increasing by the hour and the traumatic turn of events was experienced individually in so many ways. At one stage, when the water level appeared to plateau, a 'false peak' level of near 16 metres was communicated. This indication was spurious and hopes of an early easing of the flood were dashed. The Katherine River level increased rapidly to an unanticipated 4.04 metres (1.1 metres above the supposed record flood level of 1957) with, consequently, water up to several metres deep in the main street and central business district.

On January 28, 1998, upon the recommendation of the Chief Minister of the Northern Territory, Shane Stone, a 'State of Disaster' was declared by the Administrator Dr Conn, for Katherine and surrounding flood affected areas, the Northern Territory Police, Fire and Emergency Services assumed state of disaster powers and continued, with direct participation from Northern Territory Government personnel, Royal Australian Air Force (RAAF) officers and other ADF personnel, and citizens generally, an expeditious evacuation of over 5000 people whose homes had been flooded.

The extent of the flooding around Katherine town centre is shown in *Figure 4*. The darkest shading indicates the extent of the flood beyond normal 1-in-100 planning levels. Some 1170 flats and houses, 500 businesses and every government office and business in the CBD was inundated. Around 5000 people, half of Katherine's population, were evacuated.

As the flood receded, communication links were being re-established; public buildings and business premises, which were initially abortively sand-bagged, were cleaned; and the community made as safe and secure as possible. Medical centres were progressively staffed, and essential supplies and food were distributed, with some 10,000 meals being supplied twice daily at the height of the disaster. A comprehensive audit of the emergency situation and precautionary planning and actions to restore the *status quo* to Katherine and other, already, or prospectively, seriously water-affected and water-damaged places, was undertaken. Relief measures were swift and effective. Both the Army and the Royal Australian Navy were ultimately involved in the cleanup procedures.

Throughout the immediate emergency responses and well into the recovery stage those concerned with managing and reconstructing the physical fabric and vital systems of the towns and settlements did a fine job (Munday, 1998). All essential services and utilities were kept operating to the maximum capabilities available. The following services and utilities are recognised as handling their difficulties with distinction: Police, Fire and Emergency Services, Telstra, PAWA, Medical and Health, Transport and Works and other core government agencies (DTW, 1998). The Northern Territory Government responded with alacrity requesting or commissioning many studies (e.g. Kinhill, 1998). Private organisations and corporations and volunteers all played further recovery roles (Skertchly, 1998).

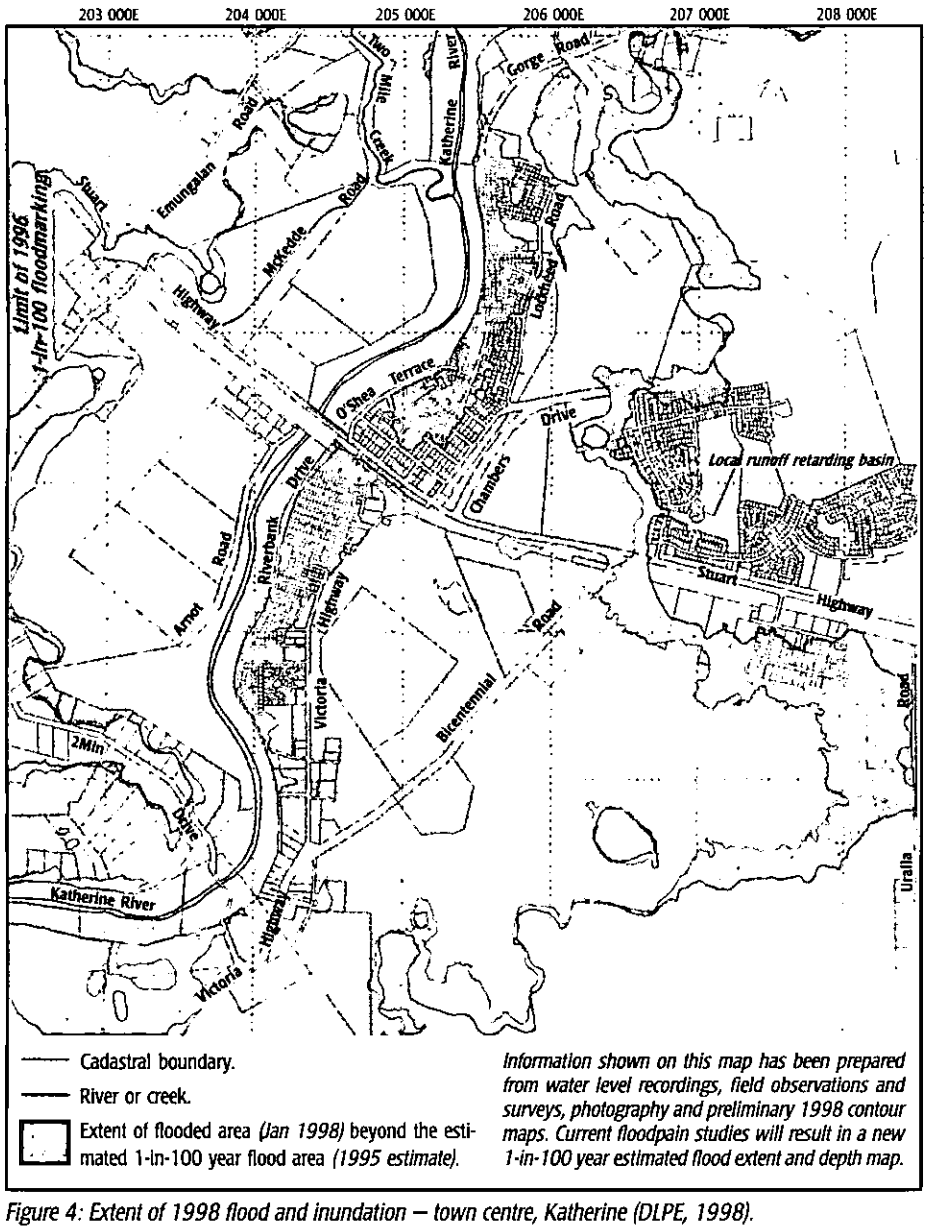

Figure 4: Extent of 1998 flood and inundation – town centre, Katherine (DLPE, 1998).

Many people took on responsibilities well beyond their normal fields when others were simply not available. Largely through high technical skills, sometimes aided by a little good fortune, those responsible for such effective, highly collaborative, contingency crisis management of a largely unexpected situation deserve the highest commendations. All those centrally concerned coped very well. Much of the credit for this lies in the high quality of the multi-faceted, multi-skilled and highly experienced, human power available *in situ* and the resources that they could access or utilise, or acquire. Many people released and exploited dormant talents.

Eva Cox's statement 'When we have a natural disaster we remember we are a community' (Cox, 1997) was substantiated by the behaviour of the majority of Katherine-Daly residents faced with the flood. Businessman Lee Hunt's statement published in the Age newspaper sums up the general feeling of the Katherine residents:

> 'You actually felt pretty good, you know. All these blokes I'd known since I'd lived in this town, off we'd go looking for people. The guys coming into the boats weren't victims and we weren't heroes. It brought everyone back to the same level'.

The sense of camaraderie amongst residents was generally high during the flood experience within the Katherine–Daly region.

State of flood awareness

To an overwhelming extent inhabitants, including emergency management personnel, were completely caught by surprise by the severity of the 1998 flood. Notably, it substantially exceeded the 1-in-100 year flooding event and subsequently damage and inundation due to the flood impact was, as we have seen, unexpected and considerable. The 1998 Katherine Flood has been estimated as between a 1-in-200 and a 1-in-500 year event (Kinhill, 1998).

However, awareness by some professional and other persons of the potential of the Katherine River to extremely severe flooding is indicated by the documentation of several earlier investigations into the possibility of beyond 1-in-100 flooding and the impact such events (on a variety of scales) could have on the township of Katherine.

Katherine has been seriously and adversely inundated at least six times in the past 100 years (and much higher than these levels prior to 1788). The highest recorded level, prior to the 1998 event, occurred in 1957 where the Katherine River reached a level of 19.25 metres. Subsequently, models of flood contours emerged from research since this time (KRCDPC, 1997).

In response to a request from the Northern Territory Town Planning Board in 1969, the Water Resources Section of the Mines and Water Resources Branch (NT) conducted an investigation into flooding of the Katherine River and its potential impact upon the township. The report, released in 1970, was confined to areas over which contours were available. In addition to the ten year and twenty year flood return periods which were examined, investigation also focussed on the potential for more extensive flooding in rarer events and the effects that such events may have on flooding in the area (MWRB, 1970).

Notably, the study concluded that a severe flood (of the order of 500,000 cubic feet per second corresponding to a level of RL 360 at the bridge), as a rare event, could be expected. It was predicted that a flood of this magnitude would be 'above the 1957 flood level for about three days and well above it for two' (MWRB, 1970). These investigations, and others, had a significant degree of foresight, but did not raise much interest outside an elite group of technocrats. The 1995 land-use report (DLP, 1995) continued to use average recurrence interval (ARI) 1-in-100 floodlines.

Further, there is now available scientific data confirming much higher Katherine region flood levels (by metres) than those experienced in the aftermath of Cyclone Les have occurred outside the modern river level data observation period (Nott, 1998).

The immediate emergency response for the Katherine-Daly Region 1998 flood was an outstanding success. Overwhelmingly, the immediate response's effectiveness was close to 100%. Economic, cost-beneficial efficiency would be significantly less. With refined planning, improved flood warning, better deployment of rescue resources, a more aware citizenry and enhanced flood mitigation in place, the total adverse financial and other impacts of a flood of similar magnitude could perhaps be halved. Immediately after the flood an urgent hydrological appraisel was commissioned (Kinhill, 1998) and this lead to a substantial

project of geomorphological modelling of Katherine River and its catchments. This, and a number of other much-needed initiatives, will hopefully contribute to better Katherine-Daly flood preparedness and remediation in the future.

If the 'Precautionary Principle' had been clearly manifested in planning and government administration of human settlements in the Northern Territory, the question as to whether the 1998 Katherine-Daly Flood was 'The flood we had to have?' (Collins, 1998) would probably never have arisen.

Social issues and concerns

People living in isolated and remote settlements generally display high levels of self-reliance. The Katherine District is a good case in point. Although very largely reliant upon government utilities and resources for ultimate survival, often the directives from authority figures as to actions to be taken are not taken kindly by local inhabitants. When these impersonal power figures even suggest, let alone direct you to leave your home, a high level of command 'insubordination' is in evidence in the civilian population. The natural resistance to such radical change, coupled with sheer disbelief as to the severity of the pending flood threat resulted in the first 'door-knock', advising people to prepare for evacuation, to be all but ignored. Until the water was seen to be visibly rising into houses and direct evidence conveyed the actual seriousness of the situation, many people did not take the evacuation advice seriously. This resulted in many unnecessary losses of household goods, vehicles, and artefacts etc, and slower, more dangerous and more expensive, boat and airborne rescues. The people of Katherine and Daly River Regions have much to be grateful for, due to the fact of the many rescuers who were available, able and willing to help, and who had access to the resources necessary to affect so many successful rescues and evacuations. The ultimate need, in the face of clear danger, to secure their own safety and survival provided the motivation for most, (with the exception of three people), to, ultimately, respond positively directives.

Great variability exists in Aboriginal communities with regard to effective day-to-day administration. When a community lacks cohesion, or ignores the advice of expert others, this seriously and adversely affects its capacity to respond and cope efficiently when exposed to potentially damaging natural hazard risks. In the case of the flooding of Beswick community, the total responsibility for safeguarding and evacuating the community rested on the shoulders of the OIC Maranboy, who coped with all the many demands placed upon him in an outstanding manner. At the time of the flood the Beswick community on its own could not have coped. A Beswick adviser, upon returning to the community on 29 January acted 'inept and devious'. Waipiri people reacted at a late stage and they had to walk out of the community in waist deep rising waters.

At least one community, Ngukurr (Roper River), anticipated and coped with the worst of the floods on their own. This community, under the highly commendable leadership of their local Police and Emergency OIC brought in extra supplies at an early stage and were therefore relatively self-sufficient. Other communities, such as Daly River, which are also well administered, were simply overwhelmed by the magnitude of the flood, and had to be totally air-evacuated to Batchelor using official external emergency transportation. The Daly River community was dislocated for a month before they could return, but apart from some social tensions during confinement at Batchelor, coped well.

For many persons, the impacts and losses experienced in such events as the Katherine Region Flood 1998 will have lasting personal repercussions. Research confirms that up to 15% of populations so impacted may be affected adversely for longer than a year, some for life. Once the immediate reconstruction phase is over, it is important not to forget that hundreds of people may require sustained advice and counselling to help with their post-flood lives. Providing such support in the diverse, scattered and remote communities of the Katherine District over many years to come is a challenge to the providers.

The central role of volunteers in Australian emergencies is well known and highly regarded. In the Katherine–Daly floods, many volunteers again performed beyond normal expectations. Apart from official organisational volunteers, there were thousands of individuals. The fatigue and motivation of such hard-pressed volunteers is another important issue (Skertchly, 1998). We need to examine the roles, resources, and recognition and rewards, that should be accorded to such quintessential people working in vital emergency management domains, and ensure they may optimally used and always esteemed.

Future research

There are many future possibilities for research and development. This outline of the circumstances of the Katherine-Daly flood confirms on-going areas worthy of early research attention as indicated below, highlights flood research possibilities:

- hazard warnings and human responses for culturally diverse communities
- far-out hazard incidence modeling beyond 1-in-100 year: EVT-extreme value theory
- applications of military command and response systems in civil emergencies
- modern emergency mobile and fixed command centres
- optimal civilian-military co-operation
- life-line vulnerabilities
- selection and training of emergency management leaders
- Emergency management in remote communities
- robust broad-band data communications under extreme environmental conditions
- robust narrow-band message AM short wave or homing pigeons under EEC
- maintaining the motivation and viability of the emergency volunteer force
- appropriate forms of remedial aid and reconstruction
- costs and benefits for attainable flood mitigation measures
- action-effective contingency emergency management.

Some recommendations

The flood stimulated a number of new initiatives by many key people, groups and organisations. Flood studies were undertaken (Kinhill,1998). New flood level gauges, more advanced flood warning, telemetry and town sirens systems, are now in place. The 1998 flood levels are incorporated in new maps of Katherine. New land-use policies and practices have been promulgated for Katherine township. A comprehensive contemporary hydrological and geomorphological study of the Katherine water catchment area has been commissioned, and the Katherine Region Counter Disaster Plan has been updated (NTES, 1998). The ADF has instituted a natural hazard mitigation plan for RAAF Tindal. And there are more such initiatives completed or initiated. But there remains much to do still, particularly in flood preparedness and hazard mitigation in the smaller communities and amongst the widely dispersed remote people. The Emergency Management Australia commissioned 1998 Katherine–Daly Region Flood Study included the following recommendations:

- Australian Government needs to assess vulnerability to natural hazards of all strategic military installations and their 'life-lines'.
- The Northern Territory Government needs to accommodate better, through precautionary thinking and acts, realistic natural hazard risks ... *(cont. page 50)*

Observations on the Tsunami disaster in Papua New Guinea

by Phil Stenchion,
Overseas Emergency Management Officer,
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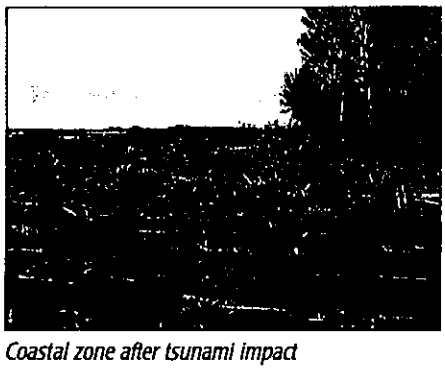
Introduction

In July 1998, people in the Aitape region on the north coast of Papua New Guinea suffered a disaster which captured the world's attention. A large tsunami impacted on a vulnerable population, and the results were tragic to say the least. The disaster has been fairly well documented in the media, and the scientific analyses on the event are still going on. The PNG Government was swift in requesting assistance from Australia. As the Overseas Emergency Management Officer for EMA, I was tasked to assist the PNG National Disaster and Emergency Services (NDES) in managing the response, and I was in Port Moresby from 20 July to 1 August. This article provides some personal thoughts on the operational response from a disaster management perspective. These thoughts are based on observations of events and in some cases my own interpretation of what transpired.

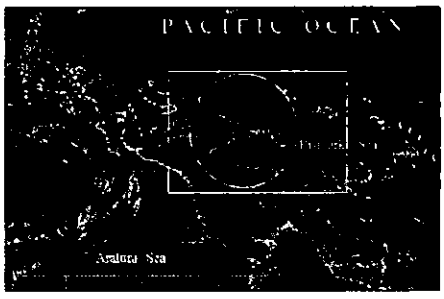
AusAID/EMA involvement

Emergency Management Australia (EMA) has acted since 1984 as an agent for AusAID (formerly AIDAB) in coordinating Australian physical assistance to an overseas disaster. EMA maintains AUSASSIST



Coastal zone after tsunami impact

Plan for this purpose. When AusAID decides to respond to an official request from the government of an affected country, EMA sources suitable materials, tasks appropriate agencies (e.g. ADF), provides technical advice to AusAID and coordinates the response under AusAID overall direction. Sometimes this involves sending a disaster operations officer to the affected country to assist our diplomatic mission to liaise with the affected country's disaster management system. In this particular case I was sent both in that role and to assist NDES.



