



EMA

The Australian Journal of Emergency Management

Vol 17 | No 2 | August 2002



Australian Aid

Making a difference in times of disaster

Are some of our
disaster policy
frameworks outdated?

How to get an Australian
rural community to adopt an
Environmental Health Plan

Combating floods
the NSW State Emergency
Service way

Snapshot



Queue waiting outside to identify bodies in the 'Death Shed'. From *Town and Country Journal* 9th August, 1902.

Photo from the collections of the Wollongong City Library and the Illawarra Historical Society.

The Mt Kembla Disaster

At 2pm on 31st July 1902 on a cold windless day, an explosion shook the Mt Kembla coal mine in New South Wales, killing ninety-six men. The explosion made the ground lurch and tremble as if hit by an earthquake, and witnesses from as distant as eight miles away reported sighting the great cloud of smoke which arose from the mountain. The scene at the mouth of the mine was one of comprehensive devastation. The explosion took place during a time of social and industrial upheaval, when safety issues had become a bargaining point between management and miners.

Piggin, S., and Lee, H., *The Mt Kembla Disaster*,
Oxford University Press, Australia, 1992.

Cover

Australian aid funded seeds, tools and rice being distributed in Aileu, East Timor.
Photo by David Haigh, courtesy of AusAID.



**The Australian
Journal of Emergency
Management**

Vol 17, No 2, August 2002 ISSN: 1324 1540

PUBLISHER

The *Australian Journal of Emergency Management* is the official journal of Emergency Management Australia and is the nation's most highly rated journal in its field. The purpose of the journal is to build capacity in the emergency management industry in Australia. It provides access to information and knowledge for an active Emergency Management research community and practitioners of Emergency Management.

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Grey Worldwide Canberra

Manager, Mark Godfrey

Editorial Coordinator, Anita Cleaver

Researcher, Margaret Wallis

Design and Typesetting by Whizzbang Art

CIRCULATION

Published on the last day of August, November,
February and May each year. Over 5,000 copies
are distributed quarterly without charge to
subscribers throughout Australia and overseas.

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publication may be forwarded to:

The Australian Journal of
Emergency Management

Main Road

MT MACEDON VIC 3441

Tel: (02) 6295 3662

Email: ajem@ema.gov.au

Or visit us online at www.ema.gov.au/ajem

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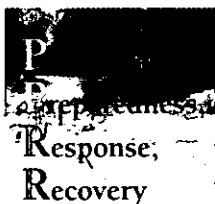
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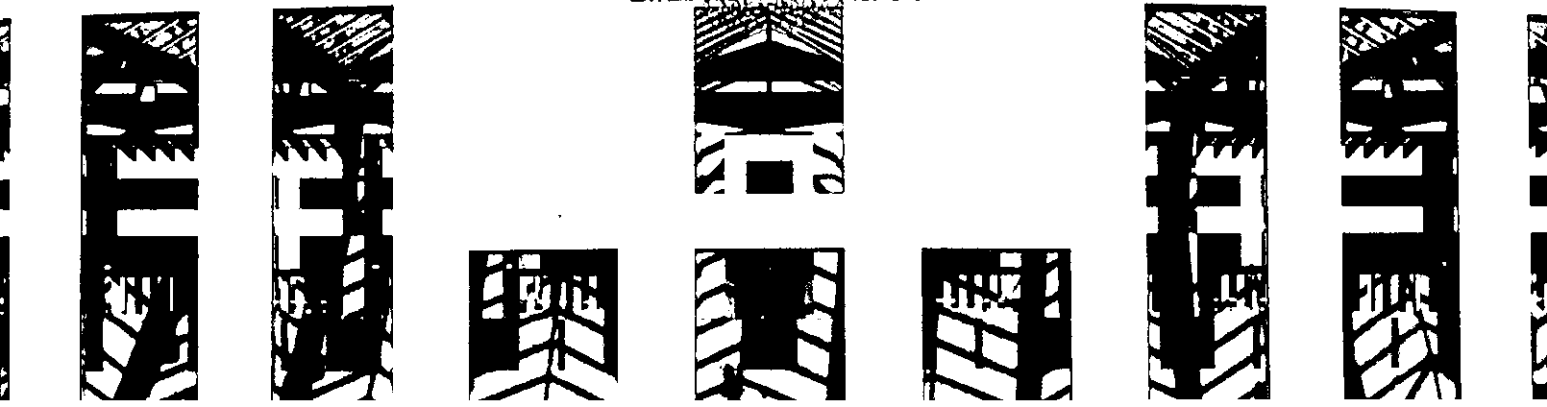
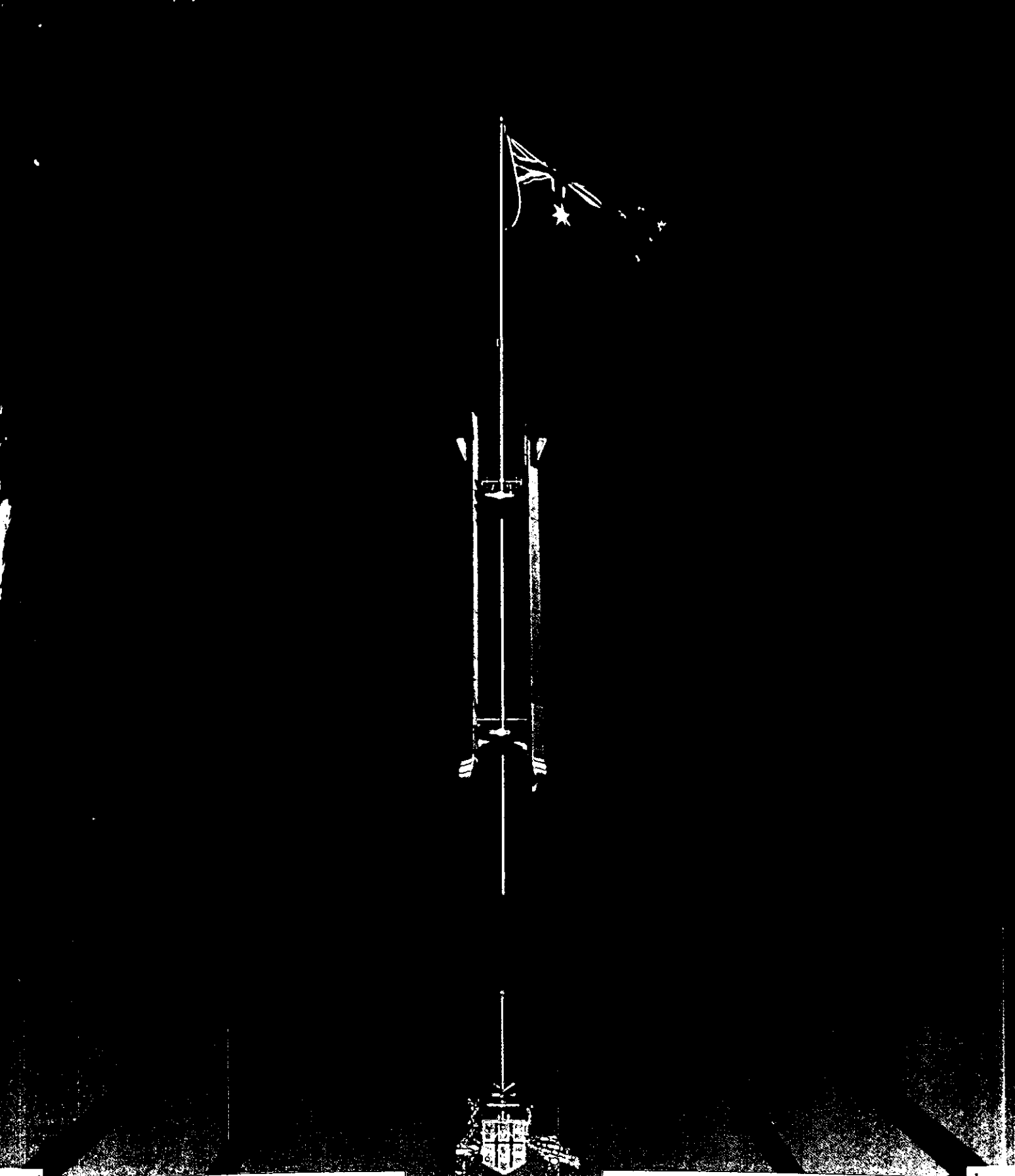
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FOREWORD

National Summit for Volunteers in the Emergency Management Sector

David Winterburn discusses EMA's achievements since the October 2001 Summit

It is widely acknowledged within the emergency management community that there are growing challenges within the volunteer emergency sector, and that positive action will be required if it is to remain viable in the mid to long term. Recognising this situation, Emergency Management Australia, supported by the Department of Family and Community Services staged the first ever National Summit for the sector with the provocative title of *Value Your Volunteers or Lose Them*.

The Summit, held in Canberra from 11 to 12 October 2001, provided opportunities for volunteers to discuss issues of concern and focused on the four themes of recognition, legislation/protection, training and funding.

Following the Summit, a comprehensive report and Executive Summary was produced. To increase awareness of volunteer issues amongst key stakeholders, both were widely distributed in hard copy and CD Rom. They are also available on the EMA web site.

At the Summit, the participants recommended, as an indication of solidarity with their American colleagues, a display of badges from all emergency management organisations present, be forwarded to the Mayors of New York City and Washington DC.

EMA arranged for the displays to be created and organised their transportation to America. They carried the following message:

"Australia's emergency management volunteers salute the dedication, professionalism and sacrifice of our American emergency management colleagues in responding to and recovering from the tragic events of 11 September 2001."

The Australian Ambassador to the USA presented the display to the

Mayor of Washington and the Australian Consul-General made a similar presentation to the Commissioner of the New York City Office of Emergency Management. Significant media coverage was obtained on both occasions.

One of the main recommendations of the Summit was that a national peak body should be created to represent volunteers in emergency management. Such a body has since been formed and is known as the Australian Emergency Management Volunteer Forum. Its primary purpose is to facilitate better communication between the organisations within it and to provide advocacy for the sector.

At its inaugural meeting held in April 2002, Major General Hori Howard (Retd) was appointed Chairman of the Forum. The Forum is currently reviewing the Summit recommendations to establish the most appropriate means of implementing them.

Having attended the formative meetings of this new group it was pleasing to witness the spirit of cooperation that exists between members who represent a diverse range of organisations. They are all keen to work towards the common goals of ensuring that the volunteer ethos thrives within emergency management and that the volunteers themselves are well trained, protected, resourced and recognised for the excellent contribution they make to the community.

Of further note is the progress that has been made in relation to volunteer issues within the Council of Australian Governments (COAG) Review of Disaster Relief and Mitigation. The COAG High Level Group has acknowledged that volunteers are an indispensable part of Australia's emergency management capability. A major milestone



Ambassador Michael Thawley (R) accepts a gift from DC Mayor, Anthony Williams, following the Ambassador's presentation of the EMA shield display to the District of Columbia, 29 May 2002.

for volunteers will be achieved if the recommendations relevant to them are accepted by COAG.

The National Volunteers Summit was a very significant and successful event. For the first time ever, and especially in the International Year of Volunteers, it brought together volunteers from many agencies around Australia and highlighted some of the current issues of concern to the emergency management volunteer sector.

Since the Summit, considerable progress has been made toward implementing the major recommendations arising from the event. Many of the issues are extremely complex and will require much effort on the part of the volunteers, their agencies and all spheres of government to resolve. Australia has a proud tradition of emergency management volunteerism that is in danger of being slowly eroded. If this tradition is to remain strong, all stakeholders must show how much they value their volunteers by working together to address the issues they have identified.

EMA intends to convene a further Summit for volunteers in 2003 to examine achievements since 2001 and determine future direction.

David Winterburn is EMA's Acting Assistant Director, Development Initiatives.

Australian Aid: making a difference in times of disaster

AusAID demonstrates how the Australian Government, through its overseas aid agency, has responded to different emergencies throughout the world.

Disasters can occur anywhere, anytime. They may be in the form of a natural event such as a cyclone or an earthquake or as a man-made phenomenon. In the case of a natural event, often there is no warning. Loss of life is almost inevitable and the social and economic costs can be heavy.

Some nations are better equipped to manage disasters than others. The reasons are varied. Factors such as political and economic stability, sophisticated technology and an informed and educated public can combine to avert disasters or limit the damage caused by them.

This paper outlines how the Australian Government, through its overseas aid agency AusAID, has responded to disasters in different parts of the world, drawing on the expertise of its own staff, of other government agencies and of non-government organisations.

Australians have always responded generously to international appeals for help in times of emergency and disaster. It is this same concern that drives the Australian Government's humanitarian and emergency aid program.

In 2000–2001, Australia provided in the order of \$107 million to help relieve human suffering caused by natural disaster, armed conflict and economic and political crises, mainly in Asia, the Pacific and Africa.

Australian governments have a long history of being able to respond rapidly to natural disasters overseas, drawing largely on specialists in overseas aid, the logistic capacity of the Australian Defence Force, and in particular through a standing and close arrangement with Emergency Management Australia.

Extra support has been provided through funding the work of Australian and overseas non-government organisations and by supporting the work of multilateral organisations such as the UN and the Red Cross.

The challenges have been many. Changing climatic patterns, when interacting with the poverty of vast populations in developing countries, have exposed increasing numbers of people to natural disasters. In the past few years there has been a sequence of particularly severe events.

However, it is not just natural emergencies that concern Australia's aid program.

Conflicts and social upheaval now reverberating around Asia and the Pacific also demand a response.

Increasingly these latter challenges assume substantial national priority and require a more complex response than do natural disasters. Such responses often draw on players from many areas such as defence and the civilian police force.

In addition, AusAID bilateral country programs are increasingly providing support to communities recovering from crises and are

assisting with indigenous disaster management capacities.

This paper offers examples of how the Australian Government, through its overseas aid agency AusAID, has responded to different emergencies.

Reconstruction in East Timor

In the second half of 1999, Australia became engaged in what has been its biggest humanitarian response to a crisis so far.

After supporting the right of the East Timorese to decide their own future, Australians witnessed a brutal turn of events in the former Indonesian province as militia groups went on the rampage, looting and destroying what they could, before setting fire to buildings, homes and churches.

During this violent period more than 200,000 people fled East Timor, most ending up in refugee camps in West Timor. Hundreds of thousands more fled their homes and sought refuge in surrounding mountains.

The destruction of their former homeland meant the East Timorese had to build a new country from the ashes.

Australians responded with generosity and compassion.

At AusAID headquarters in Canberra, an East Timor Unit was immediately formed to deal specifically with the immediate needs of the East Timorese.

At the time, the world's attention was focussed on the troubles of

Devastation caused by volcanic eruption in Rabaul, 1994.

Photo by Josephine Hutton





*Houses in many parts of Vietnam are vulnerable to the elements.
Photo by Tim Acker, courtesy of AusAID.*

Kosovo and Angola and the resources of the United Nations were stretched.

Australia's offer to take a substantial role in the reconstruction of East Timor was readily accepted and within six months, the Government had increased its initial funding of \$4 million to \$80 million.

AusAID provided immediate logistical support from Darwin, transporting equipment, food, goods and personnel to East Timor.

As part of its humanitarian response it sent food and medicine to refugees stranded in camps in West Timor and provided kits of seeds, tools and emergency shelter for people returning to their farms and homes.

The Australian Government also agreed to contribute to a Reconstruction and Development Trust Fund and a United Nations Trust Fund.

The first fund was set up to rebuild East Timor's economy, essential infrastructure and services. The second was to support governance

and administration, concentrating on developing the capacity of the East Timorese to run an independent East Timor.

Since then, Australia's commitment to East Timor has not waned.

During 2001–2002 its aid to East Timor is allocated at \$40 million and to date in total Australia has contributed \$131.8 million.

The funding has been earmarked for measures that reduce poverty and build on East Timor's capacity to govern a peaceful, democratic and independent country.

These include as a high priority, programs which increase and improve education, health, rural development, water and sanitation and governance.

It has helped the country prepare for independence by assisting with budget management and taxation systems, helping to establish land administration systems, providing English Language Training and scholarships targetted at the country's highest priority skill needs.

Other activities have been aimed at vulnerable groups and those living with limited access to resources, particularly outside Dili. This recognises the fact that 85 per cent of East Timor's poorest people live in rural areas, large tracts of which were burnt or severely damaged in the turmoil following the vote for independence. When people returned to their villages in November and December 1999, it was only weeks before the wet season, yet the next season's crops had not been planted. Without immediate action, a food shortage would have been imminent.

The Australian Government contributed to a large crop planting exercise by distributing tools and seeds in November. \$1 million was channelled through World Vision and Care Australia to buy seeds and tools and distribute them to farmers in the mountains for planting before the wet season. The seeds included a range of varieties such as pumpkin, tomato, bittermelon, corn, red beans, navy beans, kidney beans, mung beans, soybeans, choy sum, bitter gourd and lettuce. The vegetables formed the basis of a

high protein diet aimed at alleviating malnutrition. The farmers first planted those vegetable seeds that took between one and two months to grow, followed by the maize which took longer. Farmers were also given a 10 kilogram bag of rice each so that people had food on hand to eat and did not resort to eating the seeds. Basic tools such as shovels, crow bars and picks were included in the resettlement kits.

World Vision worked with local groups to decide where the seeds and tools should be distributed and met with local farmers to advise them on the planting.

Australia has also started longer-term development programs to increase food security, and help re-establish rural livelihoods in three districts, a water supply project to bring clean water to three districts and an oral health care program to help re-establish basic dental care through East Timor.

Australia is also providing training for East Timorese leaders and their support staff in democratic parliamentary processes. It has also helped build a functional Parliament building and provided technical advice for the elections held in August 2001.

Flood Control in Central Vietnam

Central Vietnam is one of the poorest regions in the country. In 1998, 48 per cent of those in the region were classified as living below the national poverty line, against a national average of 37 per cent.

The area is extremely vulnerable to natural hazards. It is subject to typhoons and tropical depressions from June to November each year and heavy rains from September to December.

The coastal plains are the most heavily populated. When overloaded by rainfall, waterways discharge their excess run-off into

the floodplains as flash floods. Therefore, when extreme weather events such as typhoons and floods occur, the impact on people, their agricultural lands and livestock and their infrastructure is calamitous. Development efforts are set back and the people remain trapped in a cycle of poverty.

In 1998 and 1999, exceptionally heavy rain fell in seven provinces in Central Vietnam with the result that much of the region was severely flooded.

Throughout November and December 1999, some areas received twice their mean annual rainfall in just a few days. By most estimates, these floods were considered the largest to have hit Central Vietnam in the past one hundred years.

The damage was considerable. More than 700 people lost their lives and many more were injured or stricken with disease while coping with the floods. Tens of thousands of people had to be evacuated to higher ground. Many families lost their homes and their livelihoods and had to be resettled to safer areas. There was immense destruction of and damage to homes, schools, clinics and other buildings. Rural and urban infrastructure was damaged or destroyed. Agricultural land was washed away or covered with sediment. Crops were destroyed and thousands of livestock were destroyed or became diseased. Local authorities did not have the resources, rescue materials or training to react effectively.

The cost of the physical damage in the central provinces was estimated to be more than US\$340 million and those most affected by the flooding lived in the poorest communities.

In December 1999, immediately after the second flood, the Government of Vietnam and the international donor community recognised the importance of responding to both the immediate

and longer-term needs of the people most affected by the flooding.

Australia was the first nation to respond in a practical way to a Natural Disaster Mitigation



AusAid has helped villagers rebuild their market gardens through the East Timor Community Assistance Scheme. Photo by David Haigh, courtesy of AusAid.

Partnership for Vietnam. The partnership grew out of a multi-donor mission that was undertaken in May 2000 and included representatives of the United Nations Development Program, the Asian Development Bank, the World Bank and the Netherlands.

The mission recommended that an Integrated Natural Disaster Mitigation Policy be formulated for Central Vietnam. The policy would take all issues that relate to natural disaster mitigation in Central

Vietnam into account and would result in an action plan that would include a range of short, medium and long-term measures.



*Australia provides assistance to East Timorese farmers.
Photo David Haigh, courtesy of AusAID.*

Australia has since signed a Memorandum of Agreement developed between the international donor community and the Government of Vietnam to underpin the partnership.