Tsunami zone

Some background

Papua New Guinea is a country of about 463,000 km^2, with a population of more than 4 million. The mainland is dominated by a rugged spinal mountain range rising to 4,300 metres, where much of the population lives. Elsewhere the population is concentrated in the most fertile areas. No area is completely uninhabited.

Culturally and linguistically, the population is extremely diverse as a result of isolated development in steep highland valleys and dispersal through many islands. Nearly 700 languages, one quarter of all known languages, are spoken in Papua New Guinea. There are three official languages, English, Motu, and Pidgin. Pidgin was developed in colonial times but now has a formal grammar and dictionary.

Sandaun Province

Sandaun Province (formerly West Sepik) is the north-western province of Papua New Guinea. Its western boundary is the border with the West Irian province of Indonesia. Sandaun is a large province with an area of 36,300 km^2 and a population of 139,917 at the 1990 census. Most observers currently add 10–15% to these figures for 1998.

Communications in Sandaun are limited. Vanimo is the provincial capital and it has road links to Jyapura in Indonesia but not to the rest of the province. The secondary centre of Aitape, close to where the tsunami impacted, has more extensive road links to the rest of the province, though the roads are rough, and also into East Sepik Province and its capital Wewak. Air transport is the only convenient means of transport between the centres.

Sandaun Province has only a single hospital in Vanimo, but there are a number of health centres, including a large Catholic health centre at Aitape. These have inpatient accommodation. They are supported by a network of health sub-centres and aid posts. In recent years there has been a decline in the availability of health services due to a shortage of funding for salaries and other recurrent costs. In fact, the day of the tsunami impact was the last scheduled day for the Aitape centre before closure. Wewak, in East Sepik Province, has a larger hospital, which provides more specialised services.

Local area

The area of the tsunami impact had a population of somewhere around 13,000, with around 9000 in the affected villages. Most of these people engage in subsistence farming or fishing with limited income generation from local marketing of surpluses. There are copra and cocoa plantations in the area, and some timber harvested for sale.

The coastline in the affected area consists of low beaches 3 to 4 metres high and up to 100 metres wide, protecting extensive inland lagoons and waterways. The palm

Village damage

groves behind the beaches are popular village sites. The Sissano lagoon forms narrow strips of land between the lagoon and the ocean, and it was on these narrow strips that most of the directly affected people lived. Prior to the formation of the lagoon from seismic events in 1907 (as a small lagoon) and again in 1935 (increased to its present size), the Warapu people lived in the area of the lagoon after migrating from West Irian last century. The formation of the lagoon forced the Warapu, who suffered a significant number of fatalities, onto the beach areas.

Only mature coconut trees were left standing

The event

At approximately 1930 hours local time Friday 17 July 1998 two earthquakes occurred within a short time of each other. Neither seems to have been of sufficient magnitude to have generated a tsunami (at least a 7.8 is required), and some scientists are convinced that a submarine landslip, resulting from the earthquakes, generated the tsunami. There is still some conjecture over the epicentre, with an on-shore location being favoured in some quarters. Approximately 10 minutes after the earthquake (though reports vary from 5–25 minutes) the first of the 7–10 metre tsunami waves impacted.

The tsunami impacted along 50 km of the coast west of Aitape, with the worst affected area being a 25 km strip from Sissano to Malol. The first indication of the arrival of the waves was a loud roar after which the sea appears to have withdrawn. The waves then came through the villages at high speed sweeping people, houses and possessions inland, into the Sissano lagoon and other waterways. The tsunamis appear to have penetrated up to 1 km inland with an average penetration of 0.5 km. The penetration was deeper in lagoon areas. The water receded quickly, and the main impact area presented a picture of almost total destruction, being stripped of all habitation structures, and all vegetation except casuarina pines and surviving mature coconut trees.

Stories from survivors tell of the sea being 'on fire' and 'burning their skin'. Observers believe the 'fire' to be phosphorescence, and the 'burning' probably due to skin being abraded by the coral grit and sand churned up in the waves.

Casualty figures were constantly adjusted throughout response operations as information was confirmed or otherwise, and indicate more then 2200 dead, 668 with major injuries requiring attention from regional and visiting medical teams, and many more with minor injuries treated at aid posts. There may be several hundred still unaccounted for. There are still bodies in the lagoons and inland debris areas, but the difficulties of finding and retrieving them, their condition, and the presence of crocodiles led to the search and rescue operation being abandoned on 23 July.

A number of villages, around 16 depending on the definition of 'village', were completely destroyed. Others were partially destroyed and isolated housing damage was experienced even to the east of Aitape. Some of the villages contained up to eight small settlement areas, known locally as hamlets. The tsunami destroyed three schools, a health sub-centre, a health aid post, a number of mission buildings and churches, as well as the government administration centre at Sissano. Two bridges on the road between Aitape and Malol were severely damaged. Although some food gardens were located around houses, the majority were inland and little affected. Coastal vegetation inundated by the tsunami is dying, although still-standing coconut trees and casuarina pines should survive. The casuarina trees stood up well to the scouring effects of the water and in some cases their roots are now exposed some feet above the new surface levels.

Secondary damage was confined to salt water contamination of wells in some surviving villages and coliform contamination of coastal lagoons and waterways. Copra production was affected to some degree by destruction of coconut trees. Fishing income was somewhat affected by local concerns about contamination of local fish and the restrictions on access to Sissano lagoon area.

Response management issues

Standing disaster management responsibilities

Overall responsibility for disaster management in PNG rests with the National Executive Council (NEC). It exercises this responsibility through the National Disaster Committee (NDC), which is established under disaster legislation. The NDC is responsible for disaster relief coordination through the National Disaster Centre (used for operations coordination). The National Disasters and Emergency Services (NDES) implements disaster management activities on behalf of the NDC, acts as its Secretariat, and operates the National Disaster Centre. Each Province is supposed to have a Disaster Committee (PDC). Each PDC is responsible under the disaster legislation for relief operations within the Province.

At the time of the tsunami, disaster management in PNG was not well developed or coordinated, and this was recognised by the government during the 1997–98 drought. A National Disaster Management Plan had been produced in 1987, but it had not been reviewed since then, was not up-to-date with changes in government departments or policies related to provincial reforms, and in any case its existence was little known. Most provinces had only recently formed working disaster committees at provincial level because of the severe drought. Only a handful of people in PNG had received any sort of disaster management training, and very little of that was concerned with managing emergency response. Such response plans as existed were generally out-of-date, did not reflect reality, were not well known, generally untested, and were not supported by operational procedures.

Warning and activation

The tsunami impacted on Friday evening, the start of a four-day holiday weekend. Notification of the impact did not reach outside of the affected area for some hours, due mainly to a lack of communications hardware in the affected area, but also due partly to a lack of constant 24 hour monitoring of what communications systems do exist. Nevertheless, some local military, some local police and other people with some emergency supplies were at the scene by daylight the following morning to assist in search and rescue.

At NDES, first notification was received at around 8.00 a.m. on Saturday 18 July 98, in the form of a facsimile from Sandaun Province. Senior officials in NDES and the Department of Provincial Affairs received various telephone calls from Sandaun Province as the morning went on and the word spread quickly after that. NDES was staffed with sufficient people by mid-

A number of villages were completely destroyed

afternoon. This is despite the fact that at that time there was no established duty officer and call-out system for NDES staff, nor any organised method of emergency after-hours activation of national resources within line departments.

I understand that prior to this disaster, the PNG Observatory had no special interest in the seismic nature of the area affected by the tsunami, or at least no more interest than any other area. The Observatory is capable of detecting seismic events

of the type involved and determining a location, but has no after-hours alert system linked with disaster organisations that could trigger emergency activities.

The time between the earthquake and the tsunami impacting on shore is not certain, and survivors indicate periods between five and thirty minutes. Best indications are that this time was somewhere around 10–15 minutes. There is no community warning system in place for such events in PNG. Given the geography of the area, the likely time between the earthquake and the tsunami impact, and the reported size of the first wave, some ten plus metres, I doubt that even a sophisticated warning system would have made much difference to the eventual tsunami effects.

There was no public education and awareness program related to such risks. People in this particular area were not well sensitised to tsunamis, as indicated by the location of the destroyed villages. The noise associated with the approach of this tsunami prompted some people to run towards the shore out of curiosity. Even had they run away from shore as soon as they felt the earthquake, there is a limit to how far they could have reached in the time available. With the local geography, perhaps immediate action of that kind would not have made much difference.

Tremors affected the area for some time after the tsunami. Liaison between the Observatory, the Australian Geological Survey Organisation, and AusAID resulted in an approved and funded short-term project to place monitoring instruments in the disaster area on 31 July 98. This would have provided some warning had more tsunamis followed.

Effective information management

Information from the affected area to NDES was patchy throughout the first two weeks after the impact. Apart from communications hardware problems, there were no information management plans or procedures at NDES. Staff at NDES were not sure what information should be sought, nor what should be done with any information that was received. There were no disaster management-trained people in the affected area to provide organised information, and no set reporting systems from district to province to NDES.

Various organisations in the area provided some initial reports, but these often contradicted each other and few people had a complete picture of the whole problem in the first few days. Most notably, the catholic church network in the area provided much of the initial information. When the Prime Minister and other senior officials went to the area on Sunday 19 July, they reported back with a series of one-off requests for relief supplies. The district administration at Aitape started providing some information from Monday 20 July.

With no organised disaster management training at any level prior to this disaster, comprehensive and appropriate information coming to NDES from the area was not really expected. NDES therefore briefed and dispatched officers to Vanimo, Aitape and Wewak around Tuesday 21 July, and these officers from then on provided reasonably regular reports to NDES. These officers were quite dependent on the control and coordination mechanism established at Aitape to furnish information, but that mechanism tended to operate independently and did not really link with NDES.

Typical coastline near Aitape

NDES, under guidance from advisers, collated and analysed what information it obtained, and was able to present a reasonable picture of the situation every day to senior officers and the NDC should it be required. Unfortunately, despite repeated recommendations by advisers, it failed to produce situation reports to a wider audience such as other provinces and the media. Consequently, provinces launched massive appeals for assistance to Aitape, much of which was not necessary and created management problems in Port Moresby and at Aitape, and the media sought their own information.

Fully-functioning EOCs

Some weeks prior to the tsunami, the responsible Minister had placed all NDES officers, except the Director, under suspension for administrative reasons. Around the same time, NDES moved to a new location. When the tsunami impacted, there were two permanent staff in NDES, some desks, some whiteboards, two computers, two radios, two telephones, a few seconded staff from Provincial and Local Government Affairs, and two advisers. The seconded staff and advisers were there as part of the drought relief operation and were performing secretariat functions for the drought working group.

These individuals performed extremely well under the circumstances of non-existent training, no operational procedures, and a four-day weekend. Despite these circumstances, they were able to commence sending relief supplies to the area by Sunday. By Wednesday some 200 tonnes had been sent.

Ideally, key sectors and agencies, especially line departments, should have liaison officers with knowledge and authority operating from the EOC. This did not occur at NDES despite repeated requests, and affected NDES operations considerably.

An EOC was established at Aitape, run initially by the District Coordinator, and later by the appointed Assistant Controller. Once again, the people there were untrained in managing response operations. This EOC did not work to the EOC in NDES but rather to police headquarters, and the information exchange with NDES was sporadic. A serious problem at Aitape was the requirement to brief a very large number of 'visitors', detracting from operations. A specific briefing centre would have allowed the Assistant Controller to concentrate on operations.

Control–Coordination–Authority

Officially, initial control was vested in the NDC under the Disaster Management Act. NDES was expected to manage the situation, as with previous disasters, with some strategic guidance from the NDC. The Prime Minister made an early visit to the affected area and took with him the Chair of the NDC and the Director of NDES. While there he 'declared' a national emergency under the Constitution and 'appointed' the NDC Chair as Controller.

A declaration of national emergency relates also to civil disturbance situations and there is no separate disaster declaration available to government. This meant that provincial administration and authority was virtually set aside for the duration of the declaration (through to October). This contradicted the hierarchy for disaster responsibility in the Disaster Act and reflected in the national disaster plan. Ironically, the lack of knowledge throughout all agencies of the plan reduced the potential effect this situation had on initial response, though it did not help in recovery management. Because of the emergency control system run by police officers, recovery issues were not addressed in any detail until two months after the tsunami. A recovery management system is now in place involving the District, the Province and the NDC, but there are some interests who are attempting to change it. The District Recovery Committee is currently

embroiled in actions to ensure all monies are allocated under its control.

The legal requirement is that the National Executive Council (NEC) makes emergency declarations and appointments. This would normally be based on advice from the NDC. In this case the Prime Ministers unilateral actions were subsequently ratified by the NEC, with the appointment of Controller changed to be the Police Commissioner. According to reports, the Police Commissioner was chosen because of the need for a disciplined and organised body to be involved in controlling the situation.

This appointment however, created problems. The Controller operated from police headquarters and did not visit NDES during the emergency response. He made a series of emergency orders related to managing the situation, but sought little input from NDES or the NDC in formulating these orders. NDES had to be proactive in obtaining copies of these orders despite the presence of a police liaison officer. The appointed Assistant Controller at Aitape was also a police officer. Whilst he did an effective job, he was untrained in disaster management and tended to treat the problem as a police operation rather than a disaster requiring coordination across a range of sectors. The original appointment of the NDC Chair would have avoided some of these problems.

Damage and needs assessment

With no serious disaster management development in PNG for many years, a progressive and meaningful needs assessment was not possible. Reports received in Port Moresby were 'shotgun' approaches from a variety of sources and it was difficult to get a coherent and accurate picture. Different groups took different approaches and in the end there were a number of uncoordinated needs assessments done by various sectors, often at the same time. None were standardised. The UNDAC system commenced a definitive needs assessment seven days after the event, and this concentrated mainly on recovery needs.

Relief supplies sent from Port Moresby to the area over the first four days were either in response to specific one-off requests from what were perceived to be reliable agencies, or were a 'best guess'. These supplies seemed to have met the immediate and obvious needs, as no requests were received after the first four days for other than resupplies of medical consumables.

Effective decision-making

Effective decision making in response relies on clear lines of authority and effective information management. Neither of these was prominent in the tsunami response. Information management was 'ad hoc', and division of responsibility between the NDC and the appointed Controller was never very clear. As most decisions were made on-site by the Assistant Controller, the lack of coordination with NDES affected the efficiency of the operation.

Despite these problems, decisions were generally made well and in a timely fashion for the urgent response issues. Recovery issues took much longer to decide and even today some issues are unclear.

Resource management

The first relief flight from Port Moresby went to Vanimo late Sunday morning, carrying a variety of relief supplies sourced in Port Moresby, using an ADF C130 in PNG for training flights. Sourcing of supplies on a holiday weekend with no organised emergency system to do so was problematic, yet successful in the main. Resource management in Port Moresby was generally handled quite well, with the exception of medical issues. The lack of an early definitive needs assessment by PNG health officials, and the lack of a health liaison officer at NDES, added to the what problems existed. Fortunately, the presence of specialist military assistance and personnel from Australia and New Zealand meant that these problems were not allowed to affect the medical response effort greatly. Certainly it is correct to say that many lives were saved because of the international medical assistance.

A serious problem involved management of resources in the affected area. Getting relief supplies to the area was relatively easy due to the presence of military and civilian aircraft. These were delivered to Vanimo or Wewak, and smaller quantities were able to be taken directly to Aitape. The problem then was to get them to the affected people in the remoter areas. There were a limited number of helicopters to move a large quantity of supplies, the numbers of victims in different areas was vague for some time, needs were unclear, those managing the relief effort were untrained, and storage capacity at Vanimo and Wewak was limited. There were reports of some supplies sitting in places and not being delivered because appropriate authorities were unaware of them. Yet there were other reports of excellent resource management. Given the large area involved, the large quantities of supplies, and the lack of systemised response, these contradictions were expected.

Media cooperation

Once again, the lack of trained personnel operating to a tested plan meant that media issues became a problem. There was any number of officials making media statements, some contradictory. There were non-government people making all sorts of statements, which did not enhance relationships with government. There were a large number of media people from all over the world all wanting to be in the area.

International and national assistance

The amount of relief assistance offered was quite unprecedented and created management problems, which still exist today.

Official relief assistance offered from other governments alone was more than sufficient to meet immediate and long-term needs in the affected area. However, substantial assistance was also offered from a staggering number of non-government relief agencies, businesses, and individuals in PNG and from all over the world. These offers created an enormous work load for NDES staff who had to record offers, attempt to match them to needs, and arrange for the supplies to get to the area. Many sources sent supplies unannounced either directly to the area or to Port Moresby. A visit to the affected people today would show that they are better off than they were before, and certainly better off than the 'non-affected' in the same area, in terms of food, clothing, tools etc.

The assistance provided from other governments was more organised than from other sources as it was provided under normal bilateral mechanisms. Australia and New Zealand played major roles in providing aircraft for transport of relief supplies as well as the major medical response, as did France. These countries coordinated their assistance under the FRANZ agreement. AusAID also funded some NGO activities, and funded technical assistance to NDES.

Community and recovery aspects

The immediate reaction of people washed out of their villages was to seek dry land. All accounts say that Friday night was horrific with individuals trying to find each other in the mangroves, and hundreds severely injured.

Families looking for relatives conducted the immediate first night search and rescue. The next day church groups, police and military joined in. I am unaware of just how well it was organised, but there are no trained search and rescue teams in the area. There is no doubt that whatever could have been done, by untrained and unorganised people, was done with maximum effort.

Survivors made their way, some taking days, to the nearest known villages inland. Here they were cared for by the residents until more organised *(... cont. on page 58)*

Gender and earthquake preparedness

A research study of gender issues in disaster management: differences in earthquake preparedness due to traditional stereotyping or cognitive appraisal of threat?

Abstract

Despite the fact that males and females appear to differ in their hazard preparedness and mitigation attitudes and behaviours, emergency managers typically have not focused their efforts on this area. Psychological explanations of differences in gender preparations have traditionally revolved around gender stereotyping. PrE theory suggests that differing attitudes and behaviors result from differences in appraisal of resources relative to threat. The present study was conducted to investigate masculine and feminine differences in earthquake preparedness and to explore reasons for these differences.

Results suggest that males and females may engage in different types of earthquake preparedness and mitigation activities, and that these differences may be the result of the way that males and females cognitively appraise the threat of an earthquake, an explanation that would be consistent with PrE theory.

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Disaster preparedness and mitigation is a topic of much concern, especially in earthquake-prone areas such as California (e.g. Bourque, Shoaf, & Russell, 1995; Duval & Mulilis, in press; Mulilis & Duval, 1995a, 1995b, 1995c, 1996, 1997; Russell, Goltz, & Bourque, 1995). Furthermore, this same body of literature reveals that males and females appear to differ in their efforts along these lines. Examples of such differences include (1) that due to the structure of many societies, females may be more at risk in a general way to the consequences of hazards and disasters than males (e.g. Morrow, 1995a; Valdes, 1995), (2) both formal and informal personal post-disaster community response services are more likely to be performed by females than males (e.g. Morrow, 1995a; Neal & Phillips, 1990; Reskin & Padavic, 1994; Valdes, 1995), (3) males tend to be more active in early post-disaster recovery efforts, while females tend to be more active in later post-disaster recovery efforts (Morrow, 1995a), and (4) the family unit which has specific gender-related functions in the preparedness, mitigation, response, and recovery aspects of the disaster cycle (e.g. Abel & Nelson, 1990; Drabek, 1986; Finch & Groves, 1983; Fitzpatrick & Mileti, 1991; Fogelman & Parenton, 1956; Hill & Hanson, 1962; Nigg & Perry, 1988; Perry, 1987; Quarantelli, 1960; Shelton, 1992).

The above behavioral differences between males and females seem to point to the existence of a gendered dimension in disaster-related activities. Such a dimension would be consistent with the findings of Morrow (1995b) who notes that women are generally involved in more mitigation and preparedness activities than men, particularly for activities centered inside the house. Furthermore, mitigation and preparedness activities that men do perform, usually revolve around behaviors related to the outside of the residence (e.g. structural reinforcement of walls).

Sociotropic[1] versus egocentric perspective

A possible reason for these gender differences may be due to psychological differences that exist between males and females. For example, the gender literature in the field of psychology reveals that, in general, females tend to adopt a more sociotropic or connectedness focus compared to the more egocentric or autonomous perspective of males (Baumeister & Sommer, 1997; Brown & Gilligan, 1990; Carlson, Cooper, & Hsu, 1990; Chodorow, 1978, 1989; Cooper & Carlson, 1991; Cooper & Grotevant, 1989; Cross & Madson, 1997a, 1997b; Gilligan, 1982, 1990, 1991; Gilligan, Brown, & Rogers, 1990; Grotevant & Cooper, 1985; Martin & Ruble, 1997).

According to this perspective, differences in disaster-related activities might be behaviorally expressed differently in males and females, with females tending to be concerned more with gender stereotypical activities that focus on the perspective of others and males tending to be concerned more with gender stereotypical activities that focus on their own perspective.

Division of labor perspective

Another possible reason for gender differences in disaster-related preparedness activities may be due more to a difference in the socialized roles of males and females rather than differences in the personality structures of males and females. Such an approach has been used to suggest that a division of labor between genders has emerged over time due to a combination of biological and social factors. A review of the appropriate psychology literature indicates that traditional gender-stereotype attitudes and ideologies are linked to sex-typing in the division of labor between men and women both in the work force and at home (e.g., Atkinson & Huston, 1984; Baruch & Barnett, 1981; Eagly, 1987; Hochschild, 1989; Johnson, Huston, Gaines, & Levinger, 1992; Kibria, Barnett, Baruch, Marshall, & Pleck, 1990; Kroska, 1997).

Cognitive appraisal perspective

Still another possible reason for gender differences in hazard-related preparedness activities may arise from differences in the way that males and females cognitively appraise the threat of the hazard (i.e. think about the consequences of the threat), or from beliefs about household resources available to combat such a threat. Such an explanation for gender related preparedness differences is based in Lazarus' (Lazarus, 1966, 1991; Lazarus & Folkman, 1984) cognitive appraisal theory of coping (see below), and as such, would be consistent with PrE theory (Duval & Mulilis, in press; Mulilis & Duval, 1995a, 1995b, 1995c, 1996, 1997, 1998) and the research of Lindell (Lindell & Perry, 1997; Lindell & Whitney, 1998).

According to Lindell and Perry's (1997) review of 25 years of research regarding the adoption of actions that reduce personal injury and damage in the event of an earthquake, there are four different classes of factors that affect the extent to which households and individuals engage in preparedness activities. Lindell and Perry (1997) refer to these factors as 'household characteristics' (i.e., demographics such as gender, age, education, etc.), 'direct hazard

experience' (e.g. damage and injuries sustained in previous hazards), 'household resources' (e.g. knowledge, skills, finances, as well as appraisals of a number of beliefs about preparedness activities), and 'perceptions of the hazard' (e.g. judgements or appraisals about the personal impact of the hazard). Furthermore, the effect of these factors on both preparedness activities as well as intentions to engage in such activities has been recently documented by Duval, Mulilis, and Lalwani (1998). Thus, according to this research, differences in preparedness activities between genders could arise from any one of these four factors. Furthermore, recent research by Lindell and Whitney (1998) indicating that females tend to appraise the risk of a major earthquake as greater than males would be consistent with this approach as would the growing body of disaster literature (e.g. Bord & O'Conner, 1990; Cutter, Tiefenbacher, & Solecki, 1992; Flynn, Slovic, & Mertz, 1994; Fothergill, 1996; Howe, 1990; Leik, Leik, Ekker, & Gifford, 1982; Turner, Nigg, & Paz, 1986) that indicates females tend to appraise disasters as more threatening, more serious, and more riskier than males for a variety of natural and man-made hazards (e.g. earthquakes, tornados, volcanoes, nuclear power issues, chemical pollutant issues, etc.).

The effects of gender differences in preparedness arising from differences in hazard appraisal and/or appraisals of beliefs about hazard resources are also consistent with PrE (person-relative-to-event) theory (Duval & Mulilis, 1998; Mulilis & Duval, 1995a, 1995b, 1995c, 1996, 1997, 1998). PrE theory is based in Lazarus' coping theory (Lazarus, 1966, 1991; Lazarus & Folkman, 1984) which proposes that coping efforts to deal with a harmful event such as an earthquake are based in two processes. On one hand, a person seeks to determine the seriousness of the threatening event, while on the other hand they simultaneously appraise their personal resources available to deal with the event.

Applying this approach to negative threat appeals, PrE theory maintains that behaviours such as changes in earthquake preparedness are a function of a person's appraised personal resources (i.e. the 'person') *relative to* their appraisal of the threatening event (i.e. the 'event'). As such, PrE theory maintains that behavioral change (e.g. as related to preparedness and mitigation activities) is not so much a function of either person variables (i.e. variables similar to Lindell & Perry's, 1997, 'household resources') or event variables (i.e. variables similar to Lindell & Perry's, 1997, 'perception of the hazard'), but rather due to appraisals of person variables *relative to* event variables. That is, PrE theory holds that such behaviors will or will not be engaged in based on the appraised value of person *relative to* event variables.

Extending the above research to the present topic, PrE theory would predict that observed gender differences in earthquake preparedness behavior would be accompanied by differences in the relative values of levels of appraised hazard resources (i.e. person variables) and levels of appraisals of the threat of the hazard in question (i.e. event variables). Mathematically, relative differences in these levels could only occur from either differences in levels of appraisals of preparedness resources or from differences in levels of appraisals of the threat of the event. Thus, as with the research of Lindell (Lindell & Perry, 1997; Lindell & Whitney, 1998), PrE theory would also predict that differences in the appraisal of a threatening hazard and/or differences in appraisals of beliefs about hazard resources between genders could also lead to differences in the behavioral preparedness activities of males and females.

In summary then, and in light of the recent emphasis on determining precisely why males and females differ in disaster-related preparedness activities (e.g., Scanlon, 1997), the present study was conducted to investigate the existence of differences in levels of masculine and feminine earthquake preparedness activities, hypothesising that (1) females would tend to exhibit higher levels of preparedness on disaster-related activities that reflect a more traditional feminine gender-stereotypic focus, and that (2) males would tend to exhibit higher levels of preparedness on disaster-related activities that reflect a more traditional masculine gender-stereotypic focus. Furthermore, based on both PrE theory (Duval & Mulilis, 1998; Mulilis & Duval, 1995a, 1995b, 1995c, 1996, 1997, 1998) and the research of Lindell (Lindell & Perry, 1997; Lindell & Whitney, 1998), it was also hypothesized that males and females would differ in either their appraised levels of the threat of an earthquake or in appraised levels of their beliefs about their preparedness resources.

Study 1 Method

Participants

Participants consisted of 2833 University of Southern California undergraduate students (1314 males and 1519 females) who took part in this research to earn extra course credit.

Procedure

As a matter of routine, earthquake preparedness and psychosocial data were obtained from participant populations on a semi-annual basis during the years 1986 to 1992 (i.e. each semester). The size of these 12 groups ranged from 151 to 443 participants per group, leading to 2833 undergraduates participating in this study over the six year period. It may be noted that this data set has not been previously analyzed in the hypothesized manner.

The earthquake preparedness data were collected using the MLEPS (i.e. the Mulilis-Lippa-Preparedness-Scale—Mulilis, Duval & Lippa, 1990; Mulilis & Lippa, 1985, 1990), which is a 27-item multi-act earthquake preparedness scale to which participants are asked to indicate if they have or do each of the 27 preparedness items *(see Tables 1 and 5 for examples of items)*. This scale has been shown to have reasonably good psychometric properties (e.g. validity, internal consistency, internal reliabilities and test-retest reliability — see Mulilis, Duval, & Lippa, 1990), and has been used in a number of investigations (e.g. Duval & Mulilis, 1995, in press; Duval, Mulilis & Lalwani, 1995, 1998; Mulilis, Boyde & Dewhirst, 1996; Mulilis & Dewhirst, 1997; Mulilis & Duval, 1990a, 1990b, 1991a, 1991b, 1993, 1995a, 1995b, 1995c; Mulilis, Duval & Lippa, 1990; Mulilis & Lippa, 1985, 1990). It may be noted, however, that due to the nature of these investigations, all of the above studies used the total score of the 27 items of the MLEPS (ranging from 27 to 81). That is, these investigations did not address the issue of subscales within the MLEPS.

The psychosocial data collected included participants' responses to questions concerning demographics (e.g. age, gender, ethnicity, religion, primary residence etc.), perceptions of the earthquake hazard, and beliefs about earthquake preparedness resources. Questions on demographics focused on variables such as age, gender, number of years lived in California, and present household living quarters.

Participants' perceptions of the earthquake hazard were measured by responses to the following items: (1) 'I worry that my property and/or living quarters would be destroyed should a great earthquake occur', and (2) 'I worry that I would suffer personal injury and/or die should a great earthquake occur'. Participants were asked to agree/disagree with each of these items by circling a number on scale following each item that was anchored by 1 ('disagree strongly') and 6 ('agree strongly'). Additionally, perceptions of the earthquake hazard were measured by having participants rate a great earthquake from 0 to 100, with 0 representing 'no problem', 50 representing 'a moderate problem', and 100

representing 'the worst possible problem'.

Lastly, earthquake preparedness resources were measured by a number of beliefs that Duval and Mulilis (Duval & Mulilis, in press; Duval, Mulilis & Lalwani, 1998; Mulilis & Duval, 1995a, 1997, 1998) argue should be treated as hazard resources. Thus, for example, participants' beliefs about their personal responsibility assumed for earthquake preparedness were assessed by their responses to the following items: (1) 'I am responsibility for my being prepared for a great earthquake', and (2) 'The city, state, or federal government is responsible for my being prepared for a great earthquake'. As before, participants were asked to agree/disagree with each item by circling a number on a scale following each item that was anchored by 1 ('disagree strongly') and 6 ('agree strongly'). Following Duval and Mulilis (Duval & Mulilis, in press; Duval, Mulilis & Lalwani, 1998; Mulilis & Duval, 1995a, 1997, 1998), level of personal responsibility assumed for earthquake preparedness was calculated by subtracting each person's level of responsibility attributed to external agents (i.e. city, state, and federal government) from his or her level of indicated personal responsibility.

Results

Preliminary analyses indicated no significant differences in male and female responses to the demographic questions (except, of course, the question on gender) *t's=ns*. Consequently, all subsequent analyses were collapsed across these variables.

Factor analysis was conducted on the 27 preparedness items of the MLEPS from the combined data for all 12 groups. Examination of the scree plot (Cattell, 1966) resulting from the analysis suggested a three-factor solution. Using principal components analysis and varimax rotated axis extractions, the preparedness items were forced into three factors. The results of this analysis revealed that all 27 preparedness items of the MLEPS loaded primarily on one of these three factors. The individual items that loaded on each factor are indicated in *Table 1*.

An examination of the factor items in *Table 1* reveals that conceptually these factors encompass similar dimensions of survival, planning/preparation, and hazard mitigation obtained by Russell, Goltz, and Bourque (1995), who used similar items in assessing the earthquake preparedness of Southern California household residents, and also obtained a three factor solution for the data collected from these residents. In this respect, factor 3 of the present study is similar to their survival factor (e.g. collecting food and other supplies, knowledge of an emergency broadcast radio station), while factor 2 of the present study is similar to their planning and mitigation factors (e.g. cognitive preparation, securing the contents of a home). Factor 1 of the present study focuses exclusively on the location and operation of household utilities (e.g. water, gas, electricity). The internal reliabilities (Cronbach's alpha—Cronbach, 1970) for the three factors in the present study were calculated to be .87, .65, and .71, for factors 1, 2, and 3, respectively, which are similar to the values obtained by Russell, Goltz, and Bourque (1995) for their three factors.

Factor 1 – Cronbach's alpha = 0.87
- location of water valve
- location of gas valve
- location of electric power switch
- operation of water valve
- operation of gas valve
- operation of electric power switch.

Factor 2 – Cronbach's alpha = 0.65
- cabinets fastened with latches
- water heater fastened to wall
- tall furniture (e.g. bookcases) fastened to wall
- heavy objects (e.g. mirrors, paintings, plants) fastened to wall
- household earthquake plan
- neighborhood medical emergency center
- read earthquake preparedness material
- listen/watch radio/television earthquake preparedness messages
- earthquake insurance
- school meetings on earthquake preparedness
- vote on earthquake-resistant buildings.

Factor 3 – Cronbach's alpha = 0.71
- flashlight
- batteries for flashlight
- transistor radio
- batteries for transistor radio
- emergency broadcast station
- first-aid kit
- 4 gallons of water in plastic containers
- 4 days supply of dehydrated or canned food
- fire extinguisher
- wrenches to operate utility shut-off valves and switches.

Table 1: MLEPS items for the Three Factors.

To investigate gender differences in these factors, t-tests were conducted on the mean male and female preparedness levels for each of the three factors. The results indicated that males were significantly more prepared than females on items in factor 1 (*M*'s = 11.5 and 9.2, respectively), however, females were significantly more prepared than males in items in factor 2 (*M*'s = 20.1 and 19.8, respectively), while males and females did not significantly differ on items in factor 3 (*M*'s = 18.0 and 17.8, respectively), $t(2831) = 15.14$, $p < .001$, $t(2831) = 1.92$, $p = .05$, and $t(2831) = 0.79$, *ns*, respectively. Thus, the results appear supportive of the proposed hypotheses, and seem supportive of the existence of gender differences in hazard preparedness activities.

To determine if the observed gender differences were stable over the 6 year data collection period, t-tests were also conducted on the mean male and female preparedness levels in each of the 12 groups of participants for each of these three factors. The results of these analyses, as well as the results of the t-tests conducted on the combined levels of preparedness for all 12 groups, are indicated in *Tables 2, 3*, and *4*, for factors 1, 2, and 3, respectively.

As indicated in these tables, the results of analyses on the 12 individual groups tend to be supportive of the results of the analyses conducted on the combined groups. That is, males tended to be more prepared for earthquakes than females on factor 1 for all 12 data groups, however, females tended to be more prepared for earthquakes than males on factor 2 for these groups, while males and females tended to be equally prepared for earthquakes on factor 3 for the 12 groups.