A Secretariat will ensure there is coordination between individual projects and avert conflicts in competing proposals. A Consultative Group will meet twice yearly to prioritise the allocation of resources and to discuss strategies and policy issues.

In signing the agreement, Australia recognises that limiting the damage

caused by disasters will help make its existing development work in rural communities in Vietnam more sustainable.

To this end AusAID commissioned a feasibility study into the Quang Ngai area of Central Vietnam.

It found three main causes of vulnerability of the poorer communities to natural disasters.

The first was increased exposure to hazards such as floods, storms and drought because of unplanned and uncontrolled developments.

The second was a lack of resources and emergency services for poor communities to prepare for and respond to natural disasters.

The third was unstable river behaviour, river bank erosion, saline water overflow into agricultural land and an absence of refuges for fishing boats during floods and storms.

The report recommended master planning for the Tra Bong and Tra Khuc river basins to provide guidelines and policies for future developments in the basins. It suggested better community preparedness for natural disasters and the development of appropriate infrastructure to improve the management of river banks and adjacent land, reduce losses from the intrusion of seawater and provide a boat refuge for fishing vessels.

This study will form the basis of an Australian-funded disaster mitigation project in Quang Ngai province, scheduled to start next financial year.

This work builds on other Australian assistance to help North Vam Nao Island in An Giang province in the Mekong Delta in Vietnam to help it withstand flooding and improve the quality of life for 270,000 people.

This \$10.3 million program is assisting local authorities and construction firms to build, operate

and maintain water control facilities to defer and limit the levels of flooding, improve draining and dry season water supply. By the time the project is finished, there will be a system of dykes, sluices and canals to prevent the entry of early floods into the project site of 31,000 hectares.

The project includes other measures to increase farm production through family training in crop and livestock production. It is also developing and funding a targeted credit program for women and poorer families and giving women the training and materials needed for better nutrition and sanitation.

As well as providing equipment and technical assistance for the final design and construction of the flood control facilities, Australia is meeting about 40 per cent of the total cost of the civil work up to a value of nearly \$3 million. It also is providing technical and financial inputs for the credit component, and health and agriculture components. The Government of Vietnam is meeting 60 per cent of the civil works, all resettlement compensation costs and will contribute nearly \$800,000 towards the establishment of a pilot farm.

The benefits of the program will extend to the entire population of North Vam Nao, or 270,000 people. Delaying the annual floods will increase crop yields and reduce the need for manually-built earthen dams. Credit, agriculture and health programs will be targeted particularly at women and young families with little or no land to enable them to take advantage of flood control.

Public Health in Mozambique

In March 2000, about 700 people died in heavy flooding in Southern Mozambique. Nearly 300,000 people were displaced, and at least ten per cent of cultivated area in the region was affected. Fishing boats and nets were lost, roads cut and power facilities damaged.

The Ministry of Health in Mozambique asked for technical assistance to help the country's health authorities respond to the immediate disaster and become better prepared for future floods.

The Australian Government, through AusAID, provided Mozambique with a team of experts from Victoria's State Emergency Service.

The team was charged with helping the Ministry of Health respond to the immediate crisis as well as trying to avert a broader public health disaster from epidemics such as cholera and malaria.

One of the main tasks during the mission involved training a range of Government health personnel in strategies to manage public health disasters, especially floods and to increase their capacity to deal with similar emergencies in the future.

The team was also required to identify further steps to assist in the management of post flooding.

The project was conducted against a history of endemic cholera of which there are regular outbreaks around the country because of poor sanitation and hygiene. While a cholera vaccine exists, it has limited efficacy and is too expensive and resource intensive for the Mozambican Government to consider making it generally available. Because of the floods and the resulting severe damage to water and sanitation systems, there was an outbreak of cholera in the affected area. In attempting to minimise its impact, the Government conducted public education campaigns to alert the population together with epidemiological studies to identify new cases to begin treatment early.

The team conducted its field research in the Gaza Province at Chokwe and Macia townships and the Chiaquelane temporary accommodation facility. The initial research included inspecting flood

damage to buildings, roads and irrigation facilities at Chokwe and areas of residual flooding, water and sanitation as well as housing. The informal market in the main township was also studied.

The team visited a temporary accommodation facility at Chiaquelane to examine water, sanitation, waste disposal, general living conditions and the Spanish Hospital. It also investigated the temporary accommodation camp at Macia.

Areas in and around Maputo City, Catembe and Matola were assessed for evidence of flood damage on the effect on local infrastructure.

The Xai-Xai area and the Limpopo River flood plain were studied. Visits were then made to the

ounded by the poor state of the small fire service that had inadequate equipment, training and maintenance.

There was no evidence of dam safety emergency plans for any of the dams in Mozambique or a coordinated flood warning system with the neighbouring countries from which most of Mozambique's rivers originate.

The existing limited flood warning system (mainly using school teachers) did not co-ordinate the many river level readings, automatic river gauges, rainfall gauges and local indicators operated by various Government bodies and private industry for their own benefit.

Several areas affected by landslip and erosion in the Maputo City

AusAID bilateral country programs are increasingly providing support to communities recovering from crises and are assisting with indigenous disaster management capacities.

Provincial Director of Health in the Gaza Province, the Institute for Disaster Management, an emergency accommodation centre and associated hospital, health post, health centre and a cholera treatment centre. Consideration was given to the public health implications from local water, sanitation and waste disposal systems.

A large cholera treatment centre in Maputo City was examined in detail.

The Australian team found the country lacked the funds and resources to allocate to a comprehensive disaster prevention program although it recommended a range of actions that could be taken without incurring significant costs. This situation was comp-

area were found to be in need of stabilisation before they could be repaired and future damage minimised.

The team recommended a water chlorination project be implemented in conjunction with a public education campaign as a matter of urgency.

It found that low-lying stagnant water in Chokwe and its surroundings, especially the market, needed urgent anti/larvae, anti/mosquito treatment for malaria prevention and measures taken to reduce the high risk of an outbreak of diarrhoeal illness, in particular cholera.

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Prevention, Preparedness, Response, Recovery – an outdated concept?

Mal Crondstedt questions the relevance of the Comprehensive Approach to managing emergencies and disasters.

Disaster policy in Australia is led and defined by some basic principles adopted and promulgated by the Commonwealth for many years. Although Constitutionally the States within Australia have the legal role of providing for day-to-day emergency and disaster policy and services, the Commonwealth

in Australia. Encompassing emergency prevention, preparedness, response and recovery, it is defined in the Australian Emergency Management Glossary as: "The development of emergency and disaster arrangements to embrace the aspects of ...PPRR" (EMA, 1998, p24). Further, Emergency

All Hazards Approach, All Agencies Approach and Prepared Community) The same policies have been adopted by most emergency management policy makers around Australia and have been incorporated into high-level policy documents such as the State Emergency Management Committee's (SEMACE) 'Policy Statement Number 7' (WA Government, 1997).

As mentioned earlier, PPRR was a concept developed some twenty-three years ago, well before risk management as we know it today was developed. Though PPRR has found a 'place' in the new methodology, the 'fit' is not neat and has inherent problems.

has, for some years, provided leadership and training in this field. As a result the basic emergency or disaster policy framework and associated definitions developed by the Commonwealth have been widely adopted by the States and Territories.

On such principle is the notion of a *Comprehensive or Prevention, Preparedness, Response and Recovery (PPRR)* approach to managing emergencies and disasters.

This paper examines the rationale and policy surrounding the adoption and use of the Comprehensive or PPRR approach and challenges its relevance in contemporary emergency management. It also explores the source of the concept and research challenges to its existence in contemporary emergency management policy.

Background to PPRR

The *Comprehensive Approach* is one of the fundamental concepts of emergency management promoted

Management Australia (EMA) details the concept on its website (EMA, 2001) as follows:

"The Commonwealth recognises four elements of emergency/disaster management, namely: prevention/mitigation; preparedness; response; and recovery...and advocates the development of ...arrangements to embrace all of them."

EMA then goes on to detail the elements themselves:

"The first element is to prevent or mitigate...hazard impact. The second element is to ensure preparedness within the community. The third element is to provide an effective response, immediately following... hazard impact. The fourth element is to provide for recovery of the community affected by the hazard impact."

The *Comprehensive Approach* is one of four key principles espoused by Emergency Management Australia as being the core policies to be pursued by emergency and related agencies (The others being the

The approach has also been promoted as best practice to international markets through at least one publication sponsored by the Asian Development Bank and drawn from largely Australian sources (Carter, 1991).

PPRR originates in the work of the State Governors' Association in the United States (1978). It was first espoused as *Comprehensive Emergency Management (CEM)* suggesting a policy framework encompassing Mitigation, Preparedness, Response and Recovery. This framework was subsequently imported into Australian emergency management policy and has held prominence in policy ever since, having been adopted by many (if not most) Australian emergency management authorities. The principles have been adapted somewhat with the substitution of Mitigation with Prevention (though mitigation often appears appended to, or a part of, prevention).

It is apparent, from the author's reading, that there are two broad rationales for the PPRR model. Firstly, PPRR has been represented as the sequence or phases of

emergency incidents and therefore describes the events that occur before, during and after an event. Secondly, the model has been used to categorise a 'menu' of available emergency management strategies.

A review of a sample set of state-level Hazard Management Plans developed by the State Emergency Service of WA reveals that PPRR is a central theme around which the hazards are managed (SES, 1999). The plans are largely organised around the PPRR elements and detail specific state-level strategies against each principle. In addition, the Fire Services of WA posit PPRR as four of the eight 'Strategic Intentions' in their Corporate Plan 1999–2001.

At least two other Fire Services in Australia use the PPRR model in some way. The Queensland Fire and Rescue Authority, in its 1998/99 annual report categorises its services using Prevention, Preparedness and Response (leaving off Recovery as an applicable service) (QFRA, 1999). The Metropolitan Fire and Emergency Services Board (Melbourne) similarly lists PPRR as a corporate strategy (MFESB, 1998).

Recent Developments in Emergency Management

There has been a general policy shift within the emergency management community in recent years associated with two key issues:

The shift from an internal agency focus to a community-centred focus – a shift away from delivering a limited range of services (usually response based) to more intelligent resource allocation based on risks – business-like management and outcome based performance.

Salter (1998, p11) illustrates some of these shifts in Figure 1.

With this shift has been a concentration on the best practice models of resource allocation and maximising return on investment. A clear watershed in this field was the development and publication of the joint *Australian / New Zealand*

Figure 1: Shift from internal agency to community-centred focus (Salter, 1998, p.11)

| FROM | | TO |
|------------------------------|---|--------------------------------|
| Hazards | → | Vulnerability |
| Reactive | → | Proactive |
| Single Agencies | → | Partnerships |
| Science Driven | → | Multi-disciplinary approach |
| Response Management | → | Risk Management |
| Planning for Communities | → | Planning with Communities |
| Communicating to Communities | → | Communicating with Communities |

Source: Salter (1998)

Standard on Risk Management AS 4360:1995. This Standard was written in generic style for adoption across both the public and private sectors. Numerous publications have since built on the foundations of the Standard, extending its sphere into public administration (AGPS, 1996), and emergency management (EMA, 1999).

In terms of emergency management, the guidelines for applying the Standard's methodology have been embraced, though the EMA concepts detailed earlier remain largely unchanged. PPRR or the

Comprehensive Approach has now found a place as emergency management's set of available treatments. Figure 2 outlines the risk management approach and where PPRR currently sits.

Figure 2 generalises the risk management approach as it applies to emergency management, though serves to illustrate where the PPRR elements 'sit'. In this system, it is clearly intended that PPRR categorise available emergency treatments rather than describe a continuum or cycle of events. The *Guidelines for Emergency Risk*

Figure 2: The place of PPRR in the risk management approach



Management (1998, p10) states, "This step takes each risk and identifies a range of prevention, preparedness, response and recovery treatment options." The Guidelines then go on to recognise a broader range of treatments beyond the traditional PPRR. This clearly signals an intention to guide the reader to examine other options, and probably recognises that the Guideline authors are starting to think beyond PPRR, though PPRR remains as the first 'appearing' model.

Why challenge PPRR?

Recently some authors have challenged the PPRR paradigm in some way. Although the author cannot find any material that explicitly and directly challenges the usage of PPRR as a central concept, at least two writers provide points of view that challenge its foundations.

Kelly (1999, pp 25–27) reviews a variety of models that describe the disaster cycle. Kelly also posits a model for 'complex non-linear events'. The model attempts to assist disaster managers "... define and understand[sic] the relationship between inputs and impacts starting from the comparison of two factors, rather than beginning with the imprecise disaster stage classification approach" (ibid, p27).

The model posited by Kelly appears to have merit, though requires more work to clarify its inherent process. Notably, Kelly suggests that software tailored to the model will facilitate its application – this may make it more 'user-friendly'.

Esplin in a short paper titled *Repositioning Emergency Management in a Larger Context* (2000), challenges emergency managers and policy makers to shift from their current 'view of the world'.

It suggests that there are considerable drivers for change within and without the industry that will de-stabilise some strongly held concepts and beliefs. Though not explicitly stated, the author believes that PPRR is one of the concepts that is affected by the changes suggested by Esplin.

As mentioned earlier, PPRR was a concept developed some twenty-three years ago, well before risk management as we know it today was developed. Though PPRR has found a 'place' in the new methodology, the 'fit' is not neat and has inherent problems.

First of all, PPRR sets-up artificial barriers between the four elements and therefore implies a clear delineation between the elements. This delineation leads to unnecessary discussion and concentration of effort at categorising treatments into one of the elements. It seems that as much debate derives from arguing the appropriate category of a treatment than the appropriateness or otherwise of treatment.

Secondly, the elements always appear equally important in all circumstances. The four categories appear equal in weight and imply that one must always have strategies or treatments that fall under each element. This 'forced' weighting does not recognise that a risk management approach may not reveal strategies that neatly, or at all, fall under all elements.

Thirdly, the elements assume a sequential consideration of PPRR and that they must be considered and implemented in the same order all the time. This assumes that treatments are inextricably linked to the emergency cycle and that therefore treatments follow the same order. The Risk Management model however, does not make this

assumption and leads one to select the most appropriate treatments, regardless of order and categorisation.

Fourthly, the elements appear biased towards 'action' based treatments, whereas there may be softer options involving social dimensions. PPRR, tends to relate to activity and physical actions. This focus on action appears to be a carry-over from the emergency management paradigm that focussed on the hazard rather than vulnerability. Emergency Risk management now focuses on the interaction between the community and hazard within a particular context. Such consideration goes well beyond the physical hazard and includes socioeconomic and psychological vulnerability factors such as income, perceptions, networks/support groups, and the like. Many of these factors do not easily lend themselves to categorisation within the PPRR framework.

In summary, PPRR constrains broad and innovative thinking about risk treatments. It confines and channels ones approach to investigating and selecting the most productive risk treatment path.

An alternative approach

The risk management methodology should guide the selection, application and review of risk treatments, *without* the use of PPRR as a means of categorising treatments. The selection of treatments should be based on criteria founded on efficiency, effectiveness and economy. Efficiency provides the basis for cost/benefit comparison across treatments; effectiveness provides the basis for impact on risk level and risk criteria set up in the context; and economy is used as a basis for assessing resource implications for possible treatment selections.

PPRR should therefore be removed from usage in the emergency management community. The treatment selection methodology and criteria in the latest *Guidelines for Emergency Risk Management* remain suitable. However, once a large range of treatments have been brainstormed and aligned with appropriate criteria/options, questions testing the appropriateness of treatments, should be phrased as follows:

1. What will the impact of the treatment be on the assessed risk and how well will it meet the risk criteria (established at the 'context' stage)?
2. What is the cost/benefit ratio?
3. What is its total cost?
4. How acceptable will the treatment be in light of the environment in which it will be implemented and monitored (eg. organisation/political)?

The above questions are not exhaustive and are only intended to guide thought.

Un constrained thinking about possible treatments is a critical feature of deriving innovative, new and possibly better ways of treating risks. Participants in the risk management process, in particular while sourcing and selecting treatments, must therefore be able to look beyond a framework that emerged from an era well prior to the current risk management framework.

Related issues

While examining the issue of PPRR and its continued existence as a central emergency management concept, the author noted that there might be a need to question the existence of other accepted concepts. As noted at the outset of this paper, there are four concepts espoused by EMA as 'Australian Emergency Management Principles':

- All Hazards Approach,
- Comprehensive Approach (the subject of this paper),

- All Agencies Approach, and
- Prepared Community.

There may be a need to examine the concept and challenge them in a similar manner to PPRR. This however will be the subject of a separate paper (or papers!).

Conclusion

PPRR or the *Comprehensive* approach has been in common use across Australia since its importation from the United States over twenty years ago. It has become entrenched in emergency management plans, organisational corporate/strategic plans and is in common usage in the emergency management community.

Much has changed in the field of emergency management in the years since PPRR was adopted. Organisations have become more community and business focussed. The Risk Management standard was developed and adapted to the industry and numerous related contexts. Given the greater focus on risk management as espoused by the standard, it seemed timely to challenge some of the concepts that have endured the surrounding changes.

PPRR, it has been argued, is too constraining a concept in contemporary emergency management. Though valid and useful for focussing attention in the absence of any other suitable model, it is no longer as useful to emergency managers. The application of risk management methodology, complete with adequate efficiency, effectiveness and economic criteria (among others), will better focus our attention on appropriate risk treatments.

The next step is to challenge the remaining concepts and associated emergency management paradigms.

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Mal Cronstedt is Acting Manager, Community Education with the Community Safety Division of the Fire and Emergency Services Authority of Western Australia (FESA).

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A combat agency and its hazard: a New South Wales State Emergency Service perspective on the management of flooding

The best way to combat floods is to build better practices and agencies argues Chas Keys

The New South Wales State Emergency Service was formed, nearly 50 years ago, as a direct result of flooding. The period 1949–55 had seen floods in many parts of the State, some of them catastrophic in their consequences:

Perhaps the principal responsibility that the conferring of combat agency status implies is that the agency becomes expert in the management of its hazard.

dozens of people had died, massive damage had been wrought on urban and rural assets and community life had been severely and repetitively disrupted across large areas. In response the government of the time decided that an agency was needed to coordinate community reactions to the flood threat and to protect and sustain communities during and

after flood events. For many years the SES's actual role in flood management was only vaguely defined, however, and was interpreted largely to mean the management of floods as they occurred – that is, at the real-time moment of emergency response. In recent times this has seen considerable change: the role has been considerably broadened as well as being more formally defined, and today's SES is involved in a wide spectrum of activities relating to flooding and its management.

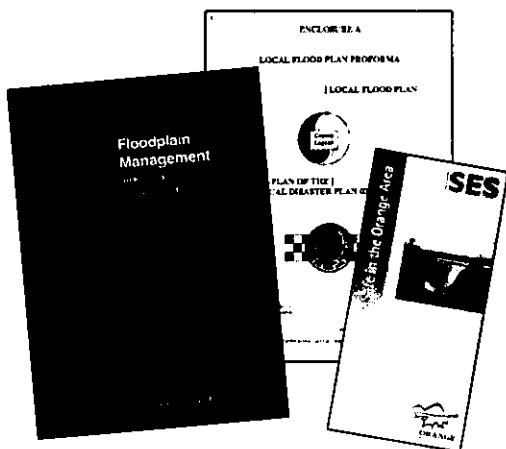
Since the passage of the State Emergency Service Act in 1989 the SES has been formally designated as the State's 'combat agency' for flooding. This status, and the criticism levelled at the SES in a government-commissioned 1989 report which led to its restructuring, caused the organisation to rethink its purpose and the ways it carried out its responsibilities. As a result the SES moved to participate in or lead activities beyond those real-time response activities such as warning, rescue, evacuation, resupply, property damage mitigation and the provision of information and advice to communities actually under the threat of flooding. Nowadays, the SES also concerns itself with preventative and preparatory activities including planning for floods, developing improved warning systems and procedures, participating in decision making processes relating to flood mitigation and the use of flood liable land, and fostering the

education of community members about floods and their management. The combat agency's remit these days is treated as being a very broad one requiring the development of wide-ranging expertise.

Developing expertise in flood management

Perhaps the principal responsibility that the conferring of combat agency status implies is that the agency becomes expert in the management of its hazard. Virtually by definition this responsibility requires that a broad view be taken, as is also implied by the 'comprehensive approach' to emergency management that has been accepted Australia-wide for several years (Emergency Management Australia, 1993). In essence, this approach suggests that combat agencies should maintain an interest across all phases of the management of the relevant hazard.