Discussion

The purpose of Study 1 was to investigate whether there were significant differences in masculine and feminine earthquake preparedness activities, and to determine the stability of these differences over the 6 year data collection period. Factor analyses performed on the combined data revealed the existence of three factors of an earthquake preparedness scale (i.e. the MLEPS) that were suggestive of corresponding gender differences in earthquake preparedness activities. While the results of analyses on the 12 individual groups tended to be supportive of the results obtained on the combined sample, there were some notable exceptions. Thus, as indicated in *Table 2*, while males were significantly more prepared than females on factor 1 for all 12 groups, the reverse gender trends were not obtained for factor 2 *(see Table 3)*. That is, on factor 2 females were more prepared than males for only 9 or the 12 groups, and none of these differences reached conventional levels of significance. Furthermore, female and male preparedness levels were very similar for many of these nine groups. Taken together with the fact that gender differences for the combined sample barely reached statistical significance (i.e. $t(2,831) = 1.92$, $p = .05$) may lead one to conclude that there were no clear gender differences for the preparedness items comprising factor 2, just as there were no differences observed in factor 3 (see *Table 4*). On the other hand, as suggested by Neal (1997), it may be that real gender differ-

		Males		Females		
	Group	Mean	No.	Mean	No.	T value
1	Fall, 1986	10.9	233	8.9	210	5.44**
2	Spring, 1987	12.0	92	9.4	110	4.69**
3	Fall, 1987	12.0	131	9.1	160	6.12**
4	Spring, 1988	11.7	98	9.3	80	3.85**
5	Fall, 1988	11.5	83	8.9	124	4.60**
6	Spring, 1989	11.4	109	9.3	120	4.15**
7	Fall, 1989	11.1	128	8.9	164	4.67**
8	Spring, 1990	11.2	110	9.3	102	3.27**
9	Fall, 1990	12.1	128	9.6	148	4.83**
10	Spring, 1991	11.7	76	9.4	117	3.74**
11	Fall, 1991	11.7	61	9.2	98	3.60**
12	Spring, 1992	11.2	65	9.0	86	2.99*
	All 12 groups	11.5	1314	9.2	1519	15.14**

** *significance of t-test ≤ .001* * *significance of t-test = .003*

Note: As means increase, levels of preparedness increase.

Table 2: Cell means for male and female earthquake preparedness behavior on Factor 1.

		Males		Females		
	Group	Mean	No.	Mean	No.	T value
1	Fall, 1986	19.5	233	19.4	210	0.31
2	Spring, 1987	19.4	92	19.4	110	0.12
3	Fall, 1987	20.1	131	20.2	160	0.05
4	Spring, 1988	19.7	98	20.8	80	1.84*
5	Fall, 1988	20.1	83	19.9	124	0.20
6	Spring, 1989	20.3	109	20.6	120	0.53
7	Fall, 1989	19.6	128	19.9	164	0.65
8	Spring, 1990	19.6	110	20.2	102	0.93
9	Fall, 1990	19.7	128	20.0	148	0.62
10	Spring, 1991	19.9	76	20.3	117	0.80
11	Fall, 1991	20.0	61	20.8	98	1.24
12	Spring, 1992	19.6	65	20.1	86	0.65
	All 12 groups	19.8	1314	20.1	1519	1.92**

** *significance of t-test = .05* * *significance of t-test = .07*

Note: As means increase, levels of preparedness increase.

Table 3: Cell means for male and female earthquake preparedness behavior on Factor 2.

ences in disaster preparedness may be obscured by the very nature of the factor analytic structure itself.

In discussing problems associated with the use of disaster phases (e.g. preparedness, response, recovery, and mitigation), Neal (1997) notes that factors associated with hazards are generated by statistical programs and then labeled using such terms as 'survival', 'planning', and 'mitigation' etc., that appear clear cut and obvious to the researcher. However, Neal (1997) points out that these categories may not reflect the potential victim's representation of what activities do and do not fall into distinct categories. Indeed, Neal (1997) suggests that no evidence exists indicating persons engage in the type of categorisation of activities that would yield the same factors in separate factor analyses across samples and time.

Clearly Neal's (1997) contentions are consistent with the discrepancies observed between results of the 12 individual groups and those of the total combined sample in the present investigation. Thus, using a factor analytic approach to answers questions concerning differences in male and female earthquake preparedness may be problematical. In view of this issue, it was decided to conduct Study 2 in order to explore the existence of gender differences in earthquake preparedness by relying more directly on the concept of traditional gender stereotyping (e.g. as contained in the notion of gender divisions of labor) rather than relying solely on the statistical procedure of factor analysis.

STUDY 2 Method

Participants

Participants consisted of the same 2833 University of Southern California undergraduate students (1314 males and 1519 females) described in Study 1. Likewise, the same data collected for Study 1 was also used in Study 2. In fact, the only differences in Study 2 involved the procedures used to form the gender subscales of the MLEPS as discussed below.

Procedure

Using the results of the factor analyses from Study 1 as more of a guideline rather than an inflexible rule, three subscales of the MLEPS were chosen which conceptually reflected the more traditional gender-stereotypic masculine and feminine aspects of earthquake preparedness activities. These three subscales are shown in *Table 5*, and were identified as a 'masculine subscale' (containing items associated more with a masculine stereotypic focus), a 'feminine subscale' (containing items associated more with a feminine stereotypic focus), and an 'androgynous subscale' (containing items associated more with either a masculine or feminine stereotypic focus). The internal reliabilities (Cronbach's Alpha—Cronbach, 1970) for these three subscales were calculated to be .82, .68, and .72, respectively, which again are similar to values obtained by Russell, Goltz, and Bourque (1995) for their 3 factors.

It may be noted that the masculine subscale contains the six utility-related items

		Males		Females		
	Group	Mean	No.	Mean	No.	T value
1	Fall, 1986	17.2	233	17.0	210	0.50
2	Spring, 1987	18.7	92	18.8	110	0.18
3	Fall, 1987	17.8	131	18.1	160	0.57
4	Spring, 1988	18.3	98	18.3	80	0.01
5	Fall, 1988	17.7	83	17.5	124	0.32
6	Spring, 1989	17.7	109	17.5	120	0.28
7	Fall, 1989	17.6	128	17.4	164	0.33
8	Spring, 1990	18.1	110	18.1	102	0.03
9	Fall, 1990	19.3	128	17.9	148	2.14*
10	Spring, 1991	18.7	76	18.5	117	0.17
11	Fall, 1991	17.7	61	18.6	98	1.10
12	Spring, 1992	17.9	65	17.2	86	0.75
	All 12 groups	18.0	1314	17.8	1519	0.79

* *significance of t-test = .03*

Note: As means increase, levels of preparedness increase.

Table 4: Cell Means for Male and Female Earthquake Preparedness Behavior on Factor 3.

Masculine Subscale
– Cronbach's alpha = 0.82
- fire extinguisher
- wrenches to operate utility shut-off valves and switches
- location of water valve
- location of gas valve
- location of electric power switch
- operation of water valve
- operation of gas valve
- operation of electric power switch
- water heater fastened to wall
- tall furniture *(e.g. bookcases)* fastened to wall
- heavy objects *(e.g. mirrors, paintings, plants)* fastened to wall
- vote on earthquake-resistant buildings.

Feminine Subscale
– Cronbach's alpha = 0.68
- 4 gals of water in plastic containers
- 4 days supply of dehydrated or canned food
- household earthquake plan
- read earthquake preparedness material
- listen/watch radio/television earthquake preparedness messages
- school meetings on earthquake preparedness.

Androgynous Subscale
– Cronbach's alpha = 0.72
- flashlight
- batteries for flashlight
- transistor radio
- batteries for transistor radio
- emergency broadcast station
- first-aid kit
- cabinets fastened with latches
- neighborhood medical emergency center earthquake insurance.

Table 5: MLEPS items for the Three Subscales.

of factor 1 plus the fire extinguisher and wrench items, as well as the three items involving fastening objects to the wall. Thus, the masculine subscale has a 'tool' orientation, which in general, tends to reflect a more traditional gender-stereotypic masculine focus. Additionally, the masculine subscale contains the item dealing with voting on earthquake-resistant buildings. The rationale for including this item on the masculine subscale is that historical voting was a privilege given to males and denied to females, and also since the topic of earthquake-resistant buildings implies a knowledge of engineering and construction, which historically has been a field dominated more by males.

On the other hand, the feminine subscale contains more items directly related to household preparedness activities, which would be consistent with Morrow's (1995b) findings that women are generally involved in these type of disaster-related activities than men. The androgynous subscale contains the remaining items and which tend to reflect either a tool, household, or medical orientation, and thus, may be assumed to have a focus that could be described as either masculine or feminine.

Results

To investigate gender differences in preparedness, 2 (gender) X 12 (group) ANOVAs were conducted on the preparedness data for the three subscales. These analyses were performed on the total combined sample of all 12 groups (1) since they were independent groups from the same population (i.e. University of Southern California undergraduates), and (2) to increase the power of the analysis.

The results of the ANOVA on the masculine subscale revealed a significant main effect of gender, with males being significantly more prepared on this subscale than females (M's = 16.7 and 14.1, respectively), $F(1,2809) = 192.46$, $p < .001$. There were no other significant main effects or interactions for this analysis.

The results of the ANOVA on the feminine subscale also revealed a significant main effect of gender. On this subscale, however, females were significantly more prepared than males (M's = 10.4 and 9.8, respectively), $F(1,2809) = 33.81$, $p < .001$. As was the case for the masculine subscale, there were no other significant main effects or interactions for this analysis.

Lastly, the results of the ANOVA on the androgynous subscale did not reveal any significant main effects of gender or sample, nor was the interaction between these two variables significant, F's=ns.

To determine if the above gender differences on these subscales were stable over the 6 year data collection period, t-tests were conducted on the mean male and female preparedness levels in each of the 12 groups of participants, as well as on the combined preparedness levels for all 12 groups. The results of these analyses are indicated in *Tables 6, 7,* and *8,* for the masculine, feminine, and androgynous subscales respectively.

As indicated in *Table 6,* males were significantly more prepared for earthquakes than females on the masculine subscale for all 12 groups as well as for the combined data for the 12 groups. On the other hand, as indicated in *Table 7,* females were more prepared for earthquakes than males on the feminine subscale for all 12 samples. Furthermore, these differences were significant in five of these groups, as was the case for the combined data for the 12 groups, and approached significance in four other groups. Finally, as indicated in *Table 8,* males and females were more or less equally prepared for earthquakes on the androgynous subscale for 11 of the 12 samples as well as for the combined data for the 12 groups.

To determine if the above gender differences in earthquake preparedness corresponded to gender differences in either participants' perceptions of the earthquake hazard or in their beliefs about preparedness resources, as before, 2 (gender) X 12 (group) ANOVAs were conducted on the hazard perception and hazard resource data for the total combined sample.

		Males		Females		
	Group	Mean	No.	Mean	No.	T value
1	Fall, 1986	15.8	233	13.7	210	4.87****
2	Spring, 1987	17.7	92	14.6	110	4.78****
3	Fall, 1987	17.3	131	14.0	160	5.65****
4	Spring, 1988	16.8	98	14.2	80	3.49****
5	Fall, 1988	16.6	83	13.8	124	4.12****
6	Spring, 1989	16.4	109	14.2	120	3.56****
7	Fall, 1989	16.2	128	13.7	164	4.26****
8	Spring, 1990	16.5	110	14.3	102	3.11***
9	Fall, 1990	17.6	128	14.7	148	4.58****
10	Spring, 1991	16.9	76	14.7	117	2.96**
11	Fall, 1991	17.1	61	14.1	98	3.49****
12	Spring, 1992	16.5	65	14.0	86	2.80*
	All 12 groups	16.7	1314	14.1	1519	13.78****

**** *significance of t-test ≤ .001* ** *significance of t-test = .003*
*** *significance of t-test = .002* * *significance of t-test = .006*

Note: As means increase, levels of preparedness increase.

Table 6: Cell means for male and female earthquake preparedness behavior on the Masculine Subscale.

		Males		Females		
	Group	Mean	No.	Mean	No.	T Value
1	Fall, 1986	9.5	233	9.6	210	0.02
2	Spring, 1987	9.5	92	10.0	110	1.40
3	Fall, 1987	9.5	131	10.3	160	2.32***
4	Spring, 1988	10.3	98	11.7	80	3.35*****
5	Fall, 1988	9.9	83	10.3	124	1.11
6	Spring, 1989	9.8	109	10.8	120	2.72****
7	Fall, 1989	9.7	128	10.1	164	1.55
8	Spring, 1990	9.8	110	10.8	102	2.34***
9	Fall, 1990	10.2	128	11.0	148	1.97**
10	Spring, 1991	9.9	76	10.5	117	1.57
11	Fall, 1991	10.1	61	11.0	98	1.88*
12	Spring, 1992	10.2	65	10.4	86	0.36
	All 12 Groups	9.8	1314	10.4	1519	5.84*****

***** *significance of t-test ≤ .001* ** *significance of t-test = .050*
**** *significance of t-test = .007*
*** *significance of t-test = .020*
Note: As means increase, levels of preparedness increase.

Table 7: Cell means for male and female earthquake preparedness behavior on the Feminine Subscale.

The results of the ANOVA conducted on participants' ratings of a great earthquake as a problem revealed a significant main effect of gender, with females indicating a great earthquake to be a significantly greater problem than males (M's = 73.8 and 70.2, respectively), $F(1,2809) = 20.01$, $p < .001$. This analysis did not reveal any other significant main effects or interactions. Similarly, the results of the ANOVAs conducted on participants' responses to the items relative to their degree of concern about personal injury and property damage resulting from a great earthquake revealed significant main effects of gender, with females indicating significantly greater concern than males about personal injury (M's = 4.9 and 4.4, respectively) and about property damage (M's = 4.8 and 4.5, respectively), $F(1,2809) = 45.03$, $p < .001$, and $F(1,2809) = 14.05$, $p < .001$, respectively. Again, neither of these analyses

		Males		Females		
	Group	Mean	No.	Mean	No.	T Value
1	Fall, 1986	22.3	233	22.1	210	0.57
2	Spring, 1987	22.9	92	23.0	110	0.12
3	Fall, 1987	23.2	131	23.1	160	0.17
4	Spring, 1988	22.6	98	22.6	80	0.04
5	Fall, 1988	22.7	83	22.2	124	0.74
6	Spring, 1989	22.1	109	22.3	120	1.35
7	Fall, 1989	22.4	128	23.3	164	0.10
8	Spring, 1990	22.6	110	22.6	102	0.01
9	Fall, 1990	23.1	128	21.9	148	2.12*
10	Spring, 1991	23.5	76	23.1	117	0.59
11	Fall, 1991	22.2	61	23.5	98	1.69
12	Spring, 1992	22.0	65	22.0	86	0.05
	All 12 groups	22.7	1314	22.5	1519	1.15

** significance of t-test = .03*

Note: As means increase, levels of preparedness increase.

Table 8: Cell means for male and female earthquake preparedness behavior on the Androgynous Subscale.

		Males		Females			
	Group	Mean	No.	Mean	No.	T Value	P
1	Fall, 1986	69.5	233	71.2	210	0.77	0.443
2	Spring, 1987	70.0	92	74.9	110	1.53	0.127
3	Fall, 1987	67.1	131	73.0	160	2.26	0.024
4	Spring, 1988	69.8	98	75.6	80	1.83	0.070
5	Fall, 1988	67.3	83	72.2	124	1.55	0.124
6	Spring, 1989	69.7	109	74.6	120	1.68	0.094
7	Fall, 1989	68.2	128	74.0	164	2.27	0.024
8	Spring, 1990	75.8	110	77.1	102	0.45	0.651
9	Fall, 1990	74.4	128	77.3	148	1.04	0.300
10	Spring, 1991	68.4	76	74.5	117	1.81	0.073
11	Fall, 1991	65.7	61	71.7	98	1.63	0.105
12	Spring, 1992	72.9	65	74.5	86	0.44	0.658
	All 12 groups	70.2	1314	73.8	1519	4.32	<.001

Note: As means increase, ratings increase.

Table 9: Cell means for male and female ratings of a great earthquake as a problem.

revealed any other significant main effects or interactions.

To determine if the above gender differences were stable over the 6 year data collection period, t-tests were conducted on male and female perceptions of the earthquake hazard in each of the 12 groups as well as in the total combined sample. Results of these analyses are presented in *Tables 9, 10,* and *11,* for participants' ratings of a great earthquake as problematic, and their responses to the statements relating their degree of concern about the destruction of their property and personal injury, respectively.

As indicated in *Table 9,* females rated a great earthquake as a greater problem than males for all 12 groups. Furthermore, these differences either achieved or approached conventional levels of significance in 8 of these groups. Consistent with these results is the fact that females worried more than males about the destruction of personal property *(Table 10)* and about experiencing personal injury and/or dying *(Table 11)* during such an event, for all 12 groups. Again, these differences either achieved or approached conventional levels of significance in 10 *(Table 10)* and 9 *(Table 11)* of these groups, respectively. Taken together, these results suggest that females appraised the earthquake hazard as more severe than did males.

Lastly, in order to determine in similar gender differences existed in participants' beliefs about their earthquake preparedness resources, 2 (gender) X 12 (groups) ANOVAs were conducted on participants' appraised personal responsibility assumed for earthquake preparedness activities. The results of these analyses revealed that males and females assumed similar degrees of responsibility as indicated by their responses to the statements indicating that (1) they are responsible for being prepared for a great earthquake (M's = 4.75 and 4.85, respectively), and (2) the city, state, or federal government is responsible for their being prepared for a great earthquake (M's = 3.02 and 3.05 respectively), $F(1,2809) = 2.24$, *ns*, and $F(1,2809) = 0.69$, *ns*, respectively. Similarly, results of analyses conducted on the degree of responsibility for preparedness attributed to self minus the degree of responsibility attributed to the government for such actions (i.e. an 'absolute' level of responsibility attributed to self—see Duval & Mulilis, in press; Mulilis & Duval, 1995a, 1997, 1998) again revealed no significant differences in the level of personal responsibility assumed for preparedness actions (M's = 1.73 and 1.80, respectively), $F(1,2809) = 0.30$, *ns*.