Expertise in emergency management is created and enhanced by many means, including the experience that is gained by managing actual events. But real-time involvement in response activity is not enough by itself, and in New South Wales the personnel of the SES is encouraged to develop their flood management expertise outside actual flood time as well as within it. This they can do by participating in the flood planning process and in training in relevant field skills (for example the operation of flood rescue boats) as well as learning about and applying management principles (through, for example, courses on working in



A selection of documents designed to develop the expertise of SES personnel.

operations centres or workshops on coordinating evacuation operations). Forums for providing information and to promote discussion on aspects of flood management are also organised. Thus trained staff impart information and facilitate the examination of relevant issues in regular regional conferences of SES members and in meetings with small, locally-based planning teams, in post-flood debriefs and in public meetings held to capture lessons and to learn from mistakes. Formal exercises are also devised whereby volunteers and staff members can simulate a coming flood and construct and debate responses in a tabletop environment.

It falls to a combat agency to define and then to follow 'best practice' in the management of its designated threat and to provide resources to encourage the achievement of best practice. Some time ago the New South Wales SES took the lead in developing a set of national guides on various aspects of flood management (*Emergency Management Australia*, 1999a, 1999b, 1999c), and the organisation has sought to ensure that the contents of these guides are promulgated and used. In effect the SES takes the view that as the flood combat agency it must be an effective custodian of the knowledge that applies to the management of the hazard and must ensure that it keeps abreast of and contributes to developing practice in the field. If done poorly, it risks criticism from outside (for example, in adverse findings in coronial inquiries or in public criticisms of its actions during floods).

Ensuring that best practice is genuinely sought extends to carrying out research on particular problems as they arise: a recent example in New South Wales related to the problems of motivating and organising a large-scale evacuation of the levee-protected town of Grafton in March



SES dealing with the Department of Community Services as the deliverer of welfare services to evacuees and other victims of flooding.

2001 when for a time the overtopping of the levees looked likely (Pfister, 2002). Other work of this kind has included assessing the merits of new technologies which may be used to warn of developing floods (Molino et al, 2001), promulgating improved warning procedures (Keys, 1997; Opper and Rutledge, 1999) and defining an appropriate modus operandi for incorporating emergency management considerations into consent authorities' decisions relating to the development of flood liable land (Keys and Opper, 2001).

Combat agency responsibilities, then, should not be confined to the moment of response to a particular event. Rather, they should be discharged with consideration to the whole of the management of the hazard even when other agencies have the lead role for some elements of that management. Accordingly, the SES in New South Wales believes it must be able to advise agencies with responsibilities for mitigation: hence it needs to deal with councils of local government in their consent role as well as with other organisations including the Department of Land and Water Conservation (the State's adviser on floodplain management issues and the coordinator of floodplain management studies at

the local level), planning NSW (the caretaker of land management regulations) and the Land and Environment Court (which in effect settles disagreements on matters relating to the utilisation of land). Likewise the SES must be able to communicate with and advise the Commonwealth Bureau of Meteorology on matters relating to flood prediction and the promulgation of flood forecasts via the warning process, and with dam owners and dam safety authorities (in New South Wales the Dams Safety Committee) on issues relating to potential dam failure and its management as regards prevention, warning and evacuation. In addition, it must be able to deal with the Department of Community Services as the deliverer of welfare services to evacuees and other victims of flooding. With all of these organisations the flood combat agency has a high degree of common cause and shared interest.

Because flood management is the business of many agencies, it is important that there be robust structures for inter-agency communication and consultation. Active networking is vital here, and the combat agency must be involved in relevant forums to learn about the threat and its management, to impart ideas and to



SES Operations Centre staff at work during a flood. Photograph courtesy of the Grafton Daily Examiner.

negotiate responsibilities and tasks. In New South Wales the SES is heavily involved in the deliberations of the Flood Warning Consultative Committee, the Dams Safety Committee, councils of local government and the Floodplain Management Authorities (an organisation which lobbies the state and federal governments on behalf of councils in relation to flood mitigation). In addition the SES interacts closely with relevant consultancy and research organisations, of which there are many, and with other emergency services in the context of regular meetings of emergency management committees at the local, district and state levels.

It follows from what has been said that contacts must be developed across agency boundaries so that learning can be maximised, activities integrated and expertise built. The combat agency for flooding cannot be an island unto itself: to remain apart from other organisations with roles to play in relation to floods would be to invite becoming isolated from its own core business. The combat agency cannot do the whole job of flood and floodplain management, but it does need to be aware of the whole job and to be thoroughly well

networked with those people and agencies whose work relates in some way to flooding. Then the results of the knowledge gained from this networking have to be communicated internally within the combat agency to ensure that expertise is developed at all levels including, most importantly, the local one where an understanding of principles must be grafted on to the comprehension which is gained by managing actual floods in real time and in specific areas. Participation in the preparation of local flood plans also helps local SES volunteers in this regard. In short the combat agency must be encouraged to be a learning organisation and must create an environment in which learning about the management of the threat is consciously fostered.

Some individual functions

What has been said indicates that the New South Wales SES believes that it has a wide range of responsibilities in the flood management field and that these go beyond the management of operational tasks when floods are actually occurring. Space allows a detailed consideration of only four of these functions here – planning

for the occurrence of floods, developing flood warning systems, playing a role in floodplain management processes and ensuring that community members are ready for floods and able to manage them effectively at the level of the individual person.

Planning for floods. The New South Wales SES has been actively and systematically planning for floods in all flood prone areas in the state for only about ten years. In that time the planning effort has become increasingly clearly focussed, the inputs to it better understood and its goals more sharply defined. The state now has a flood plan for almost every council area which can be said to have a significant flood problem beyond those produced solely by minor overland inundation from local heavy storm rains. As far as possible each plan covers all flood threats that could occur in its reference area, including floods from rivers, creeks, lakes and caused or exacerbated by dam failure, as appropriate to the possibilities in the local environment. They also include for coastal areas flooding from the sea in the context of storm surges that may result in erosion of real property as well as inundation.

All possible levels of flooding are considered to the extent that this is possible by virtue of what is known from studies of the flood problem. Thus floods more severe than have been seen in the short period of reliable flood records are anticipated and the levels likely to be reached by the Probable Maximum Flood (PMF) are taken into account where they have been established. This is important given the potential for very heavy loss of life during rare and severe floods in some heavily populated areas, especially along the coast. In the Hawkesbury- Nepean River valley, for example, it is possible that several thousand people could be trapped on islands that could disappear in floods much less severe than the PMF (Hawkesbury-Nepean Flood Management Advisory Committee, 1997). The evacuation routes of the town of Windsor are lost at a flood height of 14 metres (roughly the 20-year flood level) on the local gauge, and the town itself is likely to become unviable well before it is fully submerged at about 21 metres (approximately the 500-year event which is itself about 5 metres below the PMF (Gillespie et al, 2002). The general problem is one that applies in many locations in New South Wales, including a large number of leveed towns whose levees are not designed to keep out floods higher than the predicted 1per cent event. In these cases some very complex evacuation operations must be anticipated and planned for and some difficult decisions made relating to the evacuation of large numbers of people before evacuation routes are closed (and perhaps even before significant flooding has begun in the areas which will need to be evacuated). The alternative – evacuation by air and flood boat after roads have become untrafficable – will in some cases be impossible in the time likely to be available.

The flood plans are written to a standard structure from a generic

model that is an enclosure in the State Flood Plan (NSW State Emergency Service, 2001. The details of the content and structure of these flood plans are spelled out in *Emergency Management Australia*, 1999a, pp.25–28). The planning process starts in each case with an appraisal of the hazard, in which the SES has benefited from the numerous flood and floodplain management studies commissioned over the past two decades by the Department of Land and Water Conservation and its predecessors.

Where necessary, special arrangements necessitated by particularly serious floods are incorporated in near stand-alone annexes dealing, for example, with warning and evacuation arrangements for dam-failure floods, floods likely to overtop urban levees, or floods in individual parts (sectors) of a council area.

With almost all council areas which have flood prone territory now having a flood plan – and this means the vast majority of council

The combat agency for flooding cannot be an island unto itself: to remain apart from other organisations with roles to play in relation to floods would be to invite becoming isolated from its own core business.

These studies have collected vast amounts of data on flood history and frequency and have made estimates of the discharges, velocities and flood levels that would apply at various locations on a floodplain for a range of design floods. Recently, the SES has sought to ensure that these studies, along with studies of potential dam failure commissioned under the aegis of the Dams Safety Committee, also gather data of specific relevance to emergency managers. This data is added to material collected by the SES during and after floods on the extent of flooding and its consequences at specified gauge heights. The SES places considerable emphasis on the development of 'flood intelligence' and its application to decisions relating to warning, evacuation, property protection, resupply and the provision of information and advice to community members. This intelligence is consciously tied to decision-making processes and written in to the flood plans, making the plans themselves into 'records of intended proceedings' that should prompt previously considered actions when floods are rising.



SES flood rescue boat crew assisting with submerged trucks.

areas in the state – the focus of the SES's six full-time professional planners is now one of coordinating reviews which will lead to better plans. The first round of planning produced documents that were not always recognised by volunteer members of the SES as being useful, and as a consequence they were not necessarily used effectively when floods arose. One of the reasons for lack of acceptance may have been that local members were not sufficiently involved in the plan-preparation process. To correct this a conscious effort has been made to ensure that local commitment to and ownership of plans is fostered: this has been sought by enlarging the size of volunteer planning groups, emphasising the notion of problem solving in advance to encourage careful consideration of necessary actions, and identifying special planning projects for individual volunteer local planners to pursue. These have included projects to locate the sites of potential road closure and to devise doorknocking strategies and estimate the numbers of doorknockers needed to cover an area in a specified time frame. In addition volunteers are encouraged to devise or enlarge community networks so that warnings and information can be effectively disseminated, to review flood classification levels against flood intelligence and revise them if necessary, and to develop strategies to ensure that a positive view is taken of the property protection function (including expedient sandbagging, the provision of assistance with furniture raising and the transportation of moveable items to safety, and the relocation of caravans from flood liable areas). Most importantly in the planning meetings, evacuation strategies are given detailed attention, as is the provision of quality warnings that are likely to motivate appropriate property- and life-protecting actions.

The flood plans are becoming more detailed and more agencies,

community organisations and businesses are being listed in them with agreed tasks to perform. The problems of the bulking up of plans are minimised by the creation of near stand-alone annexes, and increased emphasis is being placed on the briefing of participating agencies and other players. There is no doubt, though, that the approach to planning which is being fostered – slow, thorough, comprehensive and genuinely involving of local interests – is onerous, and the volunteer members of local planning groups need significant support. With six professional planners available to the SES this support can now be provided and reviews will be able in future to be undertaken more frequently than was previously possible. These same professional planners will also facilitate the utilisation of census material to fine-tune local responders' understanding of their flood liable communities, and they will be able to lead in the application of Geographic Information System (GIS) tools which will allow better advance appreciations to be achieved of the likely impacts of coming floods.

Development of flood warning systems. Of critical importance to the effective real-time management of flooding is the development of appropriate means of warning people who are in the paths of coming floods. Effective warnings unlock the essential 'manageability' of floods by telling people what to expect, advising them of what they *can do to protect belongings and maintain personal safety*, and motivating them to pursue certain actions such as raising items above likely flood reach or evacuating to safe locations.

For some 40 years New South Wales has had a high quality flood prediction service operated by the Commonwealth Bureau of Meteorology. This service operates by polling rain and river gauges and applying scientific analysis to

produce forecasts of how high floods on a river will reach at specified locations at nominated future times. Using flood intelligence the SES is increasingly able to add value to this service by estimating where the floodwaters will go at the forecast heights and thereby deriving the likely effects on the community. A knowledge of these effects provides a basis for giving advice to community members about how the impact of a rising flood can be managed in the appropriate time frame. Thus people who live or work on floodplains can be empowered to manage 'their' floods in their own interests.

The knitting together of predictive, interpretative and advice-giving functions is critical to the achievement of what has been called the 'total flood warning system' (Emergency Management Australia, 1999b, pp.5–16). The task has been a difficult one to manage in a response-focussed SES culture which has had to come to grips with the development and use of flood intelligence and the need to communicate clearly with flood prone communities, and much still remains to be achieved before flood warnings are well and convincingly disseminated in ways which routinely motivate appropriate threat-mitigating actions on the part of those needing to be warned. This is at its most important when the warning messages seek to motivate evacuation: here the need to be persuasive is especially critical, particularly if large numbers of people will need to move to safety in a short period of time. The SES seeks actively to improve its performance here by examining its own warning performance during floods (Pfister, 2002) and instituting improvements. Since the North Coast floods of early 2001, the SES has sought to devise draft-warning messages outside of flood time so that they cover the necessary content in appropriate styles and are ready for dissemination with a minimum of real-time modification

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Community response to flood warnings: the case of an evacuation from Grafton, March 2001

Neil Pfister explores why the flood warnings issued during the Grafton Floods in March 2001 were ignored by ninety per cent of the community

In March 2001, a large slow moving East Coast low-pressure system passed over the North Coast area of New South Wales, bringing extensive torrential rain that caused serious flooding on several river systems. On Saturday March 10, the Commonwealth Bureau of Meteorology issued a flood warning that predicted that the Clarence River would rise to 8.1 metres or more at Grafton. As the city's levees were thought to give protection to a gauge height of 8.23 metres, there was a very real danger that they would be overtopped. In such an event, most of the urban area would be inundated, with only two relatively small areas of high ground in South Grafton (comprising less than a third of the total population) remaining above the floodwaters. A decision was made to evacuate the 12,000 residents that live in the flood-prone areas of Grafton. The evacuation, however, did not proceed optimally and it was estimated after the operation that fewer than ten per cent of Grafton's population left the city during the nine hours that the evacuation was in effect.

The flood peaked at 7.75 metres, a level considerably lower than that predicted. This was fortunate, as the level of protection afforded by the levees was lower than expected. Water came within 0.2 metres of the top of the levee. The levees were not overtopped and evacuation turned out to be unnecessary (but not unwarranted given the

uncertainty inherent in flood prediction and the dire consequences of a levee-overtopping flood). Nonetheless, the low level of community response raises a number of important questions about the effectiveness of the warning process and the evacuation operation. Did the community hear the warnings? Did the warnings communicate effectively? What were the primary motivations for evacuation or non-evacuation? Why did so few people leave?

In the follow up to the flood, the evacuation was scrutinized in several ways. Operational issues were addressed using the debriefing process. Debriefs generally deal with what went right and what went wrong during operations. They can investigate issues such as decisions made 'on the day' by emergency managers, the control of resources, inter-agency communications, and the extent to which the design and delivery of warning messages conform with current conceptions of best practice. Debriefs are important means of exploring 'areas for improvement' and they allow emergency managers to incorporate lessons learnt into plans for future operations. Operational debriefs, however, do not usually capture the public perspective. They rarely are able to plumb the perceptions, experiences and behaviours of the community members that emergency operations are aiming to protect. Public meetings, such as those held in the Clarence River



Stranded livestock affected by Grafton flood.

communities after the March flood can go some way in this regard. Public meetings, however, do not provide the opportunity to systematically explore these issues, nor to obtain a representative sample of the communities' points of view. Consequently, the research

Operational debriefs are important but they do not usually explore the communities' points of view.

reported here aimed to explore the public experience of the evacuation in a more structured and insightful manner.

A considerable body of research regarding evacuation warnings already exists. For example, Handmer (2000) canvasses many of the reasons for the failure of

Table 1: Reasons for Failure of Flood Warnings

SHARED MEANING MAY EXIST BUT IS OF LIMITED VALUE:

- Some people are not risk averse (or less adverse or differently adverse than the warners would like) – hence warnings are understood but ignored or even taken as a challenge.
- Other priorities may interfere with immediate response to warning messages – eg. people may be unlikely to respond until the whereabouts of all household members is established.
- Other signals, such as the actions of neighbours or weather, may contradict the official warning – people may seek confirmation before acting.
- Some people have an aversion to following authority and may ignore official advice – in any case, people are disinclined to follow orders preferring to make their own decisions based on the information in front of them.
- Some people cannot respond and for these warnings are of no value – for example they may lack the physical or mental capacity to respond, or they may be absent.
- Some of those at risk may not be worried about flooding until they suffer a loss. Then the question may become the source and ease of compensation – and warnings are interpreted in this context.

SHARED MEANING DIFFICULT TO ACHIEVE:

- Typically the population at risk will be anything but homogeneous. This diversity may mean that there are different priorities, languages and levels of understanding. Shared meaning may be achieved with some groups and not others.
- Related to population [heterogeneity] is the problem of designing messages to have individual relevance and meaning.
- Some groups are largely excluded from most networks and they may not receive any warnings even where the system appears near perfect.
- Informal personal networks may reinforce, undermine or deflect official communications.

Source: Handmer (2000)

warnings. Table 1 summarises these reasons, which Handmer has classified according to whether a shared meaning between the authority issuing the warning and the public has been achieved. Shared meaning may be difficult to achieve because sections of the population do not receive the evacuation message or because language barriers exist. Where shared meaning is achieved, people may still not evacuate because they are not risk averse, because they have little faith in the warnings, or because they have some impediment to evacuation, such as lack of mobility.

The behavioural and situational factors listed by Handmer however, are not exhaustive; additional reasons are also known to come into play. The principle that levee protection can create an unjustified sense of invulnerability in a community is well established (Keys

and Campbell, 1991; O'Brien and Payne, 1997). Moreover, communities often believe that a flood will not exceed the previous flood of record, as Heatherwick (1990) found in relation to the Charleville flood of the April 1990.

McKay (1992) has raised another point that may have impeded the evacuation of Grafton. He argues that there is a general expectation that river height forecasts will have a high degree of accuracy. This may have been problematic, given that the Bureau of Meteorology had predicted a river gauge height that was less than the purported levee protection height, albeit by a small margin.

As an ancillary issue, the impact of false alarms on future evacuations is a widespread source of speculation and concern in the emergency management community. Dow and Cutter's (1997) research on

hurricane-related evacuations in the United States however, found that previous 'unnecessary evacuations' played only a small role in decisions made. The current research project provided an opportunity to explore this issue in the context of flood-induced evacuations in Australia.

The lessons learnt from previous research on evacuation have informed the preparation of best practice guidelines for flood warnings, including those intended to induce evacuation (Emergency Management Australia, 1999). The existence of previous research on evacuation, and the translation of the findings of that research into guides for practice, however, does not diminish the value of detailed, local, post-event studies. Research such as the project reported here is needed to check the importance of community perception of warning messages in a real and highly significant event. It can also serve to

check the veracity of current notions of best practice, and to reinforce the importance of best practice guidelines in the minds of emergency management practitioners where appropriate.

The aim of the research project, then, was to estimate the extent of the evacuation from Grafton, to investigate the reasons why people chose to evacuate or to not evacuate, and to explore the impact of an evacuation warning that proved to be 'unnecessary', in the sense that the expected flooding of the town did not eventuate. The research project investigated the following hypotheses:

- That many people were unaware that an evacuation warning had been issued.
- That members of the public sought confirmation of the flood threat from other people.
- That doubts about the authority of the person and organisation issuing the evacuation warning influenced behaviour.
- That people were aware that the river height prediction was less than the levee height, and that they had an unrealistic degree of faith in that prediction.
- That fears about home security contributed to the decision to stay in Grafton.
- That family responsibilities influenced the decision to evacuate.
- That pet owners did not evacuate because they did not want to abandon their pets.
- That people were confused by the content of the evacuation message, and unsure about what to do.
- That living behind a levee creates community complacency, and that experience with previous floods that did not overtop the levee contributed to a 'myth of invulnerability'.
- That the public's experience with an 'unnecessary' evacuation during this flood will militate against compliance with any future evacuation warnings.



Cars attempting to cross highway during Grafton flood.

Research Methods

The research fieldwork had two components: a telephone survey and face-to-face interviews. The fieldwork was conducted between two and three weeks after the peak of the flood.

During the telephone survey, Grafton residents who were present during the flood were asked a standard series of questions that relate to the hypotheses. The questions were a combination of open-ended and constrained response types.

The survey sample was drawn from two sources. The largest group of respondents was randomly selected from the telephone directory covering the New South Wales North Coast. Only telephone subscribers with an address in Grafton or South Grafton were selected. It was expected that the majority of the respondents from this random sample would not have evacuated, so a second targeted sample was drawn from a register of people who had evacuated. This ensured that the experiences of those who had chosen to evacuate were sufficiently represented.

Telephone surveys were conducted on several days of the week, and over a range of times during the day, in an effort to achieve as random a sample as possible. For the same reason calls that were not answered, or that were engaged, were recalled.

It is notoriously difficult to get dependable results from telephone surveys, other than on matters of fact. Issues that are not open to interpretation, such as the mode in which evacuation messages were received and the means of evacuation, are relatively straightforward, and the respondents' answers to these questions can be taken to be generally reliable. Issues that require interpretation, however, such as the motivation for behaviour, are much more difficult to investigate. For a number of reasons survey respondents can be unable or unwilling to provide accurate or insightful answers. This being the case, the survey results have to be interpreted with some caution.

Face-to-face interviews were also conducted as they can usefully



Backwater flooding – Grafton March, 2001.

complement the telephone surveys. They can usually provide more detailed and more insightful answers.¹ Initial responses can be explored further, and often, in a more extended interview, people become more relaxed and willing to give fuller and more candid accounts of their experiences and the motivations for their behaviours. Because of the less rigid structure, face-to-face interviews are also more likely to elicit responses that are not constrained by the researcher's preconceptions. The interviewees were selected as opportunities presented themselves.

Results and Discussion

Two hundred and five questionnaires were completed in the phone survey. Of these, one hundred and ninety one were from the random (telephone directory) sample, and fourteen from the targeted (evacuee register) sample.

One hundred and seventy of the one hundred and ninety one

random sample respondents (90%) live in flood-prone areas.

Twelve people participated in face-to-face interviews. The interviews were between ten minutes and ninety minutes in length.

The number of evacuees and their destinations

The random sample survey confirmed that few people evacuated from Grafton. Only twenty-nine respondents left their homes. Furthermore, seven of the people who did leave their homes moved to the homes of friends and relatives that were still within the area to be evacuated. At best only twenty-two respondents from the random sample evacuated to a safe area. This is thirteen per cent of the respondents who live in flood-prone areas, which extrapolates to approximately 1,600 residents of Grafton and the flood-liable parts of South Grafton. A further six hundred hospital patients and residents of nursing and aged homes

were evacuated. The destinations of the respondents who left their homes are shown in Table 2.

A further forty-seven respondents from the random sample (29% of those who had stayed at home) could, to some extent, be considered to be 'ready to evacuate'. These people made comments indicating that:

- they would go if they had been door-knocked;
- they were waiting for the final order to evacuate;
- they had packed and were ready to go;
- they were waiting until the last minute; and
- they had actually started to evacuate when the evacuation had been terminated.

This finding has both positive and negative ramifications. On the one hand, it shows that a large number of people were 'receptive' to the idea of evacuation. They may not have needed much more of a push to get them moving. On the other hand, the fact that they were delaying action until the last possible moment is perturbing. A 'last minute rush' to leave Grafton would be potentially disastrous, especially if evacuation was only possible via the two-lane bridge across the Clarence River. Furthermore, evacuation is likely to only be possible for a short period after levee overtopping (Water Studies Pty Ltd, 1992).

Awareness of the evacuation warning

Ninety-seven per cent of the people from the random sample reported that they were aware that an evacuation warning had been issued. While this very high level of awareness is encouraging, the three per cent that were unaware would

¹ There are several reasons why survey respondents may be unable or unwilling to provide accurate or insightful answers during surveys. Social scientists use the term 'demand effects' to refer to the unconscious tendency of some survey respondents to provide 'socially acceptable' answers; that is, the answers that they believe that the questioner would like to hear. For example, a respondent may tend to tell a researcher from the SES that they thought the SES did a great job, because that is what the researcher wants to hear. In addition, many psychologists would argue that people are often not always conscious of their motivations for behaviour.

Table 2: Summary of Grafton evacuation
(random sample, flood-prone areas)

| Destination | No. of respondents | % of sample |
|--|--------------------|-------------|
| Remained at home | 139 | 82% |
| Moved within Grafton | 8 | 5% |
| Evacuated to high area near Grafton (South Grafton hill, Junction Hill, Waterview Heights) | 18 | 11% |
| Evacuated to place outside Grafton area | 3 | 2% |
| Evacuated, but destination unknown | 2 | 1% |
| Total | 170 | |

Table 3: Modes in which respondents heard evacuation warning
(combined random and targeted samples)

| | Radio | Other People | Doorknock | Police Loud Hailer | Other Modes |
|----------------------|------------|--------------|-----------|--------------------|-------------|
| All respondents | 132 63% | 64 31% | 51 25% | 6 3% | 11 5% |
| Non-evacuees | 100 62% | 51 31% | 37 23% | 4 2% | 11 7% |
| Evacuees | 27 73% | 10 27% | 13 35% | 2 5% | 0 0% |
| Moved within Grafton | 5 83% | 3 50% | 1 17% | 0 0% | 0 0% |

equate to approximately 360 people in the flood-prone area. Nevertheless, it could be argued that many of the people who were unaware of the evacuation would have become aware if the evacuation operation had continued.

The modes through which the survey respondents heard the evacuation warnings are summarised in Table 3. Most people heard the evacuation warning on the radio, almost a third of respondents reported hearing of the evacuation warning from friends, neighbours and relatives, approximately a quarter of the respondents were doorknocked, and a few heard the evacuation warning via police car loud-hailer. Several people who heard the loud hailer warning, however, reported that the police car was moving so fast that the message was incomprehensible.

Although only a minority of respondents spontaneously reported that they were told of the evacuation warning by friends, neighbours and relatives, most people discussed the evacuation with other people. The 'other modes' category in Table 3 includes being informed by employer, by publican, and by landlord.

The proportion of evacuees that were doorknocked (35%) was significantly higher than the proportion of non-evacuees doorknocked (25%). This may be due to the concentration of the doorknocking teams' efforts in the lower-lying areas of Grafton, where residents may have a better awareness of the flood threat and a greater readiness to evacuate. The difference also indicates the value of face-to-face warnings in motivating action and reinforces the worth of this tried and true method.

Perceptions of the flood threat

A third of the evacuees indicated that they were generally risk averse. They described themselves as cautious people or used phrases such as 'you're better safe than sorry'. This conforms with the expectation that personal risk aversion is a critical factor in the decision to evacuate. Only a minority of evacuees (37%) had a firm belief that Grafton would be flooded. The fact that the majority of evacuees were not convinced that Grafton would be flooded is encouraging: it means that people, to some extent, accept that there is a degree of uncertainty in the prediction of flood behaviour but

that they are still willing to behave in a precautionary manner.

Three quarters of the survey respondents who did not evacuate believed that they were not under threat. This is by far the greatest impediment to the evacuation of Grafton. Much of the housing stock in Grafton pre-dates the construction of the levees and elevated houses are commonplace. Many of the residents of these houses are inclined to stay in the upper floor areas during flooding. Other survey respondents believed that they lived in 'the higher parts of Grafton' that would not be inundated if the levee was overtopped or breached (12% of those who stayed). Some of these people in the supposedly 'high and dry' areas gave responses that indicated that they do actually live outside the areas that would be inundated (the two hills of South Grafton), but many live in the low-lying areas which would definitely be inundated if overtopping occurred for more than a very short period.

Living behind a levee

Very few survey respondents expressed the firm belief that the levee would not, or could not, be overtopped. Conversely, many



Flood devastation of rural property.

people surveyed and interviewed admitted the possibility of levee overtopping. On this issue then, the behaviour of the people of Grafton seems to be somewhat at odds with their survey and interview responses. They express no great faith in the levee, but they behave as if the levee is likely to protect them. In the case of Grafton, living

The residents of Grafton, having experienced few direct effects of flooding since the construction of the levees, are likely to have developed a relatively low consciousness of the flood threat, and are therefore less ready to act.

behind a levee does not result in the residents having a conscious or expressed belief in the 'myth of invulnerability'. The contribution of the levee to the poor response to the evacuation warning is likely to be subtler, and to have built up over a long period of time. The residents of Grafton, having experienced few direct effects of flooding since the construction of the levees, are likely to have developed a relatively low consciousness of the flood threat, and are therefore less ready to act. In most cases, the residents do not seem to have ever considered the possibility of one day having to evacuate.

This seems to have been one of the greatest obstacles to the evacuation. On the day in that sense and to a certain extent, the battle was lost before it was fought. Whatever emergency managers did on the day, they would still be up against a huge level of inertia in the population that would be very difficult to overcome.

Confirming the flood threat

As expected, the results of the research indicate that people take steps to confirm the flood threat. All of the people interviewed reported that they spoke with neighbours, friends and relatives about the flood and the evacuation warning. A few of them also sought confirmation about the flood threat and about courses of action recommended by the SES and the Police Service.

Many phone survey respondents and interviewees reported that they had spoken with older, longer-term

residents of Grafton. These older residents frequently said that they had experienced large floods in Grafton (the implication being that they were the largest) and that the water 'never gets up to here'. This is of some concern given the relatively short span of any individual's experience. Floods larger than those that have occurred during the lifetime of Grafton's residents are inevitable but there is little consciousness of the potential for what has not been personally experienced.

A few people reported that they were persuaded to stay by other people, but a larger number of people were persuaded to go by others.

Some aspects of life in Grafton during the term of the evacuation warning were out of the ordinary – drivers queued at service stations to fill their cars with fuel, shoppers exhausted the supermarkets' stocks of bread and milk, business owners scrambled to lift and relocate stock and equipment. Evacuation warnings on the radio were heralded by the standard Emergency Warning Signal and emergency services vehicles cruised the streets with flashing lights. Other aspects of life however, continued much as they normally do. In particular, the pubs and clubs of Grafton were well patronised. One of the interviewees reported that the sight of the disco at the Royal Hotel going 'full-tilt' gave the impression that it was just another ordinary Saturday night in Grafton, and that evacuation was not really warranted. This is noteworthy, given the location of the Crown Hotel adjacent to the Prince Street gauge, where many people went to get direct confirmation of the flood threat.

Authority to issue an evacuation warning

Seventy per cent of the people surveyed knew that the SES had the authority to issue an evacuation warning. This percentage was the

same for both those who stayed in Grafton, and for those who evacuated. The perceived authority of the organisation issuing the warning therefore was not a major influence on the decision to evacuate.

Despite the fact that most people knew that the SES had the authority to issue an evacuation warning it did not necessarily imply that they had faith in the decision to evacuate. Indeed, the poor response to the evacuation warning is perhaps *prima facie* evidence that they do not have faith in the State Emergency Service's judgement on the need to evacuate.

Awareness of river height predictions

Most people were aware of the river height predictions during the flood. Eighty four per cent of the random sample reported that they were aware of the predictions. Most people were listening to their radios and, as indicated above, there was a lot of discussion about the flood, so river height predictions would have been passed by 'word of mouth'. Several people also reported that they had logged on to the Bureau of Meteorology web site to get the latest river height predictions.

All of the interviewees indicated that they were aware of the safe gauge height of the levee. It is difficult to determine, however, whether they were aware of the levee height before the flood, or have only become aware of the height since the event. Very few people said that they would not evacuate because the predicted river height was less than the levee height. The responses of the people surveyed and discussions with people interviewed indicated that Grafton residents generally seem to understand that the river height predictions cannot be absolutely precise. This is especially encouraging as the protection afforded by the levee turned out to be less than

expected. As mentioned in the introduction, the water came within 0.2 metres of the levee top, so the gauge height that the levee protects to is in the order of 7.95 metres rather than 8.23 metres.

Evacuation and home security

Surprisingly few survey respondents expressed concerns about the security of their homes once they had evacuated. Only fifteen respondents mentioned home security (8% of respondents), despite the fact that this issue had been raised in the local press in the week before the survey.

One of the interviewees, however, said that many people, with whom she had spoken after the flood, had talked about the prospect of looting. The same interviewee said that she had heard on the radio that the police would provide security for residences, but because of the small number of police in Grafton, she did not believe that the area would be secured. She thought that the police would be busy with evacuation work. Interestingly, she had not considered the possibility of looting before the radio brought the issue to her attention. The mention of police therefore 'sowed the seed of doubt' about the security of her home and reinforced her decision to stay.

As an aside, there were no reports of looting during the evacuation, but this may have been because only a minority of residents left town.

Evacuation and pet owners

Only a few people said that they would not evacuate because of the need to care for their pets. This is counter to expectations. The small number might be explained by two factors. First, most people who evacuated did so by car, to a place of their choice, so they presumably could take their pets with them.



Helicopter resupply operation.

Furthermore, a number of people who evacuated by State Rail train took their pets with them. In general terms therefore, people may not have felt constrained in their evacuation decision by pet ownership. Second, as noted above, people mostly did not evacuate because they did not consider themselves to be at risk. Having already fully attributed their decision to stay on basis of the perceived lack of risk, the respondents may not have allocated any attribution to their concern for pets. For this reason, the idea that people are often reluctant to evacuate because of the need to care for pets cannot be discounted. Furthermore, there is evidence that pet owners who do evacuate without their pets often return to the evacuated area to rescue their pets, thereby increasing their exposure to the hazard (Heath et al., 2000). Clearly evacuation planning must continue to address this issue.

Clarity of the evacuation message and the effectiveness of the evacuation procedure

As stated in the introduction, operational aspects of the evacuation are beyond the scope of this research. The decision of the emergency services to call the



Preparing sandbags during Grafton floods

evacuation, the effectiveness of the strategy pursued and tactical aspects such as the mechanics of the door-knocking operation, for example, are not addressed here. The public's perceptions of the evacuation warnings and the operational effectiveness of the emergency services may, however, inform the post-operational review process.

In the evacuation warnings, the evacuation was characterised as 'voluntary' rather than 'compulsory', even though the emergency services in New South Wales have the legislative authority to issue a mandatory evacuation order (Kanarev, 2001). Grafton residents generally comprehended the voluntary nature of the evacuation, with only a small minority of the evacuees believing that they were compelled to leave because of a compulsory order.

Also on the subject of the evacuation warnings, only three survey respondents commented that the evacuation messages were

confusing. One of the respondents said that he didn't understand the term 'self evacuation'. Another two respondents said that the evacuation message was very general and not clear on specific details of who needed to evacuate. Similarly, one of the interviewees did not know whether she lived in the first priority area in the evacuation warning, and another was critical of the 'broad brush' nature of the areas notified for evacuation. These remarks indicate a need for the SES to check the wording, and the concepts behind the wording, of the warnings.

Responses from the surveys and interviews indicate that there was a high degree of variability in the way that the door knocking was conducted. Some residents were door-knocked forcefully. They were told for example, that they should get out, that they would not be warned again, that they needed to get out as soon as possible. Other residents reported that the door-

knockers delivered a 'half-hearted' message. They were told that they should consider leaving as a precaution – that they might be asked to go later that day, or they were asked whether they wanted to go. It is not known whether the forcefulness of the door knocking corresponds with the phasing of the evacuation, with more forceful messages being delivered in areas that were first priority, and 'softer' doorknocking occurring in later priority areas.

The survey and interview responses also indicate that the coverage of the doorknocking was not optimised. Some streets were doorknocked on only one side, adding to the confusion amongst the residents. Other areas were doorknocked up to three times. In one case this was in an area that the interviewee considered to be one of the highest points in Grafton, and so the credibility of the SES was adversely impacted. These points reinforce the need for meticulous planning of doorknocking operations and thorough briefing of doorknocking teams.

The 'cry wolf' factor

Counter to expectations, few people reported that the experience with an unnecessary evacuation would have an impact on any future decision to evacuate. Only two of the thirty-seven evacuees who were surveyed indicated that the 'false alarm' would influence any future decision to evacuate. On the other hand, twenty-nine of the one hundred and sixty survey respondents who did not evacuate (18%) reported that the experience would have an effect on future evacuation decisions; that is, they would consider leaving next time because of the close call. This attitude was also expressed by one of the interviewees who said that she surprised herself with her reluctance to leave and that she would definitely evacuate in a future flood.

The interruption of service utilities

Several survey respondents and interviewees indicated that they were concerned with the possible loss of services if the levee had been overtopped. Some of these people did not become aware of this prospect until after the floods, and others did not fully comprehend the implications, until after the flood, of living without electricity, telephone, water and sewerage. This point raises two issues. First, there is an opportunity to further emphasise the consequences of the loss of services in future evacuation messages as a supplement to (not as a replacement of) messages that emphasise potential loss of life. The emphasis of inconvenience would be a stimulus to evacuate for those people who do not believe that they are physically at risk, and so do not respond to evacuation messages that emphasise loss of life. Second, the large number of people who have become aware of the serious inconvenience of the loss of services after the event, even without experiencing that inconvenience, reinforces the belief that a large proportion of the population would quickly tire of the inconvenience. These people they may have a propensity to place themselves at risk by moving about by foot in flood waters and they would increase the workload of emergency service workers as they would require evacuation by boat if the Grafton urban area became inundated.

Conclusions

Community education

The key to a successful evacuation is the readiness of the public to respond to an evacuation warning. The residents of Grafton simply were not ready to evacuate. They had very little in the way a realistic appreciation of the flood threat. For



Floodwaters encroach on the town of Ulmarra downstream of Grafton. (NB: traffic jam on Pacific Highway).

the most part, they had no acceptance of the possible need to evacuate. They had no understanding of the evacuation strategy.

Community education provides an opportunity to start the work required to successfully evacuate, outside of flood time. As many emergency managers would appreciate, however, community risk education is a difficult challenge. It is especially difficult to mount an arousing and convincing campaign in relation to a rare event such as a levee-overtopping flood that has only a one per cent chance of occurring in any one year. Nevertheless, when (not if) the big flood comes, there is a significant risk of loss of life for those people who do not evacuate. Consequently, the residents of Grafton must be given the opportunity to become aware about the local flood problem so that they have a realistic appreciation of the situation that

they face. They should be convinced about the possible need to evacuate in future floods, so that they have at least considered the option and do not dismiss it out of hand. They need to be advised of the folly of staying to remain in their homes. They should be informed about the evacuation

The residents of Grafton had a lucky escape. The levees protected them – this time.

strategy for Grafton. They need to be convinced about the need to act early, so that congestion of evacuation routes is minimised. They need to know that floods greater than those experienced by older, longer-term residents can and will occur.



Flooded canefields on the lower Clarence.
Photo courtesy of the Grafton Daily Examiner.

Community education would also increase public awareness of, and confidence in, the State Emergency Service's planning and operational ability. The enhanced public profile of the SES would help ensure that people would have greater faith in any future decision to evacuate.

While it is a difficult job, emergency managers have an obligation to do all that they can to ensure that communities are ready to react to emergencies.

Evacuation warnings

As a preface to this section, it should be noted that this research does not address the process of making a decision to evacuate in a general sense, nor does it assess the merits of the decision to evacuate in this specific case. Once the decision to evacuate has been made, however, emergency managers must

maximise the effectiveness of the evacuation.

It is self evident that, if evacuations are required, the evacuation warnings are the primary means available for emergency managers to influence public behaviour. While community education can lay much of the groundwork for evacuation, the evacuation messages are the most potent intervention 'on the day'. Their optimisation is crucial.

An evacuation warning that is not presented as a compulsory order will not compel evacuation. A voluntary evacuation warning implies uncertainty on the part of the emergency management agency and so promotes inaction on the part of residents. Furthermore, it pushes the onus for decision making onto those who are not in the best position to make that decision. Emergency managers are in the best position to appreciate the threat presented by a flood, and they must shoulder the responsibility to make a decision and act wholeheartedly on that decision.

Because a large number of people indicated that they had made some preparations to evacuate but were delaying their action, evacuation orders should emphasise that the decision to evacuate should be made early and that people should leave as soon as possible. Early action will minimise any 'last minute' congestion of evacuation routes.

Given that Grafton residents have expressed concern about the loss of services during a flood, evacuation orders should emphasise both the potential for interruption of essential services and the potential for loss of life.