Discussion

The purpose of Study 2 was to investigate whether there were differences in masculine and feminine earthquake preparedness activities, and to explore possible reasons for these differences. Using the results of the three factors obtained in Study 1 as a guideline, three subscales of an earthquake preparedness scale (i.e. the MLEPS) were derived which were conceptually reflective of traditional stereotypic gender activities. Results of analyses on the total combined sample, as well as on the

		Males		Females			
	Group	Mean	No.	Mean	No.	T Value	P
1	Fall, 1986	4.2	233	5.0	210	3.28	0.001
2	Spring, 1987	4.5	92	5.0	110	2.59	0.010
3	Fall, 1987	4.4	131	4.8	160	1.97	0.050
4	Spring, 1988	4.2	98	5.0	80	3.99	<0.001
5	Fall, 1988	4.1	83	4.7	124	2.34	0.020
6	Spring, 1989	4.6	109	4.9	120	1.48	0.140
7	Fall, 1989	4.1	128	4.9	164	3.61	<0.001
8	Spring, 1990	4.2	110	5.0	102	3.28	0.001
9	Fall, 1990	4.2	128	4.9	148	2.95	<0.002
10	Spring, 1991	4.4	76	4.9	117	1.89	0.060
11	Fall, 1991	4.4	61	4.8	98	1.72	0.087
12	Spring, 1992	4.6	65	4.8	86	0.75	0.456
	All 12 groups	4.4	1314	4.9	1519	6.58	<0.001

Note: As means increase, agreement with statement increases.

Table 10: Cell means for male and female agreement with statements concerning worry about personal injury during an earthquake.

		Males		Females			
	Group	Mean	No.	Mean	No.	T Value	P
1	Fall, 1986	4.6	233	4.8	210	1.50	0.136
2	Spring, 1987	4.6	92	5.0	110	2.81	0.006
3	Fall, 1987	4.6	131	4.9	160	1.88	0.061
4	Spring, 1988	4.4	98	4.9	80	2.91	0.004
5	Fall, 1988	4.3	83	4.7	124	2.14	0.033
6	Spring, 1989	4.6	109	4.6	120	0.27	0.789
7	Fall, 1989	4.4	128	4.9	164	2.91	0.004
8	Spring, 1990	4.3	110	5.0	102	3.28	0.001
9	Fall, 1990	4.1	128	4.9	148	3.61	<0.001
10	Spring, 1991	4.5	76	4.9	117	1.67	0.097
11	Fall, 1991	4.5	61	4.9	98	1.79	0.076
12	Spring, 1992	4.6	65	4.8	86	0.52	0.600
	All 12 groups	4.5	13144.81519			3.27	<0.001

Note: As means increase, agreement with statement increases.

Table 11: Cell means for male and female agreement with statements concerning worry about property damage during an earthquake.

12 individual data groups, consistently suggested that males and females tended to engage in different types of earthquake preparedness activities, and that these differences appeared to be somewhat stable over the 6 year data collection period.

Since the activities involved in the items of the preparedness subscales were derived utilizing traditional gender stereotyping as a guideline, one explanation for the observed gender differences might be that males and females differ in gender identity either due to more dispositional factors such as personality characteristics (e.g. sociotropic or connectedness versus egocentric or autonomous) or due to more situational factors such as the socialization processes involved in the division of labor. Such an explanation would be consistent with the body of psychological literature on gender that supports such differences.

However, since Study 2 also revealed that males and females consistently differed in their appraisals of the earthquake hazard, and that these differences were also stable over the 6 year collection period, an alternative explanation for these differences might involve cognitive appraisals considerations. Such an explanation would not only be consistent with the work of Lindell (Lindell & Perry, 1997; Lindell & Whitney, 1998) and PrE theory, but also with the body of developmental literature that indicates gender differences in cognitive development (e.g. differences in the rate of development of verbal and quantitative skills between males and females).

Summary discussion and conclusions

In the present studies the existence of gender differences in earthquake preparedness was explored, as well as the stability of such differences over time, and reasons for such differences were postulated. Results of these studies seemed to indicate that Southern California undergraduate males were more prepared for earthquakes on certain items of the MLEPS while females were more prepared for earthquakes on other items of the MLEPS, and on still other items of the MLEPS, males and females appeared to be equally prepared for earthquakes. Furthermore, these gender differences in preparedness appeared consistent over the 6 year period in which the data was collected.

On one hand, these gender differences appear to reflect traditional stereotypic differences in males and females. That is, taken in conjunction with the psychology literature on gender, the results of the present study may suggest the existence of particular gendered dimensions in earthquake preparedness. Thus, it may be that these gender differences are motivated by basic differences in the focus of males and females (i.e. sociotropic or connectedness versus egocentric or autonomous focus), or to more traditional gender-stereotypic roles with respect to division of labor. That is, it may be that the gender differences in earthquake preparedness observed in the present investigation arise from socialized differences between males and females in the divisions of labor tasks they typically perform, which results in differences in gender idealogies between the genders. Such an interpretation of the results would be consistent with the views of Kroska (1997) who interprets such ideological differences as a difference in gender identity rather than a difference in a set of beliefs between males and females. However, not everyone views gender differences in these terms.

Others, for example, have directed their focus on the differing values, beliefs, attitudes, and perceptions of males and females, with we might add, somewhat mixed results. With respect to differing values, for example, Prince-Gibson & Schwartz (1998) found that males and females gave similar meanings to 10 different types of values (e.g. power, achievement, hedonism, benevolence, and conformity). On the other hand, Burger, Sanchez, Gibbons, and Gochfeld (1998) found that males and females had distinctly different attitudes and perceptions toward environmental problems and issues, topics that are more closely related to that of the present study. Thus, at least with respect to the results of the present investigation, it may be that the observed gender differences in earthquake preparedness reflect more fundamental issues underlying processes involved in behavior change as depicted, for example, by PrE theory (Duval & Mulilis, in press; Mulilis & Duval, 1995a, 1995b, 1995c, 1996, 1997, 1998).

According to PrE theory, behaviors such as those involved in earthquake preparedness activities are a function of appraised person variables (i.e. similar to what Lindell & Perry, 1997 call 'household resources') *relative to* appraisal of event variables (i.e. similar to what Lindell & Perry, 1997 call 'perception of the hazard'). Mathematically, Duval and Mulilis (in press) have shown that this can translate into the *ratio* of person to event variables. According to this view, PrE theory predicts that the magnitude of earthquake preparedness behaviors is dictated by the ratio of an appraisal of person *relative to* event variables. In the present investigation, person variables focused on beliefs about personal responsibility assumed for earthquake preparedness activities while event variables focused on the perception of the earthquake hazard, both of which are consistent with the conclusions of Lindell and Perry (1997) and Duval, Mulilis, and Lalwani (1998).

Applying the above to the gender differences in earthquake preparedness observed in the present study, PrE theory predicts that such differences would occur in conjunction with differences in appraised personal responsibility assumed for earthquake preparedness actions *relative to* appraisal of the threatening earthquake. In fact, these results were precisely what the present investigation indicated. That is, observed gender differences in earthquake preparedness were accompanied by corresponding gender differences in appraisals of the threatening earthquake, which is consistent with the research of Lindell and Whitney (1998), while appraisals of personal responsibility assumed for preparedness actions were similar for males and females, a finding consistent with the research of Mikula, Freudenthaler, Brennacher-Kroll, and Brunschko (1997). More specifically, differences between males and females in the *ratio* of appraised personal responsibility *relative to* appraisals of the threatening earthquake were due to differences in appraisals of the threat, rather than differences in appraised responsibility, and that these differences in appraised threat corresponded to observed differences in male and female preparedness behavior. Thus, taken in conjunction with PrE theory, the results of the present investigation suggest that gender differences in earthquake preparedness may be the result of differing appraisals of the earthquake hazard by males and females.

Finally, it may be noted that several large earthquakes occurred in California during the years 1986 to 1992 when the data for the present study were collected (e.g. the 5.9 magnitude Palm Springs earthquake on July 8, 1986, the 5.9 magnitude Whittier Narrows earthquake on October 1, 1987, the 7.1 magnitude Loma Prieta earthquake on October 17, 1988, and the 5.8 magnitude Sierra Madre earthquake on June 28, 1991). However, it was assumed that these earthquakes did not affect the results of the present investigation for two reasons.

The first reason has to do with the points in time when the earthquakes occurred relative to the points in time when the data were collected. That is, either the earthquakes occurred after the data collection period (e.g. the Whittier Narrows earthquake occurred approx. three weeks after the Sept. 1987 data was collected, and the

Loma Prieta earthquake occurred approx. one month after the Sept. 1989 data was collected), or the earthquakes occurred long enough before the data collection period (e.g. the Palm Springs earthquake occurred approximately two months before the Sept. 1986 data was collected and the Sierra Madre earthquake occurred approximately two and one-half months before the Sept. 1991 data was collected) so that it might be assumed that any effects of the earthquakes on the preparedness measures had dissipated (Mulilis & Duval, 1990a, 1990b, 1991a, 1991b, 1993).

Secondly, it was assumed that any effects of these earthquakes on preparedness behavior affected both males and females in a similar manner, and thus, differences between male and female preparedness levels would not have been substantially affected relative to one another. As it turned out, the fact that peak preparedness values for the masculine and feminine subscales occurred at different time periods over the six year data collection period *(see Tables 6, 7, and 8)* was not directly supportive of this second assumption. However, the fact that the pattern of preparedness values for these two subscales was similar (i.e., somewhat random — see *Tables 6, 7, and 8*) is suggestive that the pattern of gender differences would not vary substantially with temporal proximity to an earthquake.

In conclusion, the present research takes an important step in determining precisely why gender makes a difference in earthquake preparedness activities, and as such, could aid emergency managers in increasing disaster preparation efforts. It is suggested that future research be directed toward verifying the existence of these differences in terms of different populations (e.g. non-students), different sex-role attitudes and ideologies (e.g. traditional versus non-traditional), and different types of disasters (e.g. tornados, floods, hurricanes). Furthermore, additional research is recommended in determining whether these differences arise from more traditional gender-stereotypic notions (e.g. differences in personality or differences due to division of labor) or are grounded more in the rationale of cognitive appraisal approaches (e.g. Lazarus' cognitive appraisal theory—Lazarus, 1966, 1991; Lazarus & Folkman, 1984; PrE theory—Duval & Mulilis, in press; Mulilis & Duval, 1995a, 1995b, 1995c, 1996, 1997, 1998).

Footnotes

[1] The terms sociotropic and autonomic were originally used by Beck (Beck, Epstein, & Harrison, 1983) in his work on depression to describe two dimensions of personality. Developmental theorists (e.g. Baumeister & Sommer, 1997; Carlson, Cooper, & Hsu, 1990; Chodorow, 1989; Cooper & Grotevant, 1989; Cross & Madison, 1997a, 1997b; Gilligan, 1990, 1991; Grotevant & Cooper, 1985; Martin & Ruble, 1997) have applied these and similar terms (e.g. individual versus connected, independent versus interdependent, and justice versus care perspective) to describe differences between males and females.

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Arrangements which are made to Local Government to assist with the redevelopment of infrastructure following a disaster.

The Department of Social Security also has two forms of payment which are made available to individuals and families following disasters. These are the Special Benefit Payment and the Disaster Relief Payment.

Although it is acknowledged that bushfire prevention and mitigation are State responsibilities, the Commonwealth accepts responsibilities for the land management of Commonwealth property such as army reserves.

The Commonwealth also accepts responsibility for Bushfire Research and Communications. Communications are considered through the National Communications Advisory group.

There are also a number of Commonwealth-level Committees on which the States have representation. Most of these committees consider issues common to emergency management rather than being bushfire specific.

The State/Territory roles

As previously stated, the Australian Constitution of 1901, clearly places the responsibility for emergency management with the States and Territories. This also encompasses the mitigation of, and preparedness for wildfire as well as the arrangements to respond to and assist the community to recover from such an event.

Within each State there are various types of land tenure and numerous pieces of covering legislation which highlights once again the need for partnerships.

There are World Heritage areas, National Parks, Wildland Reserves, Forestry lands, Commercial forests, private landowners, crown lands and more. Each with a different regime that needs to be managed to reduce destructive wildfire.

Each State and Territory has a number of agencies which embrace the responsibilities for emergency management in general and bushfire management in particular.

The States/Territories require partnerships with clearly defined protocols which provide coverage and guidelines for one state acting in support of another. These protocols need to extend beyond the response phase.

A very recent example of such a partnership has been the establishment of the Northern Australia Fire Management Forum. Here the environment of the savanna grasslands of Northern Australia is the common denominator. A partnership between the Commonwealth through the Tropical Savannas Cooperative Research Centre and the Western Australia, Northern Territory and Queensland State Bushfire agencies has been established to examine a range of management issues. It is early days with the protocols and partnerships still being developed. Regardless it is an excellent example of an interstate response to a common problem.

Local Government

Local Government in many States has the first line of responsibility for Emergency Management through Local Emergency Management Committees. These Committees are made up of agencies, identified in conjunction with local risk management studies.

'Some states and agencies have been fiercely independent and have retained ideas and practices that have supported an isolationist mentality, severely limiting their ability to enter into open and clearly defined partnerships.'

In many local areas the threat of wildfire is the major hazard and the partnership between fire agencies and the local government very strong. In other areas it is less so. However there is a need for local government emergency management committees to extend their arrangements beyond the most obvious and consider the uses all agencies may be put to a major emergency.

A recent Queensland example highlighted the need for the arrangements to be clearly defined. Rural fire appliances and the trained rural fire volunteers are a valuable source of manpower and equipment that can be used in support of other hazard response for example severe flooding, provided that the operational requirements are agreed to and documented in the Emergency Management Plan.

Local Government has additional responsibilities and bylaws concerning bushfire management. Many shires in Queensland now have well-developed fire management plans for their shires.

Many towns also have incident management sub-committees, that consider the requirements for interaction of agencies which are actively involved in emergency management on a daily basis.

Loosely-coupled partnerships, on horizontal and vertical planes have always existed between the layers of government, amongst agencies and between the agencies and the communities they serve.

Because of its size, settlement patterns, vast distances, consequent isolation and demographic distribution, Australia has developed a philosophy of self-help very early in the history of European settlement. This philosophy has created strong partnerships within the local communities, which have stood the ravages of time. These groups have in many cases been the foundations stones for the local emergency services which assist in the protection of our communities today.

The need for a paradigm shift from independence to interdependence

There is a need to break old paradigms that have been the source of pseudo-security in some agencies over the years.

Some states and agencies have been fiercely independent and have retained ideas and practices that have supported an isolationist mentality, severely limiting their ability to enter into open and clearly defined partnerships.

The regulatory environment of public emergency management must inevitably have a direct impact on an organisation's management practices and internal protocols.

As large government agencies develop in maturity they may pass through a period where there is no obvious alignment of the externally imposed imperatives with the internal culture, including the agencies specific goals and strategies.

Many agencies create an aura of independence with little desire to accept new management strategies or enter into equal partnerships with other like bodies.

Often the threat of loss of power base is the cause, however it is often a lack of appreciation that there is no threat of take over just a willingness to be able service the community better in the challenging environment of the 1990s.

The concept of interdependence appears to many of this group to smack of dependence and some agencies step away into isolation rather than consider the benefits of developing partnerships and protocols based on respect for an agencies domain and at the same time developing interdependence.

This path can lead to fragmentation and the wasteful use of scarce resources both human and materiel.

The preferred option is to recognise the value in various types of partnerships which may comprise many linkages and couplings of equal or differing importance. These connections will vary dependent on the phase of emergency management.

Loosely structured systems are needed to underline the limits of authority. Often totally distinctive legislation is somewhat parallel and permit a degree of shared governance.

These constraints should be viewed as benefits which allow autonomy but limit organisations from drifting too far afield from the shared vision of protecting life and property. In times of emergency response these multi-organisational networks swing into action.

What is required is for the agencies to be linked in a 'cob-web' arrangement:

- the webs of agreement linking the independent functions of the agencies
- sharing of knowledge and gaining of understanding can be facilitated through inter-agency exercises, practical scenarios and information sharing activities, where borders of ownership are explored, respected and acknowledged
- this level of understanding, often requires courage to challenge the process, to enter into risk taking and to remain committed to the vision and responsibilities of the organisation, while at the same time absorbing the ethos and requirements of other organisations who may have very similar roles and responsibilities
- personnel, able to do this are able to positively function in an environment of interdependence, without losing identity or direction.

This weblike network as any other is only as strong as the weakest link and each organisation must ensure that it is able to fulfill its identified responsibilities so as to avoid becoming, 'the weak link'.

Rooted in this multilayered intergovernmental and interagency system are intense areas of strain, which cause cleavage planes to appear. This strain and susceptibility to fracture may appear on a number of axes, and may be predicated by issues which in non stress times are non issues.

The 1994, Commonwealth Government's Senate Standing Committee report on Disaster Management included a chapter on Bushfire Management which provided an early indication that a cleavage plane was developing and the problem was highlighted in point 701.1:

"The Committee is left in no doubt that some states are failing in their responsibility to take measures to protect people and property from wildfire, whether directly through protection of crown land, or indirectly through public education and support of volunteer bushfire brigades. Although local councils are made responsible for fire preparedness and suppression, they are not given sufficient resources by state governments to adequately carry out mitigation and suppression activities."

The report continued in point 7.102:

"State Governments are failing to provide sufficient resources for bushfire brigades, they are failing to adequately carry out fuel reduction burning on their own lands, and they are failing to put sufficient funding into bushfire research. It is of concern to the Committee to hear evidence that fire tenders are old and unserviceable, that petrol driven tankers have not been replaced and are still being used, that brigade members feel that they are not adequately trained and that, above all state governments are not taking full responsibility for fire prevention and suppression in nature reserves and crown lands."

Finally in point 7.103 the Report stated:

"The Committee reminds State governments that they have a clear constitutional responsibility to prepare for and respond to bushfire threats and while the Commonwealth government can and does assist, state governments must give bushfire management higher priority in their allocation of resources."

It is pleasing to report that since 1994 all States and Territories have made substantial improvements in resourcing bushfire management.

Emphasis has been placed on reinforcing the partnerships between the Commonwealth and States, between the States and with the large number of intra state agencies with a role in wildfire management.

Overcoming resistance

Consensus between agencies is the keystone to successful partnerships.

The increasingly complex interconnectedness of the emergency management environment contains a hidden danger that the overwhelming umbrella of legislation combined with intense and varying local pressures may bring about a state of lethargy.

This state of lethargy can be equated with a 'state of learned helplessness' whereby confusion and the threat of litigation may result in inaction.

Of even greater risk is the possibility of 'exclusivity'. In this instance organisations ignore partnerships and attempt to function in isolation. Similarly the phrase "No man is an island" applies equally to organisations. How long can organisation function in isolation once the enormous and complex demands of wildfire and emergency response begin?

Recent events overseas events, involving both natural and technological disasters have clearly illustrated that the 'all agencies approach' is the only valid method to be adopted to ensure that efficient and effective emergency management will result.

All agencies need to recognise the need for coexistence and consensus and take positive steps to reduce pressures for independence.

Summary

In summary to provide a simplistic template by which the complexity of dependencies and interdependencies could be clearly illustrated would be difficult.

It is more important that the linkages between Governments, agencies and the community be clearly identified and acknowledged by each of the partners in this complex matrix.

The challenge is to be open, to provide forums for agencies to share information and methods, to grow our personnel in knowledge, to encourage work exchanges, and to demonstrate respect for the skills and knowledge embodied in other organisations.

These aspects are the silent partners in enduring relationships.

At all stages of the emergency management continuum, the before, the during and after the event there is a need for integrated and co-ordinated partnerships which do not diminish the rights of any one organisation but strengthens the links, couplings and connections for the benefit of our mutual clients the community.

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Thredbo landslide recovery

by Keith Dawe, Chairperson,
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Recovery Co-ordination Committee

Introduction

The Thredbo Landslide occurred at 11:30 p.m. on Thursday 30th July 1997. Part of a road embankment slid down the steep hillside into the ski resort village of Thredbo, in the Snowy Mountains in southeast Australia. The landslide destroyed two lodges where nineteen people were asleep. One survivor was recovered from under debris 36 hours later—the 'miracle' has focused media attention since.

Once the highly publicised rescue operations were over, the local community has tried to cope with physical, emotional, social and economic recovery. The Thredbo Recovery Co-ordination Committee was established to manage the initial part of the recovery process that will continue for years.

Most people thought that the community and its individuals would be substantially recovered within weeks, apart from the grieving of friends and relatives. Some hard periods and recurring emotional depression were expected at the end of that ski season and on anniversaries. The reality has been more difficult. The whole village lost friends who were mostly permanent residents or regular seasonal workers. Delays to physical infrastructure rehabilitation and a few surprises have created difficulties for economic recovery and heightened emotional problems. Sleep disorders and irritability have been common.

The first anniversary focus on putting the departed friends to rest, and a better than expected tourist season (although not great), has helped to ease problems. The village is now looking ahead more optimistically for the first time in a year. The main external event affecting the community now is the coronial inquest.

The Recovery Co-ordination Committee has now faded out of the picture, leaving the small ongoing role to the Chamber of Commerce and the local Community Association, which will continue the newsletter. Little else can now be done in providing external support.

I am an engineer, with an interest in emergency management. I have relied on some reference to literature, but mainly on community representatives and mental health and other professionals, to round out my own observations. My coverage of the psychosocial aspects is therefore limited. I have resisted focusing on relatively straight forward engineering aspects.

Recovery: what is it?

The comprehensive approach to disaster management in Australia embraces the inter-related elements of prevention, preparedness, response and recovery. Recovery should be planned in preparation, and implementation commenced in the response phase.

Recovery is defined in the New South Wales State Emergency and Rescue Management Act 1989, and consequently in each Disaster Plan (Displan) within New South Wales, as 'the process of returning an affected community to its proper level of functioning after an emergency'.

The Australian Emergency Manual—Disaster Recovery, produced in 1996 by Emergency Management Australia, defines disaster recovery as 'the coordinated process of supporting disaster-affected communities in the reconstruction of the physical infrastructure and restoration of emotional, social, economic and physical well-being.'

The Manual goes on to say that 'physical and social aspects are critical to effective recovery. Recovery is more than the replacement of what was destroyed and the rehabilitation of individuals. It is a complex social process and is best achieved when the affected community exercises a high degree of self-determination. Recovery is a developmental, rather than a remedial process, so the manner in which the physical and social aspects of the process are undertaken will have a critical impact. Activities that are conducted without consultation and recognition of needs and priorities will disrupt and hinder the process'.

These premises were adopted early, even before we studied the Disaster Recovery Manual. There is other literature available, but for our purposes, the Disaster Recovery Manual is a collation from several experts in the field, one of whom attended our first meeting. The manual provided verification that we were on the right track and a means of expressing concepts that matched what we were experiencing.

Planning and preparation – some background

There was no visible management structure, or any arrangements available to us for support, or to use as a guide—no recovery plans and no district or State level Recovery Committees.

Displans give recovery a low profile, for example, being only three brief standard paragraphs in the Snowy River Local Disaster Plan, which is largely a generic format customised to the local area.

The Disaster Recovery Manual was produced for the type of situation found in Thredbo, in this case, a whole community affected by a traumatic incident. It provides an overview of recovery concepts and the process, likely impacts of a disaster on the community, recovery management structures and guidelines, and outlines specific services available. The psychology of the effects of a disaster matched what the Thredbo community had been experiencing. The manual is a useful reference, but it is relatively new and largely covers the process of establishing a Recovery Co-ordination Plan before a disaster occurs. This is rarely given a high priority and had not yet occurred in our case.

Although the Welfare Functional Area Plan was incomplete, the networking of the people involved in the planning assisted with the early activation of welfare agencies in the response phase, who then carried on after the rescue phase was completed.

Recovery co-ordination committee formation

Early attempts to talk about recovery were swamped by the size of the rescue response and fatigue as participants had lost a night of sleep. However, although unplanned, recovery was commencing anyway. The local community was involved in supporting the rescue operation. Even though they would naturally have liked more involvement in 'rescuing' their friends, the local community formed a bond with the rescue personnel who came from near and far to work in difficult conditions. Counselling commenced from day one. Although few in number, tourists were encouraged back to the village from Day 3, mainly to keep otherwise idle and grieving staff busy and away from the bars.

The formal establishment of a Recovery Co-ordination Committee by the Local Emergency Management Committee Chairperson under State Displan arrangements began midway through the week long rescue operation. This was nearly too late. The earlier the start, the more successful the outcome is likely to be.

The Recovery Co-ordination Committee chairperson's role is principally as a facilitator and to provide a legal basis for convening the committee which then has access to support from other agencies and levels of government. The role of 'Recovery Manager' was dispersed amongst the committee members to promote ownership and involvement. The Committee reflected the nature of Thredbo village as a private leasehold within the Kosciuszko National Park, which carries out most municipal functions for the village. Participants included:

- Kosciusko Thredbo Pty Ltd, the main employer company and the head lessee of the village
- National Parks & Wildlife Service, as the landlord and municipal authority
- Local community representatives
- Department of Community Services as the welfare coordinator
- Health Department as the provider of counselling services
- Police (Local Emergency Operations Controller)
- a floating population of contributors assisting as needed.

The first meeting on Friday 8th August had more participants than planned, whose initial input was useful, but it was decided to involve more locals, and fewer 'outsiders'.

The rescue operation finished earlier than expected, leaving a day's gap to the first recovery meeting. Fatigue and the hasty closure of the emergency operations centre broke continuity and created an information flow hiatus. The community members had to work with the weekend tourist influx, delaying the next meeting until the following Tuesday. Fortunately, the effects of that delay were reduced by the committee secretary producing 'The Grapevine' village newsletter, to keep the community informed.

It was agreed by consensus from the outset:

- to focus on and involve the community, with management at the local level
- to facilitate access to external resources while recognising local resources and capability
- that external agencies should help, but not dictate, ie. minimum intervention, and empowering of the community in their own recovery
- to provide co-ordination between the agencies and the community
- to provide support to avoid a sense of abandonment or helplessness
- to quickly resolve concerns to reduce stresses and accumulation of minor frustrations. The community needed answers rather than deferrals. This required some insistence from the Chair when some parties wanted to leave matters unresolved
- to provide information flow and education about the recovery process—the success of the newsletter made a public meeting unnecessary
- to anticipate emotional downturns, such as at the end of the ski season and anniversaries
- to develop community projects for focus, such as the community hall/pre-school project
- to seek funding through all available avenues to resolve problems—particularly while political leaders were in a helpful mood
- continued access to counselling is essential—time is needed to heal
- that external agencies would withdraw as their usefulness diminished
- that the committee would remain only while needed as a facilitating mechanism.

Lacking role models in Australia, we pooled local experience, and 'did it our way'. After early input from external advisers, they seemed to be satisfied with our approach and left us alone.

Vision

The above points can be summarised by paraphrasing from the Disaster Recovery Manual to produce vision statements acknowledging that substantial change is inevitable, with the village losing about 15% of the permanent population:

- the community cannot entirely revert to its pre-disaster function, but can grow with a new vision, combining some of what was lost with new initiatives
- Assist the community to maintain integrity, and avoid destructive splits and conflicts. In turn, the community supports the recovery of individual members.

Successes

Early successes included:

- Reinstating information flow—the newsletter was well received.
- Reinstating some physical infrastructure, such as gas, electricity, telephones, redirecting temporary drainage to reinstate access to some lodges.
- Ongoing counselling services, despite bureaucratic attempts to close this down to cut costs.
- Financial assistance, such as government grants of $150,000 for the community hall, tourism initiatives amounting to about $3 million, although largely a repackaging of existing funding sources, but included promoting year round tourism and developing special events to attract tourists, such as a new annual international bicycle race, financial counselling being made available and accelerating Alpine Way road construction, with the aim to divert some of the Melbourne-Sydney highway traffic to pass through the mountains.
- The police focused on cleaning up the landslip site and removing reminders and annoyances from the village such as equipment left in driveways and streets. The police withdrew once the physical clean up was complete.
- Political support at both the Federal and State levels.

Tourism is the lifeblood of Thredbo and the other mountain communities and is essential to survival after a poor season made worse by tragedy. Some good snowfalls reduced the potential economic downturn, attracting more visitors than expected, although below normal. However the season then fizzled out, with poor snow conditions, becoming a relatively poor season by 'normal' standards (but still better than the year before).

Despite the delay in stabilising the road embankment above the village and the ongoing road closure, the relatively small area of damage meant that most of the village was able to continue to function physically. Most businesses were able to continue trading, albeit with fewer customers, and the few community facilities were not affected. There were no serious environmental effects. Most essential services were back in operation quickly.

The Community Hall has been built, and officially opened with much fanfare by the Deputy Prime Minister. That was a very emotional time for the community, but they have strong ownership of the project, which was driven by the Community Association.

The Health Department agreed to a community request to keep the same two counsellors through the whole recovery period, maintaining continuity and building trust. This has enabled them to assess and develop a better understanding of the needs and problems of the community members and to anticipate and respond proactively to emerging trends. The continuity has been important to the community, and a lesson for future events.

It is important to select the right people for this task. Willingness to make themselves available at all hours and emotional strength are important pre-requisites. The team successfully combined experience and youth.

Importantly, the counsellors opted for a non-intervention strategy of being available, responding to requests for assistance,

or just visiting informally to 'have a chat' where appropriate. Imposing themselves on individuals may have led to resentment of the intrusion. People have to work through their grief at their own speed.

The media have continued their interest in Thredbo. On the whole, while sometimes annoying, it was better to not be ignored, as that can be very destructive to a struggling community.

The first anniversary was a mixture of high publicity from a huge media contingent, and intensely personal grieving and reflection which was guarded by the community from external intrusion. It seems to have succeeded, as there is now a more optimistic outlook, assisted by a well timed big snowfall.

The Recovery Co-ordination Committee has helped the community to recover, and although the community has not finished recovering, the Committee has outlived its usefulness and ceased operation from mid August 1998. It will reconvene only if necessary. Counselling services continue to be available, but with lower demand since the anniversary.

Having proved its worth in keeping the community informed, the newsletter will continue, under the banner of the Thredbo Community Association.

Problems

The counsellors were twice nearly removed due to departmental budget constraints. The first occasion was only a few weeks after the landslide occurred. Fortunately the counselling services were extended to the end of the 1998 ski season.

The counsellors have noted distinct periods where there were significant emotional problems. Examples include the lead up to the end of the first ski season, the following pre-Christmas slow tourist season, and the lead up to the first anniversary. Some people were heavily involved in the rescue operation, but the accomplishment could not suppress the emotional trauma forever. Counselling was available, but many people thought it was not necessary. Some individuals 'slipped through the cracks' in the debriefing period. Not learning that their reactions to the trauma are normal and that support is available, may have contributed to some people later reappearing in a very disturbed emotional state. Delay makes rehabilitation harder.

An unexpected variation on this, was the seasonal workers who returned for the new snow season. They lagged in the recovery process, finding it hard to catch up with those who had stayed over the summer.

The interruption to the 1997 tourist season exacerbated a marginal season, creating financial difficulties. Trade was slow for retail businesses. Closed lodges lacked income to pay off mortgages or to pay managers.

For months, while geotechnical investigations were carried out, safety concerns remained unresolved for properties close to the landslide. Low confidence affected reoccupation by residents and by tourists who often changed or deferred bookings or booked at the last moment, particularly over summer. The lift company, and its major hotel complex did well, but overall, tourism was slightly down on normal levels. The snow season has seen retail trade do better than expected, but accommodation trade is still down slightly. The peak month of August was about average, but the other months were below normal.

Despite increased advertising funding, its effectiveness is uncertain. Advertising before the summer holidays probably missed the market. Those tourists visiting Thredbo tended to make late decisions during the holidays. This trend continues, making business planning difficult. Generic advertising for all three ski resorts in the region diminished assistance to Thredbo over the winter.

A visit to similar alpine ski villages in New Zealand, affected by volcanic eruptions, found some similarities. The New Zealanders expected to take about three years to recover financially from two successive interrupted ski seasons—and that involved no loss of life. (A poor snow season and a quiet 1998–99 summer season further hurt business at Thredbo.)

Initially this looked like being repeated in Thredbo and surrounding communities. However, a greater level of political and media support, resolution of some major concerns within the village, and some reasonable snowfalls bringing tourists back, have combined to improve the economic outlook for most of the community. Some businesses are still suffering. Two lodges remain closed for the ski season with the slope above them not able to be sufficiently stabilised to allow occupation.

The Alpine Way is closed, with reconstruction delayed by the Coroner's geotechnical investigation and the next snow season. Traffic diverted through the village is causing congestion and damaging streets. Reconstruction will be costly, but opening is expected in June 1999.

Losing a water supply pumping station in the landslip, and resulting poor water pressure in some lodges, annoyed customers for some months, but this has been resolved.

A decision by the National Parks and Wildlife Service to increase entry fees by 50% without prior consultation or notice, brought a furious response from the whole community. Such discouragement to visitors occurred at a time of widespread depression, further delays to the inquest, and arguments over the safety of the village and reconstruction of the road. Businesses had already arranged to advertise package deals including the Park entry fees and would have to absorb the increased costs. The Environment Minister relented and deferred the fee rises for a year and promised a review of the fee structure. This could have been handled more sensitively.

The Thredbo Relief Fund was established to receive public donations. Unfortunately, the scrupulous treatment of the funds led to delays in pay outs and dissatisfaction over perceived inequities in who was paid for what.

No assistance was provided for mortgage relief for closed lodges, and for the debts incurred by the community in building the village Chapel a few months prior to the landslide.

The coronial inquest is revealing latent anger over delays in the initial rescue operation, resulting from the necessity to stabilise the site to avoid further casualties.

The Thredbo landslide was not declared a 'state of emergency', reducing potential long term support as agencies tried to rationalise operational budgets after the sudden and unexpected blowout during the rescue phase. Such a declaration by the Premier enables more access to Government funding, and so is rarely made. I understand that the Department of Community Services has retrospectively declared Thredbo a disaster area, for the purpose of making Disaster Relief Scheme loans available for small businesses.

Psycho-social

The community recovery appears to be working well so far, despite some hurdles that have had to be overcome. Requirements for counselling services have diminished greatly since the first anniversary, which probably brought out most of the remaining latent problems.

The mood was relatively positive for nearly a month after the landslide, until the annual exodus of staff toward the end of the ski season. Normally this produces some temporary depression, but it was more universal, longer lasting and severe this time. Causes and triggers included the landslide, funerals, rain, snow melt, booking cancellations, collapse of a local booking agency, and the death of Princess Diana.

People became more aggressive rather than just upset. Dormant issues flared up. After nearly a month, counsellors moved

from defusing and debriefing style interviews to full-on counselling, with longer and deeper interviews.