Given that there is some indirect evidence that the existence of levees has contributed to a reluctance to evacuate, warning messages should actively engage

the issue. They should state that the levees are not designed to keep out very serious floods. They could mention both levee heights and flood height predictions (with due care to emphasise the uncertainty inherent in the predictions). Educational efforts outside of flood time also need to stress the point that levees can be overtopped, noting examples, such as Nyngan, where extreme floods have overtopped levees.

Emergency operations

It is imperative that flood operations serve to reinforce the authority of the emergency agencies. If people doubt the ability and effectiveness of emergency managers, they will not have faith in the call to evacuate. Messages to the public have to be credible and consistent. Headquarters staff must come across as competent. Door-knocking and other field operations have to be well planned and efficiently executed.

If a critical mass of people comprehended the seriousness of the flood threat and decided to evacuate next time the levees are threatened, then a cumulative, 'snow-ball effect' is likely to result. If so, the number of people choosing to evacuate would increase markedly.

The March 2001 flood brought widespread damage and loss to many communities on the Clarence River floodplain. The residents of Grafton however, had a lucky escape. The levees protected them – this time. Indeed, in many ways the experience of a severe flood has been advantageous. It has served as a 'wake up call' for the residents of Grafton; it has alerted them to the possibility of flooding in the city, and it may help to overcome the inertia that is the greatest obstacle to evacuation, although a conscious effort will be needed if this is to be achieved. The experience can also



Flooded canefields on the lower Clarence.
Photo courtesy of the Grafton Daily Examiner.

bring benefits to emergency management agencies. It can serve to illuminate shortcomings in planning, in procedures and in operational readiness. Emergency managers are duty-bound to examine the experience closely and to draw from it as many lessons as possible. The incorporation of these lessons into augmented plans and improved procedures is already under way within the NSW State Emergency Service.

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Neil Pfister is Planning and Research Officer, New South Wales State Emergency Service.

Effectively involving an Australian rural community in a Risk Management Process: a 'community partnerships' approach

A behavioural study of an Australian rural community's adoption of a Public and Environmental Health Management Plan

The doyen of hazard research, Gilbert F White said in 1945 that there is a problem in adjusting human occupancy of the earth to the vicissitudes of an irregular, capricious and sometimes violent nature. In such circumstances decisions on land use can be improved by considering the fullest range of social characteristics and behavioural adjustments as well as possible engineering works. This paper is a report on a multi-faceted means to ensure successful creation and adoption by a rural community of a Public and Environmental Health Management Plan. Hence, this represents a behavioural study of an Australian Community. It offers lessons for Emergency Managers wishing to promote behavioural change and enhance emergency risk management processes.

Community involvement in the process of emergency risk management or the process of planning is more likely to engender ownership and influence behaviour.

This paper explores innovative ideas generated in the development of the Public and Environmental Health Management Plan (PEHMP) for Berri in South Australia, and provides some lessons for Australian Emergency planners in rural communities as identified in a recent project for EMA (Pisaniello and McKay, 2001). The lessons are structured around aspects of the Emergency Risk Management Process as endorsed by the States and Territories of Australia in the form of the *Emergency Risk Management Applications Guide*¹, see Figure 1.

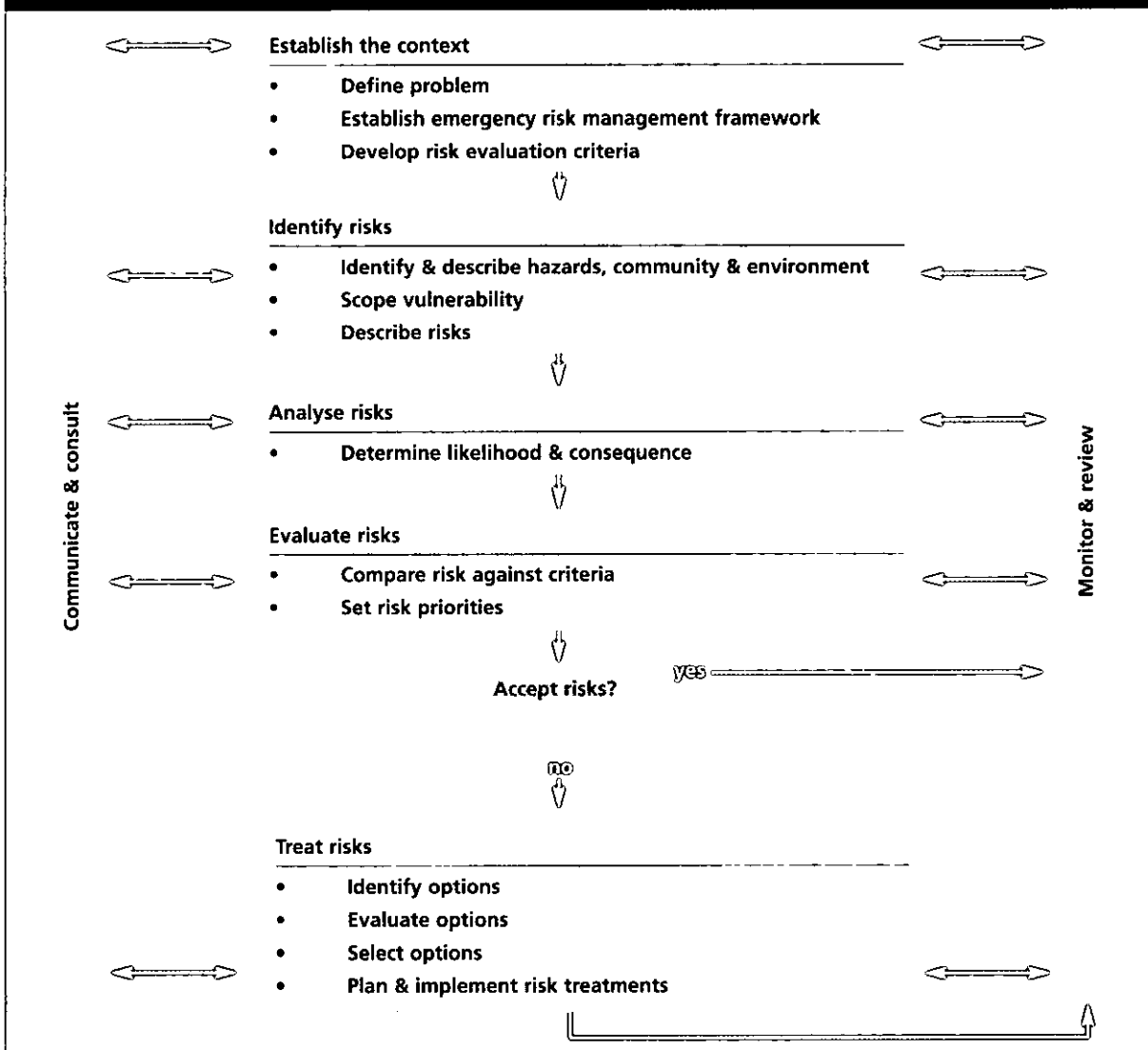
Emergency risk management is a systematic risk management process applied to communities in the context of emergencies. It produces a range of measures that contribute to the wellbeing of communities and the environment. The process includes: context definition; risk identification; risk analysis; risk evaluation; risk treatment; monitoring and reviewing; and

communicating and consulting. The process is illustrated in Figure 1. This paper will provide ideas on methods to involve the community in some of the key elements from Figure 1. These are presented in the form of 'lessons' for emergency managers. These lessons derive from 'stories' (also presented here) told by Greg Reedman (Executive Officer of the Riverland Health and Social Welfare Council 1992–1995) and Mike Stephenson (Environmental Health Officer of the District Council of Berri) who generated a successful 'risk management' plan for Berri in the field of Public and Environmental Health. This paper then relies on narrative research methodology (Clendinnen, 2000), ie. storytelling. This is a traditional means of exploring experience and has recently gained popularity as a professional development tool. Bringing about thoughtful change to practice is one trait of a reflective practitioner. Storytelling provides practitioners with opportunities to engage in reflective activities and is crucial for the development of new understanding and appreciation (McDrury and Alteria, 2000). Emergency managers are encouraged to describe their stories in relation to Emergency Risk Management and planning in order to explore, inform and advance practice (Fleming, 1996).

A key requirement for effective emergency risk management is for the local community to be aware of the risks, to be involved in the process, and ultimately to alter their behaviour (Scanlon, 1996). There have been many studies in the past demonstrating the failure of public information to alter behaviour (McKay, 1996). Community involvement in the process of emergency risk management or the process of planning is more likely to engender ownership and influence behaviour. The successful approach used to develop the Berri Public and Environmental Health Management Plan is outlined here to offer insights to emergency managers undertaking an emergency risk management process involving community consultation.

¹ Emergency Risk Management, Applications Guide, Australian Emergency Manuals Series, Part II, Volume 1, Emergency Management Australia, 2000.

Figure 1: The emergency risk management process (after EMA, 2000)



1. Influencing stakeholder involvement – part of establishing the context

Berri Council is one of seven district councils servicing the Riverland Region of South Australia. The region is generally flat to undulating, the major topographical feature being the Murray River Valley, which is up to 40m deep, and up to ten kilometres across. The river supports extensive irrigation areas, which produce citrus and other fruits, wine grapes and vegetables.

Berri is centrally located in the Region, and has therefore become the focus for industrial development and as an administrative centre for many of the government departments that service the Region. Berri's population comprises approximately 6,800 people living in 2300 households. While it has a much higher proportion of articulate, middle class people than the rest of the region, it also has a wide range of people from socio-economically disadvantaged groups. Details of some of the demographic and health information about Berri and its people are also provided in the Plan (District Council of Berri, 1994).

In Berri the impetus for the Public and Environmental Health Management Plan (PEHMP) was the need for the Council to be proactive rather than reactive (Reedman and Stevenson, pers comm, 2001). This aligns with the task of the Emergency Managers in undertaking emergency risk management.

The emergency risk management process requires broad community input and this requires exploration and definition of the communities at risk. In Berri the following statement and 'story' was provided by the authors of the report about the involvement of the towns people in decision making in the past, and the approach used to develop the PEHMP:

"The consultation and decision-making process in the past (in small rural communities) was based solely on input from groups and professionals and vocal minorities, thereby capturing only the persons with 'barrows to push' and the 'articulate middle class'. This represented a severe imbalance in the overall process as the views of the 'silent majority' went unaccounted." (Torquing, 1995)

'The Berri Approach'

"The Berri approach involved a multi faceted way of getting people interested in the ideas, and personal contacts by a well constructed letter and follow-ups. Particular managers were targeted, such as the managers of large local businesses, the Chief Executive Officer of the Hospital, the schools, the Manager of the Public Housing authority, and their networks were mobilised by getting the attention of the manager. Meetings were then called by personalised letter with adequate notice and the key managers participated and enjoyed working on issues with their workplace role firmly in mind. This got away from the usual scenario where a few vocal people hijack the agenda of a meeting and all interested parties, or indeed information on the issue may not be heard."

Story: Mike Stephenson and Greg Reedman

In order to get stakeholders on board, emergency managers may need to call on other expertise. Indeed, in this regard it is instructive to listen to Mike and Greg talk about their skills and how they evolved into a team.

The experience of the Council with previous planning projects, whether initiated by Council or from State departments or semi-government bodies, was that they have tended to be written in isolation, or with token consultation on the final product. Council was committed from the outset that this Plan be developed from the outside in, rather than Council staff writing a document and then seeking submissions and support from outside as an after-thought. (District Council of Berri 1994)

Mike Stephenson however realised that the existing public consultation process was ineffective as it contained excessive 'jargon' that is meaningless to people in 'hands on – get job done' positions. Consequently, Mike decided to develop a new process that would achieve his aims. However, Mike knew that he needed to consult in order to achieve this, which resulted in a partnership with Greg Reedman. Greg had the necessary expertise for the task, gained as a long serving senior officer of the Australian Bureau of Statistics in Canberra. Mike's initial vision was to commission Greg to perform the consultation employing the standard process. However, as a result of detailed discussions on 'what they wanted to achieve', the partnership of two highly motivated people formed, and along with it a change in methodology and approach in order to achieve the desired objectives.

Lesson: Highly motivated people will often find each other to work on an issue jointly. Effective partnerships that will assist the ERM objectives may be formed with someone from a different background and/or in a different organisation.

Mike and Greg worked to demystify the 'science' of consultation in order to get the community involved and promote ownership of the PEHM Plan at the local level. It was also recognised that in the future, funding assistance could be linked to plans such as these. To this end, every organisation or body that had any influence on health and services in Berri was invited to send a delegate to a preliminary meeting, and to participate on a Steering Committee. The response was excellent, and without really knowing what they were going to be involved in until the process was well underway. Enthusiastic support was found among people like:

- The Police Inspector;
- The Community Health Co-ordinator;
- Real estate people;
- Housing Trust officials;
- The Hotel Manager;
- Aged Care Professionals;
- 'Child Adolescent Family Health Service' representatives;
- Health Commission;
- Councillors;
- Council engineering and planning staff;
- Local Medicos;
- TAFE personnel;
- Education Department staff;
- Child Services staff; and
- The Tourist Office.

The invitation letter for involvement in Berri's PEH Plan Steering Committee was designed in line with the following key points:

- Writing a personalised letter to each key person.
- Setting out the aims of the Plan from the Council's perspective, and letting them know that their input would be valued.
- Placing the Plan into the key person's context, and describing to them a hypothetical outcome to which they could relate.

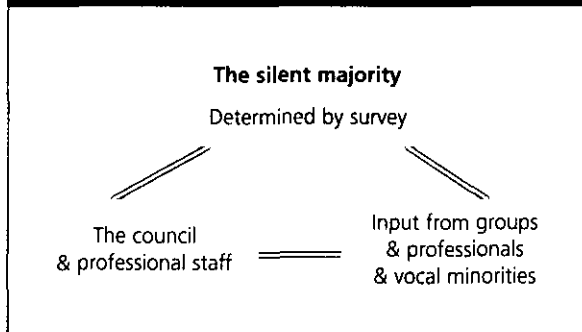
With a letter written in this way, people made the effort to attend the first meeting to see 'what's in it for them'.

Lesson: Place the invitation to participate in terms of benefits to the participant.

The wide range of representation on the Steering Committee was essential in maintaining a balanced discussion of the survey results gathered from the community (described later). In the past Council decision-making had mostly been based on the view of the Council with the input of staff and the vocal minority (District Council of Berri, 1994). The process adopted for Berri, enhanced decision making by gathering the views of the silent majority, and combining these with the view

of the Council and as many professionals and groups of interested people as possible. This improved process is illustrated in Figure 2.

Figure 2: The improved community consultation process (after District Council of Berri, 1994).



Lesson: Input and ownership by the community and key stakeholders are essential to effective community decision making in any policy area, such as Public and Environmental Health or emergency risk management.

With this Steering Committee in place the next steps in the consultation process for the development of the PEHMP evolved from the meetings and avoided the trap of the vocal minority hijacking the issues. The point of the first meeting was to ensure that each party knew the others, to find out about the provision of service or community support from each group and to outline the basis of the Plan to be developed for Berri.

At the first meeting, Greg spoke about the advantages of the use of a survey in this case and the arguments against the use of other methods in isolation. A note of caution: a fundamental mistake made in developing the Berri Plan was that the survey process did not get into full swing until the committee had begun to tire of the process. Starting the survey earlier would have kept the enthusiasm high, and the interest level 'bubbling'.

Lesson: The aim of the first committee meeting should be to achieve a consensus on the aims and the way forward.

2. Identifying risks

Looking at the demographic information about Berri and its people it quickly became apparent to Mike and Greg that traditional methods of public consultation, eg. public meetings, focus groups, 'phone ins'

discussions with key people, would be inadequate in identifying issues important to the bulk of the community. It was clear that some carefully designed and targeted techniques would be needed to consult with the full range of people in the community. Accordingly, it was decided to conduct a rigorous household interview survey, sampling from across the entire community.

The process used for identification of the community's public and environmental health issues (perceived risks) is a method transferable to an emergency risk management process. The townspeople's identification of perceived public and environmental health risks enabled prioritisation of the issues and the next step in the process.

A survey

Given that a zero budget line had been allocated for the project outside of personnel time and office back up, it was decided to make use of volunteers from the community to assist in this part of the consultation. This gave the community ownership of the process and the final product, and also had significant cost advantages.²

The benefits in conducting a statistically valid, properly designed survey of an area are huge. The greatest benefits are the intangibles:

- A feeling from the community that Council is interested in their opinion.
- Comments like "please come again, we didn't realise you were interested in us".
- Being able to implement a new policy, knowing that a definite and measurable percentage of people are behind you, and the vocal minority is just that ... a minority.
- Having a tool that will present valuable data to Council on just about any opinion expressed in the survey.

Lesson: Local government, indeed all government, should ensure that it takes into account the views of the majority. In our society the majority is often silent – one possible tool that could be used to gather community views is a survey conducted according to rigorous methodology.

Designing the survey

The key steps in designing the survey for Berri are discussed below. Torquing (1995) provides more detailed guidance on the survey process, including a checklist for designing a statistically valid survey.

² There are disadvantages and risks associated with the use of volunteers and, when used for financial reasons has shown to be negative: this should be weighed up against the benefits associated with involving the community.

Sampling was the first necessary step in designing the Berri survey, and this was undertaken as outlined in the Torquing (1995) package – which also includes comments on the need for sampling and the process of determining an adequate sample size.

To begin, Mike and Greg did not have a basis from which to sample. They needed to know how many households existed and their locations in order to draw a sample for use to produce estimates for various sub-regions. Therefore, a number of people went out and identified all the dwellings. The use of census data (ie. ABS Collection Districts) may be a more efficient source of information on your community for the purposes of gathering base data for survey sampling (Ferrier, 2000). The use of spatial data integrated with this information may also be of benefit when considering treatment options (McRae, 2001).

The existing public consultation process was ineffective as it contained excessive 'jargon' that is meaningless to people in 'hands on – get job done' positions.

Mike and Greg decided that the 'acceptable' error of the sample would be in accordance with ABS Standards or better. A random sample of 325 households spatially distributed throughout the council area was selected using standard blocking and selection processes (see Torquing, 1995). The sample size was chosen to give a standard error percentage of 5 per cent on major variables after taking account of likely non-response.

Lesson: In any statistically valid survey, the sample size should be chosen to give an 'ABS acceptable' standard error, but should also be 'achievable' with the available resources.

In the survey, three population groups were specifically examined. They were infants and children aged less than 13 years, adolescents and teenagers aged 13 to 17 years and adults aged 18 years and over. Issues associated with health promotion, education and disease control, the social environment, the built environment, the natural environment and environmental safety were investigated for the entire population.

There were difficulties with the community's understanding of the amorphous concept of Public and Environmental Health. The questionnaires were structured to be open ended and simple, and then focussed people's comments onto relevant issues with a series of diverse examples.

Publicity before conducting the survey

Before household interviews were conducted using the survey instrument, it was necessary to give credibility to the process and also to raise community awareness. This was achieved through a publicity campaign comprising two main aspects:

1. Media coverage – a media release.
2. A letter from the Mayor sent to every sample household chosen, advising that a person from the Council would be contacting them soon.

Lesson: Appropriate publicity and credibility needs to be established before wider community participation is sought.

Recruiting and Training Interviewers

All interviewers volunteered their time. They came from a wide range of backgrounds and organisations. eg. Lions, Apex, Community Health Service, District Councillors, council staff, Skillshare trainees, Health and Social Welfare Councillors and members.

The interview was a simple process where interviewers read the questions as written and merely recorded interviewees' responses as faithfully as possible.

The interviewers were essentially untrained. Their basic instruction consisted of simple map reading so that they could identify households to be interviewed, an overview of the aim of the survey and some simple instructions regarding interviewing techniques. They were encouraged to try to make the interview a structured chat with as many members of the household present as possible and to record interviewees' comments as faithfully as possible.

Given that the interviewers volunteered their time, it was essential to show appreciation and this was done publicly at a free BBQ fully catered by the Council. This was in addition to other benefits that came from involvement, eg. training for those who were unemployed.

Lesson: If volunteers are to be used, there should be good reason for this other than the cost-saving. They should also be shown some form of appreciation, to promote the goodwill between Council and volunteer.