Some of the continuing symptoms included sleep disturbances, nervousness, dreams, tiredness, irritability, mood swings, depression, and strained family and social relationships.

Many residents needed to get away for a while to try to put the experience behind them. Some succeeded, while others need more time and counselling, or even medical help. Mood swings and surges in requests for counselling have attended anniversaries, events, and difficulties imposed by agencies which failed to consider consequences. Counselling services needed to follow the staff as they left.

The description of the psychosocial effects of a disaster, in Chapter 4 of the Disaster Recovery Manual, provided a good insight into what was happening in the Thredbo community, and the inter-linked *neighbouring communities*. Some relevant points paraphrased from that chapter follow.

Irrespective of the type or scale of the disaster event disrupting the normal functioning of the individuals and community, the nature of the emotional response of the individuals involved is usually similar.

Whether rebuilding infrastructure or providing personal support services, recovery workers should consider the potential impact of their actions and the likely reactions of disaster affected individuals, so as to provide services supportively and effectively.

Unlike the Hollywood image of individual and community panic reactions to a disaster, people do respond rationally and responsibly, unless life is threatened without escape, information or leadership being available. They help each other if possible, respond to sound and reliable information, and while all suffer stress to varying degrees, few 'crack up'. Children are affected, but after the immediate responses, may hold needs back until later, when they will often need special attention.

Communities can recover, even after severe trauma and permanent change. Recovery can be a positive development, by recognising and facilitating a desire for improvement. The community hall construction in Thredbo is an example, recognised early while governments were feeling mildly generous.

As has been consistently promulgated by the counsellors, disaster victims are normal people, reacting normally to an abnormal situation. Temporary emotional strain due to severe stress does not reflect mental illness. Denying such stress has delayed the onset of symptoms in some cases, with several people presenting months later literally as 'basket cases'. The delay increases severity and makes treatment harder.

Emergency workers are affected, suffering stress to varying degrees, particularly in a small community, where they are involved. However, they could be more seriously affected by being unable to help in the emergency response.

People affected by disasters often need help, such as with information on available services, assistance in completing tasks such filling out application or claim forms, or the availability of a good listener.

Despite the stress, many people function well, but frustrations can accumulate and develop into feelings of anger and helplessness. The issues of the main road remaining closed, concerns over the stability of the road embankment and the sudden rise in National Park entry fees contributed to frustration and anger. Remote decision makers did not realise the effects of their actions.

The reactions of communities and individuals to a disaster is generally predictable. At the community level, the process of adjustment and recovery follows 'psychosocial phases':

- The *heroic phase*—an initial emotional peak, with feelings of altruism experienced from involvement at the disaster site in saving lives or possessions, mainly focusing on family, friends and neighbours. There is a re-bonding and fusion, with groups formed from the survivors of the shared experience.
- The *honeymoon phase*—a second peak where strong bonds form through sharing survival of a dangerous event together and anticipating help offered from outside and return to normal. Focus is more on community and outside agencies.
- The *disillusionment phase*—a trough following a downward slide of disappointment, anger, frustration, disputes, red tape, loss of support and exhaustion.
- The *reconstruction phase*—another emotional peak as individuals regain a belief in themselves and their community to rebuild, after a climb past obstacles, delays, and weakening or fragmentation of temporary groups.

These phases vary between individuals in severity and duration and will be felt at different times by different sections and members within the community.

Individuals have their emotional stability disrupted by a traumatic incident. Shock and disruption is followed by disbelief and denial, then an emotional impact with depression, anger and anxiety. The disaster victim then works through a period of soul searching, acceptance or coming to terms, and resumption of normal reactions with situational reminders such as anniversaries, to return to a state of emotional stability. Some individuals in the community will be still emotionally affected while others regain stability.

Three members of the counselling team presented a paper on 'Recovering From the Thredbo Disaster, 1997' to the NSW Rural Mental Health conference in February 1998 (Westerway, Elias and Skelton, 1997).

Lessons learnt

The Local Displan section on Recovery will expand, utilising the experience gained.

Each emergency management area should have a recovery plan ready to implement. Recovery planning PRIOR to the next disaster, is needed at all government levels, with funding allocated to achieve it. Being rare, recovery operations are not widely understood. Information needs to be promulgated and used.

Community needs and mood swings were largely anticipated. The Disaster Recovery Manual is useful for non mental health professionals to understand the process enough to interpret what is actually happening.

The main areas of external support for this case of a whole village affected by trauma and a long rescue campaign, included emotional and financial counselling, funding assistance for community projects to provide a focus, assistance visibly being available but not intrusive, external recognition by the media and politicians and the coordination and support role, and the neutral ground, provided by the Recovery Coordination Committee.

The effectiveness of counselling is improved by being supportive rather than intrusive, and by having a dedicated team building long term trust.

The community involvement focus in the recovery process works.

The recovery process was initially aided by:

- the success and co-operative effort of the rescue operation—a foul up in the rescue operation would have made recovery more difficult
- good co-operation and information flow from the police co-ordinator
- communications *not* being the usual major foul-up
- community involvement assisting rescuers—providing food, clothing and

accommodation gave the community something to do.

Although partly involved, the local community needed more involvement in the rescue phase to aid long term recovery. This includes more involvement for the local emergency services and casual support volunteers. They tended to be pushed aside by the large numbers of visitors and by a misguided concern to protect the local people from the trauma. While some local knowledge was used, there was some more that was lost or ignored in the process that could have aided the rescue operation. For example there were equipment failures due to visitors not understanding how to work in sub-zero temperatures.

The appropriate level of involvement varies between individuals, but they should have some opportunity to contribute, to meet their natural needs to know what is happening, and to be able to feel that they are helping their friends. Artificial delay does not help the grief process.

Conclusion

The Thredbo community has been devastated by the landslide, through physical, financial and psycho-social traumas.

Without prior planning, the recovery process had to be quickly set up during the rescue phase. The focus has been on the local community helping itself to regain function and to grow with a new vision, with external support available to assist. Issues had be resolved as quickly as possible to minimise aggravation. Information flow, co-operation and ongoing availability of counselling services have been critical to long term recovery.

Community involvement is vital in the recovery process, including the rescue phase. They need to know what is happening, how to help, and they can provide valuable local knowledge. Community projects provide valuable focus.

Mood swings continued for some time but a renewed optimism prevails since the first anniversary. Hopefully this will survive beyond the snow season. Spring is usually a period of depression, so the next summer season will be the next indicator of how well the long recovery process is succeeding. The Recovery Co-ordination Committee has done its job as far as it can and the remaining recovery will depend largely on time and knowing that assistance is still available if needed.

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Observations on the Tsunami disaster in Papua New Guinea (continued)

(... cont. from page 40)

help arrived with relief supplies. Evacuation centres, called care camps in PNG, were established at these places as it was easier to do that than move thousands of them. By all accounts running of the care camps was quite well organised, though the affected communities could ideally have been given more control over their own management.

At present those still in care camps are very well off, to the point that it is creating tension with those villagers with whom they are co-located. For example, they are getting more to eat than they would normally.

As a result the government is cutting back the provided food and encouraging the people to start using their food gardens again. This has resulted in media reports of the government 'starving the Aitape victims'. Pro-active efforts with the media might have avoided these reports.

Many of the recovery aspects being addressed now could have been started much earlier. Authorities seemed to want to wait, either in the hope that issues would solve themselves, or in ignorance of what is involved in recovery.

Nevertheless, recovery is now very much under way, and although it is not going perfectly, there is a cooperative attitude all round and the community itself has a significant involvement.

Partnerships

For a number of years there have been some problems with relationships between levels of government, and between NGOs and government. These problems resulted in a less than ideal relationship in the first two weeks of response. The provincial involvement was put aside by the emergency declaration and played little part in major decisions. This has not provided much foundation for future partnerships between provincial and national levels in disaster management.

There were open statements that various community-based groups would refuse to work with government response efforts, and inappropriate restrictions placed on NGOs trying to help. Consequently, there was a lack of cohesion between the various efforts to assist victims in care camps. Despite this, the community groups and NGO work has provided a solid foundation to improve the relationship between government and non-government organisations, and there is a visible and commendable level of cooperation at present.

Conclusion

It would be easy to read all the foregoing observations and conclude that the PNG government responded poorly to a tragic and large-scale disaster. However, such a conclusion would ignore the circumstances under which this response occurred.

There is no established and working disaster management system in PNG. One exists on paper, but few know of the disaster management arrangements and responsibilities, and even fewer have had any sort of disaster management training or experience. The area affected by the tsunami is remote by any standards, and infrastructure is lacking.

Under these circumstances, I believe that the effort in response was commendable. There was a tremendous effort made by a lot of individuals in working together to deal with a momentous event. There were many problems, none of which can be ignored, but few of these have had any serious impact on the way the affected people have been cared for or managed, and cannot really be blamed on the individuals who worked in the response.

PNG is now making a serious effort to improve its disaster management capacity, and there is likely to be an AusAID funded project to develop disaster management capacity within a year.

Pending commencement of that project, a number of activities will be conducted in PNG in 1999.

Emergency and disaster legislation in Russia: the key development trends and features

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Basic trends and directions of legislation development and change

The dissolution of the former Soviet Union and radical political and socioeconomic change have been followed by crucial changes in Russian legislation since the early '90s. Along with other important issues, these include the development and adoption of the first federal laws in the civil defense, environmental protection and emergency management areas. These in turn constitute the legal foundation of respective national policy, including building up the Russian Integrated State Emergency Prevention and Response System.

This process manifests two opposite development trends within the national legislation system as a whole and its emergency and disaster segment in particular. One of these involves *diversification* of the legislation that has been increasingly enriched with new laws and regulations, especially those concerning emergency and disaster policies, that were lacking. By 1998 the body of emergency laws in Russia included 150 federal laws and regulations and 1500 regional acts passed by legislatures of the Russian Federation, not counting hundreds of internal orders issued by federal emergency departments (Gosudarstvennii Doklad, 1998: 146).

Along with diversification, a tendency towards *integration* of emergency and disaster acts into a specific branch of the Russian Laws has become a characteristic at the federal level of the national legislation systems. On one hand, such integration implies that federal and regional lawmakers are seeking clear-cut systematisation and incorporation of the existing Acts. On the other hand, it involves harmonisation and unification of these Acts on the basis of principles and rules of international law used by the international emergency and disaster related organisations. Although the former Soviet Union, and then Russia, joined world and regional agreements in this field behind Western countries, some critical national emergency and disaster laws were issued with a further pronounced delay, or are still lacking in some important areas.

In addition to these two trends, it is worth distinguishing the *relatively increasing role of mitigation* within the emergency and disaster legislation and policy. This implies a gradual drift from a predominantly reactive and adaptive crisis management to a more pro-active and flexible one. Such a drift manifests itself in the lawmakers striving to change the proportion of federal budget expenditure between federal mitigation and response and recovery efforts, in favor of the former. In the fiscal years from 1996–99, the proportion between earmarked mitigation allocations (including the resources of the special governmental fund for emergency response) and those for recovery and rehabilitation from emergencies and disasters were almost equal. In addition, from 1999–2005, the federal government intends to carry out a comprehensive mitigation program to reduce the risks of natural and technological disasters (see Federalnaia Tselevaia Programma, 1999).

However, it is important to note that despite the important changes in developed countries of the world and Russia in the late '90s, emergency and disaster legislation (primarily on a federal level) has still been oriented largely towards preparedness, response and recovery. Prevention and mitigation issues have lower priority and a shortage of funds, particularly in Russia.

One reasons is the relatively short duration of the change of the national legislation, and respective change of organisational system, which could involve all possible hazardous sources and agents as well as stages of an emergency development. Another reason deals with pressing needs and keeping stereotypes in decision making on sharing scarce resources for emergency management. The funds needed to cope with the debilitating and devastating effects of emergencies and disasters have been solicited more eagerly and in greater volume than for prevention and mitigation. In particular, the proportion between actual expenditures on prevention and mitigation and expenses on recovery and rehabilitation was 1:1.5. This can partially be explained by the financial managers well-justified rush to reduce wherever possible expenditure on prevention, which may well be useless if no emergency occurs. At the same time such decisions are forced by a strong public demand from the affected communities to spend more and without delay on their own needs when an emergency or disaster really strikes.

Substantial changes in the Russian emergency and disaster legislation are under way, following two main directions. One involves the development of new laws and acts to prevent or decrease the risks associated with new hazard sources and agents that threaten social and environmental safety, or to cope with existing kinds of emergencies and disasters by enforcing new means and methods of legal regulation. Another direction of legislation change implies harmonisation and specification of the existing normative acts by developing and adopting amendments and comments to the existing laws, regulations and instructions. These provide for better distinguishing of areas of responsibility and coordination of the key bodies and services engaged in emergency management.

In practice, both directions are closely inter-twined, thus making a more or less holistic legal basis for regulating prevention, preparedness, response and recovery. Such a basis in Russia is constructed on a lawmaker approach that presumes the legal relations between community members, while emergency management constitutes a relatively independent special set different from those existing in the non-emergency environment. This logically requires the development and adoption of a single comprehensive normative act or a compact group thereof as a code, which would cover the total field of emergency management and integrate into a unified system all the laws and regulations in force in this field.

In Russia, the *Federal Act of the Russian Federation for Communities and Regions Protection in Natural and Technological Emergencies* (hereafter referred as *Federal Emergency Act*) was adopted in 1994. The Act established and enacted:

- the principles, tasks, functions and key features of organisation of the Integrated State System for Emergency Prevention and Response in the Russian Federation (RISE)
- responsibilities of the federal, regional and local authorities, special federal and

regional emergency services and volunteers in the area of civil protection
- the rules of public preparedness to emergencies and disasters
- the order of financial and material support to communities and regions protection in emergencies
- the tasks, functions and liabilities of the state expertise, supervision and control in the area of civil protection.

Given such coverage, many experts believe this comprehensive act is an umbrella to the existing laws and regulations that *in corpore* create the national emergency legislation. However, even if multifaceted, the Act is not fully comprehensive and even less exhaustive. It regulates protection of people and facilities against natural and technological hazards, but does not concern conflict-type emergencies (mass disturbances, riots, wars) that are or should be covered by the other acts. This is hardly a surprise, given even the best 'umbrella law' is insufficient for building up an integrated *system* of laws to regulate the legal relationship in the emergency management area. To create such a system, one needs a 'package' of interrelated acts that provide regulation both for specific functions of communities and regions protection in emergencies, and for those concerning specific types of emergencies as well as their incorporation or codification.

Typology of emergency and disaster legislation

This is still a dream for Russia, and precipitates a piecemeal and fragmented national emergency legislation rather than an integrated one. However, the country is on the way to bridging the gap, and in the foreseeable future matching the two basic sets of existing emergency acts. These could be conditionally labeled as systems, or integrated and specific, or particular acts. While the former covers the whole gamut of communities, regions and protection functions against any threat and in any type of emergency, the specific acts regulate either a particular or the whole set of emergency management functions in a specific type of crises.

Federalisation or centralisation of Russian emergency legislation is one of its most important peculiarities. Unlike the socio-economic policy of the Western world, for example, in the field of property relations, privatisation and taxation the development of legislation in the subjects or regions of the Russian Federation is still in its infancy. This partially stems from the higher degree of centralisation in the emergency management field in comparison with an economic and social policy in general that requires respective legislative reinforcement by the federal law. However, centralisation is a peculiarity of Russian history and culture over the centuries, including legal history. The outcome is that regional authorities lag substantially behind the federal government in development and enforcement of laws, while the situation is different in terms of other normative and prescriptive acts (regulations, orders, and instructions).

Integrated Acts provide the basic conceptual framework, principles, goals and tasks of the national emergency management policy in Russia. These include about 40 federal laws, of which we could mention just a few as the most important. First of all, the Constitution of the Russian Federation, adopted in 1993, contains specific paragraphs establishing citizens' rights for life, health and property, and the protection of these is the key objective of the state emergency and disaster policy. Notwithstanding, the Constitution provides for certain restrictions to these rights, to ensure the safety of the people in crises when the Russian President declares a state of emergency (see Konstitutsiya, 1993.)

For example, to provide security to people and protection of constitutional order in such circumstances paragraph 56 of the Constitution implies selective and temporal restrictions of rights and freedoms, excluding basic human rights for life, personal dignity, private life and so forth. These are more extensively described in the 1991 State of Emergency Act adopted in the former Soviet Union, but still in force in contemporary Russia (Zakon, 1991a). The Constitution also delineates the areas of responsibility and competence of both federal and regional authorities of the Russian Federation in prevention, preparedness, response and recovery from emergencies, disasters and catastrophes.

In addition, the *1992 Security Act* (Zakon, 1992a) provides formulation of the basic concepts associated with the mission and goals of emergency management, including 'security', 'safety', 'security and safety system'. It also establishes the principles, main components and functions of a security and safety system in emergencies. Paragraph 10 distinguishes the powers of the federal legislative, executive and judicial bodies within the national security system. While a similar distinction between the federal and regional authorities is also mentioned, it is more clearly formulated in the relevant paragraphs of the Constitution of the Russian Federation, which were adopted one year after it. An inventory of the basic forces and means to ensure the state security and safety policy implementation is specified in Paragraph 12 of the Security Act, supplemented later by decrees and regulations by the President and government of Russia.

The *Federal Emergency Act* serves as a focus of integrated acts concerning non-conflict peacetime emergencies. Adopted in 1994, it has been supplemented by a series of governmental regulations on classification of natural and technological emergencies and disasters, community preparedness, tasks, functions and organisation structure of the RISE system, its forces and emergency information exchange.