Mike and Greg concluded that it was imperative that each member of the Steering Committee and each member of the Council conduct at least 10 interviews apiece. 'The best most valuable surveys will be those comprised of interviewers who are involved in day to day Council activities' (Torquing, 1995). By aiming to have every member of Council staff, from the CEO to

the receptionist, the garbage truck operator to librarian conduct at least 10 interviews each, some unforeseen but rewarding benefits emerged:

"The change in outlook that staff undergo when they have listened and written down the opinions of a normal household will amaze both them and you. The attitudinal change is rewarding on its own. After a process like this the receptionist doesn't think of the next complaint as just another grizzling rate payer, and this reflects right through the organisation. Similarly from a Committee view point, the members take a renewed interest in the process, and the organisations they represent gain something too." (Torquing, 1995)

'Interviewers and the kitchen table'

"The range of interviewers we used was wide, with varied backgrounds – some were professionals in the health field, some just volunteers, some of our own staff and elected members – and the main point that came back from all of them was that they were impressed with the community's comments and level of understanding of what they were discussing, and they had an almost attitudinal change to their community because as a front counter person or a garbage truck driver or a paediatrician or whatever they were, they only normally run into a certain type of person in a type of mood or a complaining person. They were actually able to sit down at kitchen tables with real people, normal people if you like, and write down their views as they were expressed to them and write down those people's opinions, and come away with a renewed attitude to their community when they actually find out that 90 per cent of the people they talk to think that their council or their organisation is doing a good job. It impacts on their attitude and on their work from then on. That comment was reflected at a committee meeting later on that the real experience is not here at the committee table, it's around the kitchen tables".

Story: Mike Stephenson

Lesson: The methods used to consult with the community can impact on things other than the primary objective of the consultation, ie. attitudinal change amongst both the community and Council workers.

Interviews

Each interview was planned to take about 30 minutes. In densely populated areas where walking from one to the next only takes minutes, a person allocated with 10 households to interview, could comfortably do so over three evenings, between 6.30 pm and 9.00 pm. These times were found to be suitable for finding

families at home and available to chat. Each interviewer was given a fixed length of time in which to complete their workloads, eg. 10 days. It was found that once engaged in conversation with a household, interviews could extend to up to 2.5 hours in length, a commitment not anticipated by interviewers.

Validating the data

Before the results of the survey could be processed, the survey data had to be validated. This was achieved by checking the coding of the questionnaires to see if each questionnaire was internally consistent (see Torquing, 1995). Next the questionnaire results were checked against ABS Population data.

Analysis of survey results

From the 325 households surveyed in Berri, there was a 90 per cent response rate, 10 per cent were either not home and repeated attempts failed to find them, or they declined to participate.

The survey results enabled determination of the major public and environmental health issues in the community. From this information a summary of the top ten community issues raised in the interview process was produced (Figure 3).

This was sent to all interview respondents and Committee members as feedback and also published in the local newsletter. The results raised considerable interest, as demonstrated in the following story:

'The summary sheet sent to respondents and waste disposal story'

"When we released Berri's top ten highlights we distributed this information to each of the people that had taken part in the survey and to the media. A number of issues came up which we were then able to highlight. One particularly important issue was 'waste disposal'. At the time the Berri District Council had no rubbish collection at all outside the township. Throughout the survey we were able to demonstrate about 40 per cent of the population of Berri lived outside of the township. They had no rubbish picked up at all. Not surprisingly, this was an important issue to them. This happened to come at the time when the council was looking at re-development of its waste disposal approach and so they changed what they might have otherwise have done and replaced their existing system with a single person operator using a grab arm on the back of a truck and expanded that in order to redirect the resources to cover the entire district. The population at large thought this was wonderful, because the council was genuinely listening to them".

Story: Mike Stephenson

Figure 3: Survey Results: A Summary (after District Council of Berri, 1994)

Summary: SURVEY RESULTS

The top ten health and wellbeing issues to the people of Berri District Council area were;

| Issue | Percentage of households |
|---|--------------------------|
| 1. Recycling | 62.5% |
| 2. Ross River Virus | 48.8% |
| 3. Elders' Independence | 48.8% |
| 4. Bicycle paths | 44.1% |
| 5. Water Quality | 44.1% |
| 6. Domestic Pet Control | 42.3% |
| 7. Waste Disposal | 42.3% |
| 8. Employment for adolescents and teenagers | 42.7% |
| 9. Cultural and Social Facilities | 40.5% |
| 10. Public Toilets | 40.5% |

Recycling was particularly important for those households with children aged 13 years (73.7%) or young people aged 13-17 (69.2%)

Cultural and Social Facilities were seen to be important to a wide range of population, eg (47.4%) for households with young children, (38.5%) for those with adolescents and teenagers, (36.1%) for those with adults aged 18-64 years and (35.7%) for those households with a person aged over 64 years.

Water Quality was of concern to a wide range of population across all age groups and both within the townships and the districts (44.1% overall).

Differences between households in the townships and districts

Waste Disposal was important to (54.2%) of households in the Berri districts without weekly rubbish collection compared with (33.7%) for those households in the townships.

Sunburn of infants and children was important to 48.6% of households in the districts compared with 22.5% for the townships.

Footpaths were only of interest to 22.2% of households in the districts compared with 45.9% for the townships.

Bicycle paths were important to 41.7% of districts households compared with 45.9% of townships households.

Interests of different age groups

There were a number of differences between age groups.

Households with young children were particularly concerned with Bicycle Paths (47.4%).

Households with adolescents and teenagers were particularly interested in Open Spaces and Parks (57.7%).

Households without children expressed particular interest in Elders' Independence (52.6%).

Households with a person aged over 64 years were particularly interested in Footpaths (60.7%).

3. Focus Groups: using the identified risks to examine strategies for implementation

Development of the overall Plan for Berri involved the 3 'groups' in the process as illustrated in Figure 2; the household survey provided INPUT from the 'silent majority', next focus groups were used, providing opportunity for 'experts' and those surveyed to come together to discuss issues and gain agreement on the way forward, and following this, council was presented with the recommendations to endorse for action.

In establishing these Focus Groups, interviewees who were interested in focussing on particular topics were invited to attend Focus Group meetings with people with professional expertise in the area, with a view to (1) exchanging information and (2) formulating recommendations for council. Focus Group topics were determined by the Steering Committee who categorised each of the lists of issues into 4 groups. Invitations were then sent to people so that they could choose which group they wanted to be involved with. In this way the Focus Groups were selective, ie. designed to complement the random sample.

The composition of the focus groups enabled a breadth of opinion from a variety of sources. For instance, the Focus Group dealing with children, had welcome input not only from Committee members, but also from Friends of CAFHS (Child, Adolescent Family Health Service), from the Childrens Services Office, the Director of the Child Care Centre, the local dietician, Education Department officers and others.

Meetings of the Focus Groups were held at the offices of the Riverland Health & Social Welfare Council, and followed a similar format:

- an introduction to the planning process;
- a summary of the survey process;
- providing clear instructions to members on how to consider the survey results under each heading for the group's category;
- discussion as to which of the issues raised by the community should have priority over others;
- by consensus, five to seven topics were chosen in each working group for the development strategies and targets;

- those not chosen were noted for later discussion or follow up in the next plan;
- each issue was fully explored looking for possible improvements to servicing, or ways of implementing a service or facility where none existed; and
- sometimes an issue was beyond the resources or responsibility of the Council, and where this was acknowledged, some comment was generally made on how Council might influence the responsible people or authorities.

'The police chief's story from the focus groups'

"In the working on the impacts of health issues on elders through the discussion the police chief asked if there were any issues of neighbourhood safety. I undertook the interrogation of the database there on the spot and said 'it's only about 2.5 per cent of elderly people are showing any issues at all about safety'. He said: 'can you tell where they are?' We were able to do that. We discovered that they were clustered in about 5 or 6 houses in a particular part of Berri. It was a poor part of Berri and these elderly people were surrounded by people of difficult background. He said: 'That's where the problem is, we will send a patrol car around there on a regular basis'. That solved the problem. By taking on only quantitative information we would have missed out. We looked at both qualitative data from the whole survey and individual questionnaires to see what they had to say"

Story: Greg Reedman

4. Results: treatment

The final part of developing the Action Plan for Berri involved documenting the developed aims and strategies from the Focus Groups. This included the people/agencies who had been identified as being responsible for implementing the strategies and documentation of expected target dates for implementation of the strategies. Certain results were different to those expected as illustrated in the following stories.

'Yearly meetings'

"From the results where there evolved a 3 yearly process of consultation that was driven from this survey. During the Focus Group discussion stages, each of the people attending those meetings commented that they got a lot from the process and benefited from the interaction with all their colleagues and counterparts, or opponents, that they normally wouldn't see in their day-to-day activities. Many were keen to see that process carried on regularly. So one of the outcomes that we weren't expecting was that council would call a meeting on an annual basis, of a semi-formal nature, just for those service providers to get together, bounce their forward plans and outline their upcoming projects for the year in the four areas of Focus Groups that were worked on. We had an informal arrangement to

continue the Focus Groups outside of the framework of the plan we were developing. Several of those meetings were held up to about 1996 but then with amalgamation of adjoining councils and the movement that you usually have of health professionals within their field a lot of those people involved at that time have since moved on. Unfortunately, that outcome is not continuing".

Story: Greg Reedman

'Clout story – water quality'

"The survey resoundingly showed that the poor water quality was unacceptable to the community and an aim that came out of that was to place political pressure on appropriate people to develop improvements in water quality. Strategies were developed to (1) enlist the help of the Health Commission, the Minister of Health, through the local government association, and (2) make presentations on the health aspects of Water Quality to the Ministerial Committee, which was in session at the time, and delegations to the Minister of Infrastructure. All of this combined did have a result wherein that Ministerial Committee acknowledged the 'Berri a Wealth of Health' survey as having an impact on their decision to install filtered water plants through the region. Its influence was because it was a statistically correct survey that was feeding back figures from the ground or the community instead of another one of what could be said to be reports made by consultants who are being paid by the people. Because it was a ground-up survey that can be shown to be statistically correct, the people at a political level were able to put sufficient weight in it than to see it as noise making from an unhappy council".

Story: Mike Stephenson

Mike and Greg refined the aims and strategies obtained from the Focus Groups and also ensured that the aims and targets were 'achievable' (ie. not too ambitious). The Plan was kept as simple as possible in order to avoid having people 'slog through, getting a headache just translating the jargon back to everyday terminology' (Torquing, 1995). A first draft of the Plan was presented to the Steering Committee for comment, and then submitted to the Council for endorsement: this was achieved with no significant changes.

The final cut of the Plan was distributed to the Steering Committee, Government Departments linked with Environmental Health, libraries and Council, which enabled it to be integrated into the corporate planning of the Council.

5. Time

The Berri Plan took approximately 15 months to develop, from April 1993 to June 1994, in addition to 7 months preparatory work by Greg and Mike.

Plan Development

April 93 – Nov 93: A number of key activities took place during this period including:

- invitations sent out in order to establish the steering committee;
- planning the Steering Committee meetings by both Mike and Greg;
- publicity over several months including letters sent out to households;
- identification of dwellings;
- training the interviewees;
- questionnaire development; and
- pilot testing.

It should be noted that Greg piloted the questionnaire with members of his Council; around 40 people were used to perform the interviews, test the processes and modify the questionnaire.

Nov 93 – Jan 94: The interview process took place.

Nov 93 – May 94: Focus Groups were being established as the data was coming in, and meetings were being held, some in tandem with the interview process. It should be noted that Mike and Greg worked intensely during this period.

June 94: Analysis of the survey data and focus group outcomes were completed and the summary report was written and endorsed by Council. The aim was to execute the action plan in the new financial year.

It should be noted:

1. While Greg and Mike performed the intellectual work and most of the 'grunt' work, it was very important that they were supported by administration staff in order to undertake tasks such as typing and distributing letters, 'chasing up' attendees for meetings, etc.
2. Now that this process has been developed, other Councils that have since adopted this process in order to develop a Public and Environmental Health Management Plan have completed it in around 6 to 12 months, eg. Enfield Council in 6 months.

6. Challenges and obstacles

The main challenge associated with developing the Berri Plan was overcoming the preconceptions that people bring with them, particularly Council Reference groups in regard to consultation. Preconceptions that had to be overcome included:

- perceived difficulties with conducting surveys;
- perception of loss of control/power when genuine consultation takes place;

- creating a wish list and raising public expectations which can not be met; and
- community leaders believing they already know what people need.

7. Outcomes and benefits

The Berri Plan was developed in 1993 and included 120 strategies that were accepted and endorsed by the elected representatives of Council. The recommendations were actioned and progress was reported to Council on a monthly basis at elected members meetings.

At present, of the 120 strategies actioned in 1993, 84 have been either completed (ie. if they were 'one offs', they have been done) or implemented and are still in place (ie. if ongoing, they are still going), eg: banning of backyard burning, rubbish collection process, bushfire plan. Some of the other 36 strategies have either been varied, had their priorities changed, are no longer relevant, or are still aims for the future.

The most significant benefit of the process adopted for Berri was that it provided confidence that the plan represented and took into account the views of the public as a whole. As such, it provided Council with the necessary information and, hence, political strength to resist lobby groups (ie. vocal minorities) who wanted issues addressed that the rest of population (ie. silent majority) did not necessarily consider critical. This benefit is well illustrated by the first story presented in Section 5.6.

Other benefits to come out of the Berri process include the following:

- Provided for positive community building, ie:
 - Good will – people pleased that the Council was interested in their well being and listening to what they wanted. "Comments like – please come again, we didn't realise you were interested in us – are so rewarding" (Torquing, 1995).
 - Councillors and staff were generally surprised to find that people were quite happy with the process they were involved in: this changed the climate for people in Council. "The change in outlook that staff undergo when they have listened to and written down the opinions of a normal household will amaze both them and you. The attitudinal change is rewarding is rewarding on its own. After a process like this the receptionist doesn't think of the next complaint as just another grizzling rate payer, and this reflects right through the organisation" (Torquing, 1995).
- Council received much positive publicity and feedback as a result of the method and process used.

- Provided supportive evidence and a strong basis for requesting funds in a number of areas, for example:
 - \$58,000 funding to construct a bike track, which was a direct result of the recommendations in the Plan.
 - The figures from the survey were used to strongly influence the State Government on water quality, which has resulted in millions of dollars spent on the building of major filtration plants not only in Berri, but in all Riverland towns in SA.
- People of the region benefited because the decision makers were far better informed.
- Council was now able to take a significant leadership role in social issues (whereas previously it was unable to do this because it was only a small Council and therefore could not afford to employ social workers). For example, the poor self-esteem of youth was identified by the plan as requiring attention and, hence, Council demonstrated leadership by holding the “Berri’s Youth – Our Future” meeting.

8. The way forward

The emergency risk management process as outlined in Figure 1 features “Communication and Consultation” with the community at each stage of the process. Genuinely involving the community in the process may require a range of methods of consultation at different stages as illustrated in the development of the Berri PEHMP and other studies (Gregory, 2000). The benefits of involving the community in decision making (providing the results of the consultation actually influences the decisions to be made) can extend beyond good will, the community pleased that the Council/decision makers were listening to what they want, to attitudinal and behaviour change through raised awareness of individual and communal responsibilities. Although initially resource intensive, genuinely involving the community in the emergency risk management process may in fact reduce the communities vulnerability to emergencies.

Acknowledgements

First and foremost, the authors wish to acknowledge the key contributions made by both Greg Reedman (Regional Manager Riverland SASES) and Mike Stephenson (Environmental Health Officer of the District Council of Berri) who generated the successful plan for Berri and subsequently provided the valuable stories and insights for the Study reported here.

Much appreciation also to the Australian Emergency Management Institute for funding this Study and for their initiation and participation in the project through Louise Mitchell.

Thanks also to Ms Janet Matheson at the University of South Australia for her kind efforts and general assistance.

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By Dr John D. Pisaniello, Research Fellow and Prof. Jennifer M. McKay, Business Law, University of South Australia, School of International Business, Water Policy and Law Group, Mr Greg Reedman, Regional Manager, South Australian State Emergency Service, Mr Mike Stephenson, Environmental Health Officer, Berri Barmera Council, and Ms Louise Mitchell, Education Officer, Emergency Management Australia Institute.

Bells and whistles, belts and braces – designing an integrated flood warning system for the Hawkesbury-Nepean Valley

The second part of a two-part series on emergency warning technologies

The Hawkesbury-Nepean Valley west of Sydney is severely affected by flooding. The nature of flooding, the topography and patterns of development mean that in the most extreme events flood warnings must be disseminated to a population of more than 60,000 spread across a floodplain exceeding 400 square kilometres and along another 50 kilometres of river gorge. Molino Stewart investigated available and emerging technologies that are suitable for emergency warning. It then facilitated a structured process for evaluating the technologies and finding the most appropriate mix for an integrated warning system in the Hawkesbury-Nepean. An earlier paper described the technologies identified while this paper explains how they were evaluated and how an integrated concept was developed.

Background

The Nepean Catchment includes the Southern Highlands, the Blue Mountains and Western Sydney and covers 12,000 square kilometres upstream of Windsor. The river runs along the foot of the Blue Mountains between Penrith and Windsor and changes its name to the Hawkesbury River between these two urban centres. At Windsor the river is virtually at sea level but winds through steep sandstone gorges for another 100 kilometres before reaching the ocean at Broken Bay. It picks up another 10,000 square kilometres of catchment along the way.

There is a 400 square kilometre floodplain between Penrith and Windsor, which is the home to more than 60,000 people living in urban centres, rural townships and villages, rural residential developments and farms. Further downstream in the gorge area the population is smaller and more scattered with farms, weekenders and mobile homes being the common forms of accommodation. In the urban areas there are also nearly 4,000 commercial and industrial premises as well as schools, hospitals, nursing homes and prisons that may all need evacuation during floods.

In 1997, the NSW State Government formed the Hawkesbury-Nepean Floodplain Management Advisory Committee to undertake investigations and make recommendations to the Government regarding management

of the flood risks faced by the Hawkesbury-Nepean Valley communities.

A key recommendation of the Committee's "Achieving a Hawkesbury-Nepean Floodplain Strategy" was: "That the funding provision for flood warning sirens... be applied to the installation of a cost effective flood warning network comprising a combination of sirens and other appropriate technology" (HNFMAC 1997, 13).

Molino Stewart was engaged to identify and evaluate a range of potential flood warning dissemination technologies that could have an application in the Hawkesbury-Nepean. This paper explains how they were evaluated and an integrated warning system devised.

Bells and Whistles

The results of investigations into available warning technologies are reported in Molino, Begg, Stewart and Opper (2002). A total of ten different types of 'technologies' were carried forward from that investigation for further evaluation. They were:

- **Fixed Public Address** – A network of speakers on buildings and/or poles that broadcast an amplified flood-warning message throughout the floodplain.
- **Mobile Public Address** – speakers on motor vehicles travelling throughout the floodplain broadcasting an amplified flood-warning message.

- **Sirens** – A similar network to a fixed public address system but sirens simply broadcast a warning alarm.
- **Personal Notification** – Emergency Service personnel and others undertaking systematic doorknocking and speaking directly to building occupants
- **Free-to-Air TV/radio bulletin** – Broadcasting of flood warning messages over existing free-to-air radio and television networks.
- **Tone Alert Radio** – Individual radios are installed in each building. The radio is powered in a standby mode and activated by a broadcast radio signal. It then receives and amplifies a broadcast warning message.
- **Dial-out** – A computer controlled system, which dials all telephones within the area, which needs to receive a warning message. When the phone is answered a recorded warning message is delivered.
- **Community Notification Solutions** – This is similar to a dial out system in that a computer-controlled system sends a recorded warning message through the telephone network. But rather than ringing telephones and delivering a voice message it sends a data message to a device connected to the recipients phone line. A light on the device then flashes to alert the recipient to a text warning message displayed on the device.
- **Modulated Electrical Frequency** – Using a device similar to that used in the community notification system but triggering it by a frequency ripple sent along power lines in much the same way that off-peak hot water systems are switched on remotely by electricity distribution authorities.
- **Variable Message Signs** – Electronic signs by the roadside displaying flood warning messages

Belts and Braces

Having identified the various technologies, which were to be evaluated, it was necessary to use a

systematic process to compare and evaluate the technologies and develop a concept for an appropriate warning system for the Hawkesbury-Nepean Valley.