In conflict-type emergencies these are regulated by other federal laws involving the activities of state security departments, including the Ministry of Internal Affairs, the Ministry of Defense, the Federal Security Service, the Federal Frontier Service and others. For example, the *Civil Defense Act*, enforced for the first time in the history of the former Soviet Union and Russia as late as 1998, defines the tasks and responsibilities of authorities and state powers in community and regional protection in warfare (see Federalnii Zakon, 1998a).

To a certain extent such a legislator's approach has its own logic that presumes the Federal Emergency Act should supplement and specify the more generic Security Act, leaving alone the Constitution with respect to natural and technological disasters. However, this approach restrains the integration function of the *Federal Emergency Act* and moves it closer to being a specific act. For example, this breaks an organic link between the given act and the *State of Emergency Act*, primarily Paragraph 4(a). More importantly, the *Federal Emergency Act* narrows the scope and comprehensiveness of the RISE system which, according to its logic and title, should be a collective or public security system, thus providing communities and regions protection against *all* kinds of threats.

These shortcomings of the Russian emergency legislation flow from an outmoded conceptual interpretation of crises, focusing on the type of hazards rather than their causes and effect on communities. Such a conceptualisation has been extensively and rightly criticised in the last 10-15 years by international scholars who accentuated the need to use social and sociological criteria (Quarantelli, 1998). Even more importantly, operational organisations and governments in the West consider the all-hazards approach as most applicable and effective in their national emergency management systems. For instance, US and Canadian disaster legislation and management stresses the coverage of all kinds of threats to societal and environmental safety as a key principle.

Specific Acts make another set within Russian emergency legislation. These may be subdivided into two groups: *emergency-specific laws and regulations*, covering particular types of emergencies, and *emergency service-specific laws and regulations*, addressing particular emergency management function or service activities.

Examples of *emergency-specific acts* are the federal laws for social protection of the people affected by the South Urals (Cheliabinsk-65) and Chernobyl radiation disasters, or the laws regulating the use of atomic energy and provision of radiation safety (see Federalnii Zakon, 1993b, 1995e, 1995f, 1995i). Other examples are the *1995 Road Safety Act*, the *1997 Hazardous Facilities Act* and the *Hydro Technical Systems Safety Act*, which respectively deal with transportation accidents and accidents at hydropower facilities and emergencies and disasters provoked by these (see Federalnii Zakon, 1995a, 1997a, 1997b).

For geophysical hazards, the respective acts lack federal laws specially regulating community and regional protection, unlike laws that have existed in the West for a long time, such as the *Flood Insurance Act of 1968* and the *Earthquake Hazards Reduction Act of 1977* in the USA. In Russia these issues are covered by either respective paragraphs (sections) of the integrated laws or more widely by the presidential decrees and governmental regulations.

The reasons are twofold. Firstly, there is the legacy of Russian historical tradition as a highly centralised country, with executive power dominating legislative power for centuries. Secondly, natural disasters in Russia are relatively less destructive than technological ones which attract most public concern and thus obtain more lawmaking from federal legislators. Whatever the reason, the existing decrees and regulations are insufficient, both in terms of legal power and coverage of natural disasters. Even major floods, the most devastating geophysical hazard in Russia, remain untouched by the federal emergency and disaster legislation.

An analogous problem exists in the legal regulation of the conflict-type emergencies, that practically lack specific federal laws. The unique exception is the 1992 Defense Act, which covers civil protection issues in armed conflicts, wars and terrorist attacks (see Zakon, 1992b). Other pressing issues associated with conflict-type emergencies are addressed only by presidential decrees and governmental regulations, referring to specific sociopolitical conflicts (e.g. those in Northern Osetia, Ingoushetia and Chechnia in 1994–96). This is further complicated by the exclusion from the Federal Emergency Act of these type of emergencies and disasters, thereby leaving them out from the organisational framework of the RISE system, as well as from the federal emergency and disaster legislation system.

In another set of emergency and disaster acts—the *functional Acts*—one can distinguish those regulating particular functions or areas of activity of specific emergency services. For example, these include the *1991 Militia (Police) Act, 1992 Penitentiary Criminal Institutions Act, 1994 Fire Safety Act, 1994 Emergency and Rescue Service and Rights of a Rescuer Act, 1995 Federal Security Service Act, 1997 Internal Troops Act* (see Zakon, 1991b, Federalnii Zakon, 1995d, 1995g, 1997c). Numerous presidential decrees and governmental regulations supplement these federal acts. Meanwhile, however useful for research and better understanding of the spectrum of existing specific acts, their delineation is to a great extent conditional. In practice, many of these marry both emergency-specific and function-specific characteristics, which cover certain types of emergencies or disasters as well as particular emergency service functions.

Legal regulation of prevention, mitigation of and preparedness to emergencies and disasters

Almost every integrated and specific act contains multiple paragraphs and sections, regulating emergency prevention and mitigation and providing for development and implementation of measures to facilitate early detection and mitigation of risks and threats to human lives, health, social and economic welfare, national integrity and constitutional order. This should be achieved through legally-demanded expert examination of the project drafts and auditing of the actual activities to filter those considered unacceptable by the safety (risk) criteria. In 1997 alone, the central expert councils of the Ministry of the Russian Federation for Civil Defense, Emergencies and Natural Disaster Response (EMERCOM) and the State Environmental Protection Committee issued more than 130 and 80 impact statements respectively (Gosudarstvenii Doklad, 1998: 151). Russian law also prescribes preventive measures to ensure integral security and safety while carrying out routine monitoring, control and supervision functions provided by responsible state, public and private organisations.

However, the scope and depth of existing emergency acts could hardly be considered exhaustive. The bulk of these involve no more than a general list of requirements and not a specific mechanism, or respective sanctions for non-compliance. In addition, the standards that should serve as a main calibration instrument for specialists are often reconsidered. Sometimes this weakens these standards to decrease artificially the severity of an emergency, to calm the affected people and avoid liability of responsible agencies and officials. For example, this happened a few times within the last 15 years with the maximum permissible concentration of nitrates in food products and radionucleides in the milk that have been used as safety standards in mass poisonings and radiation emergencies (see Porfiriev, 1993).

Industrial personnel safety and *industrial safety acts* occupy a special place among the laws and regulations related to prevention and mitigation of technological emergencies. In the former Soviet Union and contemporary Russia these are known as Fundamentals of Labor Security Law of the Russian Federation (as amended in 1993) with the basic concept 'labor security' being, in our opinion, linguistically incorrect and misleading in substantive terms. Although the above-mentioned act is associated with prevention of technological accidents and emergencies, it is biased towards passive methods of personnel protection against industrial hazards, including compensation payments for post-impact health effects. Meanwhile, prevention and mitigation of disasters by using information-intensive technology and flexible management organisation are scarcely mentioned in the Russian law, unlike other industrialised countries.

In emergency prevention and mitigation-oriented laws and regulations the *land use planning acts, construction standards* and *operation licenses* are important. Sanitary and environmental constraints prohibit the construction of hazardous facilities in dangerous proximity to residential districts and force a protection zone around such facilities. These constraints, along with operation license requirements, are established in the *1991 Sanitary and Epidemiological Welfare of People Act*, the *1991 Environmental Protection Act*, the *1995 Environmental Impact Assessment Act* as well as construction standards developed and enforced by Russian construction departments (Zakon, 1991c, 1992e, Federalnii Zakon 1995h). In general, the latter provide efficient regulation of building construction in respect of existing hazards, although the earthquake disaster in Neftegorsk in 1995 revealed this is not always guaranteed (Porfiriev, 1998: 170-190).

Industrial safety declarations for the hazardous facilities are another legal

method of mitigating possible technological emergencies. Although well-known in the West, this regulation instrument is relatively new in Russia. Given the long-term under-estimation of technological safety issues in Russia, it is hardly surprising that government regulation demanding industrial facilities to declare their safety status in a special document was passed as late as 1995. Two years later EMERCOM and the Federal Mining and Industrial Supervision of Russia (GOSGORTECHNADZOR) approved the procedure, and the inventory of both industrial facilities and expert organisations involved in safety declaration. As a result only 5% of those who should have submitted such a declaration did so in 1997 (Gosudarstvennii Doklad, 1998: 154).

In addition to prevention and mitigation, most *specific acts* contain paragraphs and sections regulating emergency preparedness activities. Contingency planning, training and upgrading of emergency workers (fire, militia, rescue, medical care and other personnel), public information and training, fund raising, reserves accumulation and resource mobilisation constitute the basis of activities prescribed. For example, the procedure of accumulating state emergency material and technical reserves is determined by the *State Reserves Development Act of the Russian Federation of 1992.*

As a rule, Russian law distinguishes, albeit not always consistently, the responsibilities and functions of respective authorities and public administration bodies involved in emergency management. The *Federal Emergency and Rescue Service and the Rights of a Rescuer Act* is a notable exception, providing regulation of emergency training. Specific requirements and procedures for planning and personnel training are described in detail in numerous departmental orders and manuals.

However, such orders, instructions and manuals are insufficient to cope with the crisis if specific acts or special paragraphs which regulate preparedness are lacking, especially those concerning interaction between responsible state departments and emergency services. This is confirmed by the response to specific non-conflict emergencies, such as the major earthquakes in Spitak (1988, 25,000 deaths) and Neftegorsk (1995, 2000 deaths). Other evidence comes from lessons learnt responding to large-scale conflict-type crises, such as the terrorist attacks at Budennovsk (1995), Kizliar (1996) and Pervomaiskoye (1996), which led to more than 100 deaths.

Among the missing laws are the constitutional and federal acts for chemical safety, transportation of toxic and highly-hazardous materials, and earthquake and flood disasters. Some of these were developed long ago but have not been adopted, or have been adopted quite recently and applied on a limited scale, while others have not even been ear-marked by the legislators as projected for the nearest future.

Legal regulation of response to and recovery from emergencies and disasters

Specific Russian acts also include paragraphs and sections that provide regulation for disaster response and recovery, implying both legal sanctions and motivation to eliminate or alleviate the social and environmental effects of a crisis, irrespective of emergency type. These include search and rescue operations, evacuation, medical care support, relief and compensation to the affected people, rehabilitation and reconstruction of destroyed facilities.

In the former Soviet Union the respective federal laws were lacking till the late 1980s and such activities were carried out within the legal framework of governmental regulations alone. In 1987 the *Enterprise Act* was enforced to compel industries and facilities to compensate for damage incurred as a result of non-compliance to existing standards. The Act also provided for payment of fines to responsible environmental supervision agencies. These sanctions have been kept in the Russian federal law, in particular the *Environmental Protection Act* as amended, *Consumer Rights Protection Act* and *Environmental Impact Assessment Act* (see Zakon, 1992c, 1992e, Federalnii Zakon, 1995h). However, given negligible fines and the near-bankrupt state of enterprises in the economic conditions of the 1990s, these sanctions were much less efficient than expected.

Among the specific acts regulating disaster response and recovery, the *insurance legislation* plays a unique role, both in the former Soviet Union and contemporary Russia. This kind of legislation in many Western countries has an integrated or comprehensive character. This provides expected loss reduction at every stage and phase of emergency management, and is not constrained by compensation to the victims. Moreover, it is primarily mitigation-focused, and stimulates the insured to keep within established standards and recommendations, providing personal and family safety and continuity of business.

However, in the former Soviet Union, insurance was reduced to routine compensation to victims, with peculiarities of payment procedure. In conditions of absolute state ownership of enterprises, the State Insurance Company (GOSSTRAKH) was a unique monopolistic life and property insurance agency. With compulsory and centralised insurance, GOSSTAKH and its affiliates were empowered to collect premiums from all Soviet citizens and enterprises. Part of the collected premiums was transferred to a special reserve fund, which was used to pay the victims of disasters. Rather than real insurance obligations, these payments were actually allowances for the loss of the breadwinner, permanent disability and so on, which somewhat alleviated the damage incurred by emergencies or disasters. The payment procedure and amount of allowances were specified in regulations issued by the central government, and national and republican insurance laws were lacking. Such a procedure, along with negligible amounts of allowances, impeded the efficiency of the existing insurance system and predetermined its low priority within national emergency management policy.

In contemporary Russia the situation has somewhat improved, with crucial federal laws for insurance development being adopted in the 1990s. These include the *1991 Medical Insurance of the Russian Federation Citizens Act* and *1992 Insurance Act* (see Zakon, 1992b). Some insurance-related norms were also established in *Environment Protection Act Militia (Police) Act* and *Military Servicemen Status Act* (see Zakon, 1991b, 1992e, 1993). Closely associated with these are federal laws that provide additional guarantees and compensations to servicemen who operate in states of emergency and armed conflicts. In particular, such laws include those adopted in 1993 and 1995 in connection with regional armed conflicts in the Northern Caucasus and other hotbeds (see Federalnii Zakon 1993a).

Worth special mention in this context are laws and regulations that establish compulsory personal insurance for emergency personnel, including fire, militia, rescue, medical care and some other workers. These also provide for lump-sum allowance compensation to an emergency officer or their family if they are killed or injured in response or combat action and disabled with further service ruled out. *The 1998 Federal Act for Compulsory State Insurance of Servicemen, Militiamen and Tax Policemen* established the allowance to the family of an emergency officer killed in action as equal to a 25-month salary for each family member. The same allowances to a disabled officer range between 25- and 75-month salary equivalent depending on injury severity (Federalnii Zakon, 1998b).

However, the insurance market and national insurance policy in Russia are still in the cradle and in respect to emergency

management are primarily compensation focused. In addition, despite the positive changes in the 1990s, a number of important specific acts that would regulate property and other liabilities of individuals and organisations in disasters are lacking. These include damage risk insurance, insurance of hazardous facilities, liability for risk associated with the possible effect of an accidents or emergency, and others that are widely used in the West. In this context the *1992 Insurance Act* (Zakon, 1992b) could be interpreted as an integrated one only with substantial reservations, and in the foreseeable future should be rather considered as a specific act.

Within specific emergency and disaster law, worth distinguishing are the acts that regulate *the status of and regime of activities within specific emergency or disaster areas.* In Russia, some of these have existed for many years, leaving alone a substantial greater number of 'short-living' crisis zones. However, a comprehensive federal law that would provide clear-cut criteria for distinguishing and establishing the status of these areas, and serve as a 'legal umbrella' for already-existing specific acts and governmental regulations that cover concrete cases, is lacking so far. Even the integrated *Federal Emergency Act*, which provides the definition of these areas, only mentions a procedure for establishing their boundaries by field emergency coordinators. In this respect the *Environmental Protection Act*, which determines the status and schedule of activities within environmental emergency and disaster areas, could serve as a unique exception.

To a certain extent the existing law lacuna is filled by the federal laws, which regulate the status and economic activities within specific radiation disaster areas. These are a legacy of the South Urals major accidents in 1957 and 1961, nuclear testing near Semipalatinsk in Kazakhstan in 1950–60s and the Chernobyl disaster in 1986. Such federal laws, although delayed considerably, were eventually developed and enforced in Russia. However, specific acts covering other disaster areas (e.g. South Siberia, Tatarstan, Bashkortastan and Kalmik republics) that have considerable environmental contamination and degradation, are still lacking. Instead, the regional executive bodies and local administrations rely upon the general clauses of the national *Environmental Protection Act* or specific government regulations.

Last but not the least, the emergency legislation that regulates response and recovery involves two other important areas. One is relief aid to affected communities, in particular to refugees. Another is post-impact measures to prevent or mitigate future disasters. Within these, particular emphasis should be on investigation and research of the preconditions and causes of the crises to reveal organisational pathologies, responsible persons and contingencies that led to such crises.

In Russia, federal emergency and disaster relief laws and refugees acts have not yet been developed. Meanwhile, official records cite more than 700,000 refugees living in Russia in 1998. The situation looks much better in respect of federal laws, which regulate investigation of the causes of accidents, emergencies and disasters. Some of these acts have been effective since the former Soviet Union, although with some changes in titles and amendments. In this context one could mention the respective clauses of the 1996 Criminal Code of Russia, the 1984 Code of Administrative Offenses (the Tort Law amended as 1997) and some others (see Kodeks, 1998, Ugolovnii Kodeks, 1996). Specific paragraphs of these acts, along with numerous regulations and instructions of the responsible federal ministries, address the issues of carelessness, non-compliance to industrial and technological safety rules and other violations of the law that lead to emergencies and disasters.

For instance, the *1995 Operation Search and Investigation Act* and the *1995 Federal Security Service Act* provide regulation for early detection, revelation, prevention and conduct of counter operations against terrorist attacks, hostage seizure and other criminal conflict-type emergencies (see Federalnii Zakon, 1995b, 1995c). However, given the generic character of these and some other acts that are not specific to the emergency management field, this area of emergency legislation needs further development and sophistication.

Conclusion

The experience of the Russian emergency and disaster legislation reveals ambiguous trends in its development and practical implementation at the brink of the new century. On the one hand, the number of federal, regional and departmental acts has increased, covering a wide range of critical aspects of emergency management and respective juridical relationship between its stakeholders. But the scope and depth of existing legislation is still far from meeting the real needs of civil protection and crisis management in Russia. This calls for a more thorough and critical analysis of the past efforts made on a national level in this area. In addition, the world experience of coping with non-conflict and conflict crises is worth more intensive and comprehensive study, particularly that accumulated by the most industrialised countries. Successful marriage of these areas of research and implementation in practice, with particular consideration of the natural, cultural and social commonalities and peculiarities, would bring substantial improvementsin both national and international emergency and disaster legislation.

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