Evaluating Individual Technologies

Evaluation Method

A methodology called multi-criteria analysis was used to compare the technologies. This allows options with different performance characteristics to be compared objectively while making provision for subjective judgements to be made about the importance of the criteria used to compare options.

For each technology a concept was developed for the implementation of that single technology throughout the Hawkesbury-Nepean Valley. Each concept accounted for the distribution and density of settlements, topography and infrastructure capacities. For some options there were sub-options to allow comparisons between different configurations of the same technologies but which trade off different performance criteria such as cost and speed of notification.

The SES and Department of Land and Water Conservation identified 28 criteria for evaluating the performance of the options.

The SES and Department of Land and Water Conservation identified 28 criteria for evaluating the performance of the options. They also provided a range of weightings for these criteria depending on their opinions as to how important each criterion is in making a decision.

These criteria covered such issues as:

- whether the system would alert, notify or do both;
- effectiveness;
- cost;
- speed;
- reliance on the infrastructure of other organisations;
- community resistance; and
- Longevity of the technology.

Performing the Evaluation

The evaluation of the performance of each system against the evaluation criteria was undertaken by:

- Identifying information requirements for each system to facilitate the assessment of its performance against each criterion;
- Contacting suppliers of the technology in Australia where possible and overseas in other instances, seeking assistance with information requirements;
- Reaching a consensus with the SES and suppliers on assumptions needed to estimate performance;
- Estimating performance with respect to the agreed assumptions; and
- Cross-checking results to ensure consistency.

To ensure that values analysed in the MCA were consistent across all options, a generic option summary sheet was created. The sheet detailed the information required to make an informed decision about each criterion and, if relevant, outlined an appropriate scoring system to ensure consistency.

It was assumed for the purposes of the MCA that any particular option would be applied across the entire floodplain. This determined the system requirements and performance for each option. Consideration was given to more selective application of options to different areas of the floodplain in later stages of the concept development process.

Sensitivity analyses were incorporated into the MCA by estimating optimistic and pessimistic performance scores for each option against each criterion in addition to the best estimate performances. In addition, six individuals from the State Emergency Service and the

Department of Land and Water Conservation each gave a weighting to each criterion, which expressed their individual opinion as to the importance of that criterion in choosing between technologies. The group's minimum, mean and average weightings were used in the MCA with pessimistic, best estimate and optimistic scores to test the sensitivity of the option rankings to assumptions about their performance and the importance of criteria.

MCA Results

Multi-criteria analysis can produce outputs in a number of forms. The two forms used in this analysis were weighted summation and concordance. The weighted summation provided an indicative ranking taking into account the absolute scores and weightings. The concordance analysis was a useful tool for examining the relative performances of particular options by comparing each option in a pair wise comparison with each other option to determine how many

options it outperformed. A more detailed explanation of MCA and the different types of analyses can be found in Resource Assessment Commission Working Paper Number 6 (Resource Assessment Commission 1992).

Table 1 summarises the rankings from the different analyses. Consistent patterns emerge from the analyses, and these are discussed further in the following sections.

The term rankings is used in the following when discussing all analyses, although strictly the term is only applicable to the weighted summation analysis. The concordance analyses only give an indicative order of options and it is not valid to compare any two options using these analyses. Rather they are used to validate the weighted summation results or to identify the possibility of biases created by assumptions about scores.

A consistent pattern was evident from the weighted summation

analyses. Fixed PA systems were consistently the highest ranking options. Personal Notification was consistently the second ranked option. The next two highest ranking options were TV/Radio Broadcasting and Sirens. Examination of the actual scores for these two options showed that they were extremely close.

The concordance analysis indicated that while the same group of four or five options were overall the best performers, there were a number which were better at satisfying a larger number of criteria than Fixed PA (the preferred option from the weighted summation analysis).

These results were based on a single technology being applied across the entire floodplain. It is the overall goal of any flood warning system to maximise the performance of the total system against as many of the criteria as possible within the constraints imposed.

Table 1: Rankings

| RANKING | WEIGHTED SUMMATION | | | CONCORDANCE | | |
|---------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| | MIN | MAX | MEAN | MIN | MAX | MEAN |
| 1 | Fixed PA | Fixed PA | Fixed PA | Personal notification | Personal notification | Personal notification |
| 2 | Personal notification | Personal notification | Personal notification | Free-to-Air TV/radio bulletin | Free-to-Air TV/radio bulletin | Free-to-Air TV/radio bulletin |
| 3 | Free-to-Air TV/radio bulletin | Sirens | Free-to-Air TV/radio bulletin | Fixed PA | Tone alert radio | Tone alert radio |
| 4 | Sirens | Free-to-Air TV/radio bulletin | Sirens | Mobile PA | Mobile PA | Mobile PA |
| 5 | Tone alert radio | Tone alert radio | Tone alert radio | Tone alert radio | Fixed PA | Fixed PA |
| 6 | Mobile PA | Mobile PA | Mobile PA | Sirens | Sirens | Sirens |
| 7 | Community Notification Solutions | Modulated Electrical Frequency | Modulated Electrical Frequency | Dial-out | Dial-out | Community Notification Solutions |
| 8 | Modulated Electrical Frequency | Dial-out | Community Notification Solutions | Community Notification Solutions | Community Notification Solutions | Dial-out |
| 9 | Signs | Community Notification Solutions | Signs | Signs | Modulated Electrical Frequency | Signs |
| 10 | Dial-out | Signs | Dial-out | Modulated Electrical Frequency | Signs | Modulated Electrical Frequency |

Applying this principle could lead to:

- the adoption of different technologies in different locations depending on the particular features of an area; and/or
- the use of multiple technologies in some areas to ensure that the limitations of one technology do not prevent the warning being delivered to most of the population.

This principle was discussed further and applied in later sections of the concept development.

Further Sensitivity Analyses

The results of the MCA were presented to the SES State Planning Co-ordinator and the Division Controller responsible for the majority of the Hawkesbury-Nepean Valley. They asked a number of questions regarding the assumptions about options design and performance and criteria weightings. Those questions were answered by undertaking several sensitivity analyses to see whether changing certain assumptions would alter the relative ranking of options.

As a result, some additional dial out options were developed including larger, faster systems and systems operated by a third party. Some different performance scores were tested for the fixed PA and some different criteria weightings were tested (including zeroing some criteria so they did not contribute to the analysis).

The result was that in the weighted summation the Fixed PA was consistently the first or second highest ranked option. The concordance analyses generally push Fixed PA into fifth place which indicated that there are options which perform better than it on more criteria but the relative difference in performance on those criteria (which is ignored by concordance analysis) is not as great as the difference on the criteria where Fixed PA performs better.

Similarly personal notification was in the top two rankings in most of the analyses and only moves down the weighted summation rankings when selected criteria are zeroed.

Free-to-air broadcasting was also generally highly ranked in most analyses.

The additional dial out systems considered consistently ranked more highly than the original option. This suggested that workshop participants would consider that the faster speed of alert and notification outweighs the additional costs involved. It also showed that having an outside service provider who is already in the business of operating similar systems would be preferable to having to install, maintain and operate the system independently.

The use of optimistic scores did not alter the ranking of the top four options significantly and Fixed PA remained the highest ranked option. Pessimistic scores placed personal notification and free-to-air TV and radio in the top two places followed by the larger dial out systems. However, examination of the weighted summation scores indicated that fixed PA scored only 2–3 per cent lower than the dial out options in this analysis, which is not a significant difference.

It should be stressed at this point that the MCA process itself does not select a preferred option but helps give insight into the relative performance of different options. It allows a large amount of diverse information to be sorted so that decision making can focus in on the most critical elements of options performance.

Subsequent sections of this paper explain how the above observations were used by the consultants and the SES in a series of workshops to arrive at a preferred warning system for the Hawkesbury-Nepean Valley.



In special cases airplanes and helicopters can be used as part of the warning process.

Designing a Warning System

The MCA made it clear that no single technology or system performs well against all the identified criteria and many of the technologies investigated have not been tested in real emergencies. For these reasons any decision to invest in a technology or implement a particular warning system needs to recognise the uncertainties involved. An appropriate response is likely to be a 'layered' strategy that seeks to implement complementary approaches using a risk management philosophy. Which particular technologies are combined may vary from locality to locality across the floodplain.

The results of the MCA provide guidance in the elimination of some options from further consideration, the adoption of some technologies and the short-listing of others for further investigation. The following logic was applied:

Eliminated Options

- Signs along the roadside ranked very low. They would only be seen by a small number of people and most of these people would either be driving out of the flood zone within about 30 minutes or would get out of their cars within the flood zone where they could be reached by one of the other warning technologies.

- **Modulated Electrical Frequency** ranked low and the available budget would not allow it to be implemented across more than 50 per cent of the floodplain. It would not offer any significant advantages over other systems such as tone alert radios or dial out systems which would also deliver warnings within buildings.
- **Enhanced Dial Out (CNS)** systems rank lower than other dial out systems because they are more expensive, are more reliant on power supply, are an unfamiliar technology and untried technology despite being significantly faster than other dial out systems.

It was clear from the MCA that Free-to-Air Radio and Television Broadcasts rank highly as a warning dissemination technology.

- **Mobile Public Address** consistently ranked lower than Fixed PA and could offer no significant advantages over it as a public warning technology.
- **Sirens** consistently ranked lower than Fixed PA. This would appear to be because they require larger installations, are more reliant upon a power supply and can only deliver an alert message. Although the effectiveness of the notification function of a Fixed PA for people indoors has been questioned by some, it would certainly be a useful adjunct to the alert function and would only cost about 20 per cent more than a siren system. Sirens were therefore not considered further.

Adopted Options

It was clear from the MCA that Free-to-Air Radio and Television Broadcasts rank highly as a warning

dissemination technology. They have almost zero cost and quite detailed messages can be delivered and these can be continually updated. The two downsides to this technology are that it cannot be relied upon as an alert technology and it relies upon third parties to accurately communicate the warning messages.

The SES determined that free-to-air broadcasts should be an integral part of the flood warning system for the communities of Hawkesbury-Nepean River Valley. To overcome its limitations the following is proposed:

- The local Hawkesbury Radio Station be requested to provide continuous broadcast of flood warning information in event of a flood;
- All community flood preparedness literature and other preparedness communication media advertise the Hawkesbury Radio Station as the preferred source of up to date flood warning information; and
- All other electronic media be requested to only broadcast unedited flood warning messages from the SES.

The SES is also in the process of establishing a **Call Centre** (dial in only) as part of its flood awareness and preparedness strategy. It is anticipated that it would also be available during a flood to provide detailed flood warning notification to those who were already alerted by some other means.

Finally, the SES already has in place a community based **Rural Warden System** in some locations that are frequently flooded. These use a combination of telephoning and doorknocking to reach residents and businesses in high-risk locations. This system would be maintained and continue to be used in all floods but may be supplemented with other warning methods.

Options for Further Consideration

In light of the preceding discussion the following technologies remained for further consideration:

- fixed Public Address;
- personal Notification;
- telephone Dial Out System; and
- tone Alert Radios

Some further discussion was held in relation to what each of these would involve in an integrated warning system.

Fixed Public Address

The Fixed PA evaluated in the MCA involved a network incorporating two base stations, three repeater stations and 27 PA installations to cover almost the whole of the potentially flood affected areas. These included areas of dense and dispersed population. However the system design is such that the more dense the populations, the more cost effective these systems become. Coupled with that however, is that the smaller the total population, the less cost effective the systems become. These were important considerations in designing a concept for an integrated warning system.

Personal Notification

Personal notification in the MCA was confined to SES volunteers door knocking individual houses and commercial and industrial premises. Personal notification can also include personal telephone calls and 'telephone trees'. The rural wardens use these, along with door knocking, where these systems are in place in the Valley. In subsequent discussions personal notification was confined to doorknocking by SES volunteers and did not include doorknocking by rural flood wardens.

Dial-Out Systems

With regard to Dial Out Systems the MCA made it clear that the faster the system, the higher it would rank

despite the increased costs. It was also clear that a system operated by a third party who was already involved in maintaining and operating dial out systems for other purposes would decrease costs without creating any other distinct disadvantages.

There are therefore many possible scales of dial out system from systems that only cover particular localities to those which cover the entire floodplain. They could be PC based or mainframe based or they could even rely upon manual dial out from a call centre. While any of these systems could theoretically be maintained and operated by a third party as part of a larger call making business, it was not clear at the time of the evaluations whether there were any such organisations willing to undertake such a task.

Tone Alert Radio

The QuikTrak Tone Alert Radio System used in the MCA exceeds

It must be recognised that designing a flood warning system is not simply selecting the technology or mix of technologies that will be used to disseminate a flood warning. It also involves carefully designing the warning message content that may vary between the dissemination technologies.

the budget of this project by an order of magnitude and could not be considered for use across the entire floodplain. It may be affordable and appropriate for some small parts of the floodplain but based on the cost estimates provided it would not be affordable to install it in more than about 1,000 of the 20,000 potentially flood affected buildings.

There are other less sophisticated tone alert radio systems available but these have more limited capabilities and are more reliant upon building occupiers for ongoing maintenance and function. Alternatively the QuikTrak system may be able to be installed with fewer features. Such a

system might be more realistic for comparison with other warning technologies in the Hawkesbury-Nepean. In the discussions in the following sections a reference to a tone alert system is a reference to a lower cost system than the QuikTrak system originally evaluated.

Integrating Technologies

It must be recognised that designing a flood warning system is not simply selecting the technology or mix of technologies that will be used to disseminate a flood warning. It also involves carefully designing the warning message content that may vary between the dissemination technologies. Furthermore, it must be integrated with a whole awareness and preparedness strategy for the flood affected communities so that when a warning is issued appropriate responses can be made.

It was beyond the scope of this study to explore all of the community preparedness and message content issues but reference was made to these in discussing the relative merits of technologies and the design of an overall warning system.

Figure 1 shows how the various types of warning technologies could be integrated into a total warning system. It highlights those warning technologies that are already in place or will be part of an integrated warning system for the Hawkesbury-Nepean. It then shows how other technologies, if adopted, would integrate with the core elements. The diagram shows which technologies would give an alert message, which would give a simple notification message and which would give a more detailed notification message.

Figure 1: Potential interaction of flood warning system components

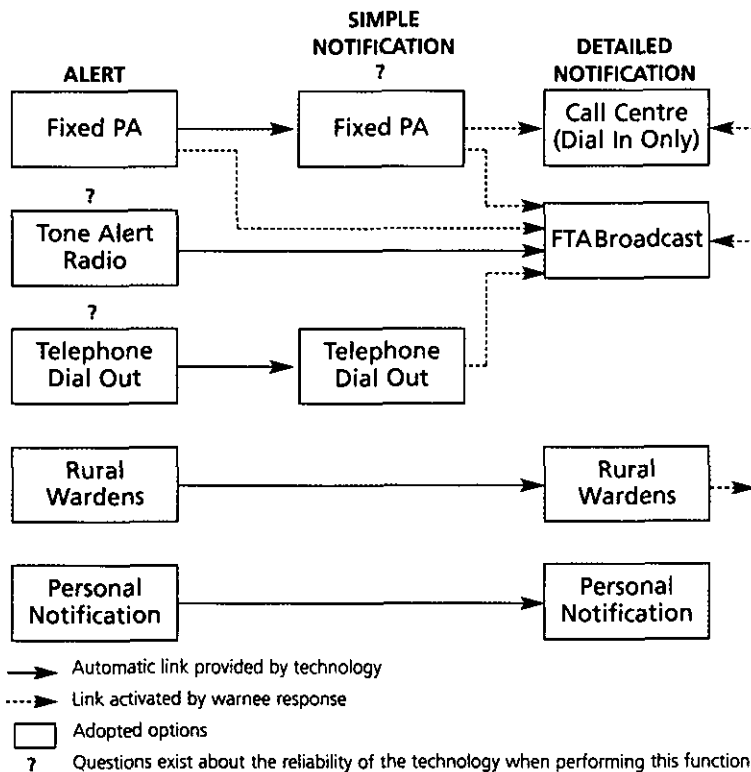


Table 2: Managing Communication Barriers

| MESSAGE TYPE | ALERT | | | | | | | NOTIFY | | | | | | |
|-----------------------------|--------------------------|-----------------------|---------------|----------|-----------------------|----------|-------------------|--------------------------|-----------------------|---------------|----------|-----------------------|----------|-------------------|
| | FREE-TO-AIR TV AND RADIO | CALL CENTRE (DIAL IN) | RURAL WARDENS | FIXED PA | PERSONAL NOTIFICATION | DIAL-OUT | PHONE ALERT RADIO | FREE-TO-AIR TV AND RADIO | CALL CENTRE (DIAL IN) | RURAL WARDENS | FIXED PA | PERSONAL NOTIFICATION | DIAL-OUT | PHONE ALERT RADIO |
| COMMUNICATION BARRIER | | | | | | | | | | | | | | |
| INDOORS | N | N | Y | Y | Y | Y | Y | Y | Y | Y | ? | Y | Y | Y |
| ASLEEP | N | N | Y | Y | Y | Y | Y | N | N | Y | N | Y | Y | Y |
| OUTSIDE FLOOD ZONE | N | N | N | N | N | N | N | Y | Y | N | N | N | N | N |
| NO POWER | N | N | Y | Y | Y | ? | ? | N | ? | Y | Y | Y | Y | ? |
| NO TELEPHONE | N | N | ? | Y | Y | N | Y | Y | N | ? | Y | Y | N | Y |
| NO ROAD ACCESS | N | N | ? | Y | N | Y | Y | Y | Y | ? | Y | N | Y | Y |
| NO RADIO RECEPTION | N | N | Y | Y | Y | Y | N | N | Y | Y | Y | Y | Y | N |
| LANGUAGE OTHER THAN ENGLISH | N | N | Y | Y | Y | Y | Y | Y | Y | N | N | N | N | N |
| HEARING IMPAIRED | N | N | ? | N | ? | N | N | Y | Y | N | N | N | N | N |

Y – Can deliver the alert and/or notification message when a communication barrier exists
 N – Cannot deliver the alert and/or notification message when a communication barrier exists
 ? – Cannot be determined with the information available at this stage or depends on the circumstances at the time

It also indicates whether the notification automatically follows the alert or whether the warned individual needs to take further steps to receive the notification message(s).

Communication Barriers

While Fixed PA is the best performing technology overall it has its limitations and there are a number of criteria against which other approaches are better performers. A risk management approach is the most appropriate way to design an integrated warning system.

Put simply, the warning system needs to get a message across to as many people as possible. There are a number of communication barriers that it will need to overcome and there may be some individuals who will not receive the warning message because it is not possible, practical or affordable to commit all the resources necessary to overcome all of the

barriers to communicating the warning message to them.

Table 2 sets out a way of considering how each technology overcomes these communication barriers and how they might be integrated in the most effective way. The first row of the table considers the type of warning message that needs to be communicated. There are two types: alert and warning. The alert message simply tells people that there is impending flood danger, the notification provides more detail about the type of danger and the appropriate response. The level of detail in the notification message will be determined by the limitations of the technology and the broader content issues of the overall community preparedness strategy.

The next row is the warning technologies in a preliminary order of preference. This order does not strictly follow that of the MCA but reflects the outcomes of meetings held between the consultants and SES personnel to discuss the MCA

results. As explained elsewhere in this paper MCA does not make decisions but is a tool that aids decision-making.

The first column lists the main potential communication barriers. The subsequent rows in the table indicate whether each technology is able to deliver the alert and/or notification message when a particular communication barrier exists. Although most of these appeared as criteria in the MCA the purpose of this table is different. The MCA ranked the technologies based on their ability to perform against these and other criteria. This analysis seeks to find the best combination of technologies to overcome the communication barriers. The preference is to have an integrated system that can overcome all communication barriers within the available budget. The table should therefore be read in conjunction with Figure 1 that shows how each of these technologies might be integrated.

Table 3: Preferred Warning Systems

| SES SECTORS | FLOOD CATEGORY | APPROXIMATE POPULATION | TECHNOLOGY | | | | | | |
|---|----------------|------------------------|--------------------------|-----------------------|---------------|----------|-----------------------|----------|-------------------|
| | | | FREE-TO-AIR TV AND RADIO | CALL CENTRE (DIAL IN) | RURAL WARDENS | FIXED PA | PERSONAL NOTIFICATION | DIAL-OUT | STONE ALERT RADIO |
| RICHMOND, WINDSOR, MCGRATHS HILL, EMU PLAINS, PITT TOWN | FL/R/L | URBAN 27,800 | C | C | X | P | P | ? | ? |
| | | RURAL 1,000 | C | C | E | X | X | ? | ? |
| CASTLEREAGH/CRANEBROOK, LONDONDERRY, YARRAMUNDI | O | URBAN 1,200 | C | C | X | P | P | X | X |
| | | RURAL 1,600 | C | C | P | X | X | ? | ? |
| PENRITH, WALLACIA | R/FH | URBAN 6,500 | C | C | X | P | P | X | X |
| WILBERFORCE, NORTH RICHMOND, | R | URBAN 1,500 | C | C | X | X | P | X | X |
| | | RURAL 180 | C | C | P | X | X | ? | ? |
| OAKVILLE/CATTAL, LOWER REACHES, SOUTH CREEK A & B, EASTERN CREEK A, B & C | R/L | URBAN 8,500 | C | C | X | X | P | X | X |
| | | RURAL 2,900 | C | C | E | X | E | ? | ? |

E - Existing - this already exists and will be continued as part of the new flood warning system

C - Committed - does not yet exist but the SES is committed to implementing this as part of the new flood warning system

P - Proposed - does not yet exist but it is a proposed technology for the flood warning system subject to satisfactory piloting

?

X - Definitely not to be utilised

Sector Analysis

The evaluations of all of the technologies in the MCA assumed that a single technology would be used to warn the entire population. However, this may not be the most financially optimal solution.

It has already been explained that the warning system would need to have a suite of technologies to maximise its effectiveness in reaching all those needing to be warned. However, for it to be cost effective that suite may need to vary from locality to locality.

Furthermore the time available for disseminating warning messages and the consequences of warnings not being heard or understood varies from locality to locality. It may be preferable in critical locations to have more options available for delivering warning messages than in areas where the consequences of not receiving a warning are less critical.

The SES has divided the floodplain up into sectors in its Hawkesbury/ Nepean Flood Emergency State Plan (SES, 2000). It has then given each of these sectors a flood classification as follows based on the characteristics of the probable maximum flood:

- **Category FL:** These are inhabited areas of high ground within a floodplain linked to the flood-free valley sides by a road along a low ridge. The road can be cut by floodwater, closing the only evacuation route and creating an island. If floodwater continues to rise after it is isolated, the island will eventually be completely covered.
- **Category FH:** These are also flood islands but the flood island is higher than the limit of flooding (i.e. above the PMF). The island is surrounded by floodwater but there is no direct risk to life or property on the island from inundation.

- **Category O:** These are inhabited areas on flood prone ridges jutting into the floodplain or on the valley side. Escape from rising floodwater will be possible by walking overland to higher ground, but not by driving.
- **Category R:** These are inhabited areas on flood prone ridges jutting into the floodplain or on the valley side with access road/s rising steadily uphill and away from the rising floodwaters. Evacuation can take place by vehicle or on foot along the road as floodwater advances.

The flood categories of sectors and the population sizes and densities were analysed in conjunction with the information in Figure 1 and Table 2.

Preferred Warning Systems

Based on the analyses the SES selected preferred combinations of technologies for each sector as set out in Table 3. It was decided that

in some sectors different combinations of technologies would be appropriate in different parts of the sectors and these are set out in the table.

Free-to-Air and Call Centre

The SES is committed to free-to-air broadcasting because it is a low cost means of disseminating a detailed notification message to many people in the valley. It is committed to the call centre as part of the preparedness strategy and therefore the additional cost of operating it during a flood would be small and it would provide an additional means of providing detailed notification to a large number of people.

Rural Wardens

The Rural Wardens system that already exists in the lower reaches and the low-lying areas of Richmond and Windsor sectors is already working well for frequent floods. This would be maintained and the preference is to develop a similar system for low lying, but less frequently flooded rural areas around Yarramundi and possibly Wilberforce and North Richmond. There is already a personal notification strategy developed by the SES for the rural areas of South and Eastern Creek and this would be maintained in preference to a warden system.

Fixed Public Address

Richmond, Windsor, McGraths Hill, Emu Plains and Pitt Town are the most critical sectors in terms of flood warning because most of these are flood islands that would become completely inundated in some floods. For this reason the SES considers that a Fixed PA system would be required as a minimum in the urban parts of these sectors. This would be a cost effective solution here because the population numbers are large and at an urban density. The PAs may be able to be heard in surrounding rural areas but it was considered that the lower population density would

reduce the cost effectiveness of extend the PAs into these areas. If more detailed investigation indicated that the PA system could be extended at only marginal incremental cost then this would be considered.

It was also considered that Fixed PA would be worthwhile in the urban areas of the category O Sectors. The population sizes are not great and so the cost effectiveness of this option is reduced but it will give these people maximum alert to evacuate and maximise the chances of evacuation by road. The same logic was applied in deciding that the Wallacia sector should have a Fixed PA.

The need to warn the Penrith sectors is less urgent but the population size, and its contiguity with the Emu Plains and Castlereagh/Cranebrook Sectors should make it a cost effective addition to the Fixed PA Network.

The remaining sectors have less critical evacuation needs and therefore it was considered that any remaining budget should be spent on supplementing warning systems in the more critical sectors.

Based on the information available, the net present cost of a Fixed PA system across all of the sectors proposed is likely to be less than \$1.5 million and possibly as low as \$1 million.

Personal Notification

There remained concerns that the notification function of a fixed PA system will not be able to be relied upon and there is a desire to supplement the PA in the most critical sectors (FL and O). Personal notification is the preferred supplementary alert and notification strategy in these sectors. However, the large number of people who need to be contacted and the short warning times available mean that large numbers of teams are required to complete the doorknocking.

In the other sectors this is less critical. Personal notification is the preferred alternative alert and notification strategy in urban areas where it is not intended to install a PA system.

It is not intended to use personal notification in most rural areas because of issues with distances and flooding of local access roads. It already is used in the South Creek sectors where this is less of a problem and it is intended to continue to do so.

Dial-Out and Tone Alert Radio

In the most critical sectors there is a preference to supplement the Fixed PA and the personal notification with another dual alert/notification technology. The greatest potential limitation of the PA is that the notification message may not be able to be comprehended by people who are indoors and for personal notification the time to disseminate the message is the issue. Either a dial out system or a tone alert radio could potentially overcome these problems, as they are effectively 'indoor' warning technologies. However, both have their own limitations.

It is uncertain whether a dial out system would be able to function if the warning dissemination caused people to make other phone calls and the telephone network capacity is insufficient to manage all of the calls. Also if there is a power supply failure then cordless and some other telephones will not function. A dial out system is also sequential in its function and would not deliver a message as instantaneously as either a fixed PA or a tone alert radio.

There are unanswered questions about the scalability of such a system because investigations to date have focussed on a large, automated, computer-based system for use throughout the floodplain. A smaller system may be able to be cost effectively provided for these sectors alone or it may be

affordable and more cost effective to include some of the lower lying rural areas of other sectors as part of such a system.

Alternatively low-lying rural areas may be better served by a manual system. If it takes an individual 5 minutes to make a phone call and deliver a detailed notification message to the person at the other end, a team of 25 call centre operators could deliver a warning to 600 households (1,800) people in two hours. A larger team could do it more quickly and it is possible that each call could only take two or three minutes.

There are many organisations that operate call centres all year round for multiple purposes. If one or more of these were to be used to disseminate the warning manually by telephone then there would be far lower hardware costs to the SES than an equivalent computer based system. Operator training could incorporate annually ringing properties in the targeted areas of the floodplain to ensure telephone numbers remain up to date. This would also reinforce the preparedness message with the people at risk.

A tone alert radio by comparison would connect all recipients instantaneously directly to free-to-air broadcast. The downsides of this technology is that unless a very expensive system is installed it may be possible for the building occupiers to effectively disable (either deliberately or accidentally) the system by removing the device, changing its pre-tuned frequency or not maintaining its battery backup power supply. It is also a technology that people are not familiar with.

There was consensus in the meetings that farmers and caravan park operators in the lowest parts of the floodplain would be more likely to maintain these devices because they are already flood aware and are keen to get early warning of

flooding to protect their assets from inundation. In less frequently inundated areas radio maintenance may be more problematic.

It is therefore likely to be a choice between tone alert radios and a dial out system as a supplementary system to PA in the FL category sectors. More information about their costs and reliability would be needed before that choice could be made.

If one of these technologies were chosen then it would be worthwhile extending its use into other rural areas if there remains funding to do so. The order of priority in extending the use of one of these technologies would be O then R then L category sectors.

Conclusions

At the time of writing, management within the State Emergency Service were considering the outcomes of the study and were yet to determine the next steps. It is considered prudent to trial the higher capital cost technologies in a small area first before committing to installing them and relying upon them across large areas of the floodplain.

The SES recognises that there is a need to consult with the community and the local Council in the areas for such trials to ensure that they understand and support the need for the pilot program. Consultation will also provide an opportunity to gauge community attitudes towards the suite of warning technologies being actively considered.

At the time of writing the analysis was still being undertaken with some sensitivity analysis being done to see how sensitive the ranking of options is to assumptions about option performance and criteria weightings.

The study demonstrated that:

- multi Criteria analysis is a useful tool in comparing and diverse

options against a wide range of criteria;

- traditional lower technology options such as door knocking and public media broadcasts are extremely valuable;
- tone alert radios and telephone dial out systems may be useful warning technologies in particular circumstances;
- no single technology can be relied upon to alert and notify all 60,000 people in the floodplain;
- a layered approach with more than one technology will maximise the reach of the warning and provide backup communication in the event of contingencies; and
- analysis of the population distribution, the nature of flooding, warning times and evacuation routes are important considerations in optimising an integrated warning system.

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By Steven Molino BSc BE MIE Aust CPEng, Principal, Molino Stewart;
Graham Begg, BSc BE MBA, Senior Consultant, Molino Stewart;
Lyndall Stewart, BA LLB, Senior Consultant, Communications, Molino Stewart, and
Steve Oppen, State Planning Coordinator, State Emergency Service.

Combating floods the NSW SES way *continued from page 18*

to take account of information that cannot be known before the actual event. It became clear, during those floods, that appropriate warning measures simply could not be created 'from scratch' in a way which would incorporate the necessary information and advice and stimulate a large-scale evacuation.

An important element of the development of flood warning systems is the appraisal and incorporation of appropriate technical systems to alert and warn people. There is an increasing range of methods to be used beyond the traditional door-knocking and broadcast radio means, including various types of siren, automated telephone dialling and other systems. In New South Wales the SES is actively pursuing the assessment of different methods for their suitability in different types of environment: a recent addition to the battery of methods being used to disseminate flood warnings is the Short Messaging Service (SMS) by which people can be warned via the display units on their mobile phones.

What is important here is that appropriate arrays of dissemination techniques are chosen for different environments. Warning is not matters of using individual techniques but of using several that operate in different ways to get the message out. It is also a matter of ensuring that messages which are received are able to motivate the taking of appropriate actions: in the end, effective flood warning systems are those which incorporate techniques which operate well at a psychological level and in doing so stimulate desired behaviours.

The New South Wales SES sets itself the goal of adding value to the flood prediction service provided by the Commonwealth Bureau of Meteorology. In essence this means ensuring that the predictions can be

understood in the community, and that they can be acted upon. There is ample evidence that Bureau predictions by themselves are unlikely to produce such actions from many people, and this indicates the importance of the value that the SES seeks to add. Beyond this role, the SES seeks also to set up 'flood watch' networks which can help to verify the existence and severity of flood conditions and can be used to fine-tune predictions.

Such networks can also provide a capacity to assess the severity of floods approaching communities that are not served by Bureau predictions. Despite the density of the Bureau's network of gauges for which formal height-time forecasts are provided, some rural communities remain without a service. This is especially the case in the inland of the state where there are many intermittent streams which lack gauging but which have large catchments and can produce damaging floods after very heavy rains. Here, farmers and farm managers reporting rain and stream conditions to an SES Local Controller can contribute to the operation of simple warning systems of a kind which used to be common in rural areas (see Keys, 1997, p.14) but which appear to have been run down over a long period of rural depopulation and farm enlargement, leading to a weakening of community communication networks. A severe flood in February 2001 on some tributaries of the Darling River was apparently not known to some of the farmers in its path and damage that might have been avoided was caused as a result. Flood watch networks have a role to play in restoring communication about coming floods and maximising the opportunity for rural people to take action to avoid or minimise damage.

Floodplain management. The core concerns of floodplain management are the utilisation of land that is prone to flooding and the protection of existing development from floods. Decisions on land use are made within a well-established legal and regulatory framework, central to which is the Development Application via which owners of land apply to the consent authority – usually a local government council – to use parcels of land in specified ways and to build on them accordingly. In New South Wales councils have for more than twenty years been guided, in the context of land which could be flooded, by manuals which encapsulate state government policy on the use of such land. These manuals have spelled out the processes by which decisions should be made: they are key to the process whose judicial endpoint, when proposed developments are rejected by the consent authority, is in appeals about decisions on decisions in the Land and Environment Court. The current manual is the Floodplain Management Manual (New South Wales Government, 2001.)

Floodplain management involves decisions about future development, then. A second role is in the identification and implementation of appropriate measures to ensure that the costs and dangers of flooding can be significantly reduced in areas in which development has already occurred. Floodplain Management Committees, set up by councils and supported by consultants' studies of local flood problems, advise on which measures would be appropriate to achieve this objective. In different environments the measures might include levees, bypass channels, voluntary buy-back schemes, or schemes to raise houses. All these are 'devices' which reduce the actual effects of flooding when it occurs.

In New South Wales the evolution of the SES role in floodplain management closely parallels the evolution of the flood-planning role referred to above. Until relatively recently the SES played little part in this field, not concerning itself with councils' responsibilities for planning the use of floodplain land or taking any significant interest in considerations of the range of methods which can be employed to reduce the impact of flooding. The SES was rarely asked about land development, or about the application of devices for reducing flooding.

Things have changed significantly over the past five or six years, however. The SES still has no directly legislated role in land use management and it seeks no such role, but increasingly councils have sought SES input to decisions in relation to the consent role, recognising that the SES can provide advice on the public safety and property protection ramifications of proposed developments. This has had significant implications for the SES, which has been forced not only to react to these demands for input but which has also had to provide appropriate resources to ensure those demands can be met effectively. In addition the SES has had to develop a body of principles or doctrine to guide its input. Along the way the SES has sought to have local volunteer input made available to Floodplain Management Committees and has tried to ensure that public safety and property protection issues are properly dealt with in the provisions of the Floodplain Management Manual. All this has been done 'on the run', with cases building up principles and the principles being tested in the Land and Environment Court via the appeals process.

Some specific matters that have arisen as the SES has become more involved in floodplain management issues should be elaborated upon. One relates to the initial tendency for council officers, needing advice

on particular Development Applications, to seek it from Local Controllers of the SES. Local Controllers are exclusively volunteer emergency managers whose expertise does not necessarily encompass the complex specialist field of floodplain management. The SES, recognising the need to protect its volunteers from the likelihood that their advice would antagonise development interests and/or councils, and the equally important need to ensure that councils receive appropriately expert advice, has sought to discipline the process. As a result Local Controllers are now directed to refer requests for advice relating to developments to the SES's State Headquarters where the necessary expertise exists and can be developed, appropriately distanced from particular cases under examination but in close contact with other relevant government agencies. State Headquarters officers involved in particular cases are, naturally, required to consult the relevant Local Controller and to incorporate him or her in the advising process.

The focus of the SES's participation in the process is the public safety dimension of land use management decisions. A particular issue that has arisen on several occasions relates to the loss of roads during floods. Isolation by itself may seem to create only a small danger, but the problem can escalate quickly if people become ill, or if telephone, power and sewerage services fail, or if inundation subsequently occurs above the floor levels of dwellings. In such cases there will be increased demands for rescue or requirements for evacuation which have obvious public safety ramifications and which will create difficulties for the SES that must resource the necessary operations. The severity of these problems is most clearly apparent in the current explosion in rural residential subdivisions. If left unchallenged, this explosion could see large-scale expansions of populations on floodplains, with

egress routes prone to being cut and with local SES units facing big increases in the demand for rescue services during serious floods (not to mention demands for resupply during routine events). Yet there can be no guarantee that road access conditions will be improved (for example, by raising low points at which closure occurs), or that the SES at the local level will be able to grow to meet the increased level of demand for it to act to save lives and property or to resupply people who have been cut off.

One element of debates about whether or not flood prone land should be made available for residential purposes is the notion that people wanting to live on such land should be allowed to do so provided they have an 'evacuation plan'. The SES has argued against such plans on several grounds: they do not meet the Land and Environment Court's strictures about 'permanent, fail-safe and maintenance-free' threat-minimising measures being applied, and there is no guarantee that such plans will be fit or will be kept fit for their purpose over the sometimes long periods which elapse between floods. Indeed there is every possibility that private evacuation plans will be prepared solely for the cynical purpose of gaining development consent. Because of these failings, the Floodplain Management Manual discourages the use of such plans in the development application process. The SES believes, however, that proper community flood preparedness demands that people living on floodplains should know what steps they need to take to manage the impacts of flooding on them and their property – including understanding that evacuation may be one such step and comprehending how and under what circumstances evacuation should be undertaken. Private flood plans are encouraged, then, but not for the purpose of supporting Development Applications.

SES involvement in floodplain management matters also includes officers participating in discussions, including public meetings, in which councillors of local government agencies are briefed and educated about the principles of floodplain management in the context of their legal responsibilities as decision makers. In these discussions the SES is duty bound to note that it is not a rescue service devised for the purpose of covering up for inappropriate developments and somehow making them sound. A site, which flooding makes dangerous for a particular kind of land use, even only occasionally, is dangerous with or without an SES unit whose presence and actions must not be seen as a palliative for poor decisions. Likewise a privately written, property-specific flood evacuation plan does not alter the facts about a dangerous site.

None of this should be taken to mean, incidentally, that the New South Wales SES is opposed to development on floodplains or that it wishes to sterilise land that could be flooded. What is sought is development which is appropriate in public safety terms and which is permitted only after a process that has consciously considered the risks to that safety. This is surely preferable to allowing floods often well below those of PMF proportions to prove the folly of ill-advised developments – perhaps by killing large numbers of people as has happened on a number of occasions in the State's history. The avoidance of massive property damage is also a factor in the SES's deliberations on floodplain management: it makes little sense to encourage increases in the scale of public and private assets which are exposed to flooding and to virtually guarantee increased financial hardship as a consequence when floods occur.

Paid SES flood planning staff have increasingly been involved in floodplain management matters including those related to consent

decisions. Volunteer SES members have also had an enlarged role, since they are now regularly invited to sit on council-sponsored Floodplain Management Committees. In this context the SES also seeks to steer floodplain management consultancies into providing data which is relevant to flood plans – for example, data on the heights at which evacuation routes are cut by flood waters or houses are inundated beyond their floor levels, and the time frames within which such floods could reach nominated critical heights (for more detail on the kinds of data which can be collected, see *Emergency Management Australia*, 1999a, pp.14–18).

In the same forums the SES raises issues relating to the provision of warning systems and services and to the difficulties posed by the need to mount evacuations when floods occur. A particular case in point relates to the valley of the Hawkesbury-Nepean River where, as indicated above, thousands of people could be trapped and their homes inundated by flood waters after the evacuation routes have been cut – and this in floods with return periods of only a few decades. In this case, a multi-million dollar government program has been established to raise evacuation routes, improve warning processes, facilitate the development of flood plans, improve the level of operational capability of the SES and ensure that community members are aware of the need for periodic large-scale evacuations and ready to take part in them. Other environments with problems similar in nature if not in severity will probably need similar treatment in due course.

Educating community members about flooding. It is probably self-evident that people who understand the environmental threats they face and have considered how they will manage them when they arise will cope better than people who lack such comprehension. It is perhaps

less well appreciated that many people who live and work in flood liable areas have little idea of what flooding could mean to them – especially in the case of large floods of severities well beyond their experience or if a long period has elapsed since flooding last occurred. It falls to the combat agency, with assistance from councils and other agencies, to raise the level of flood consciousness and to ensure that people are made ready for flooding.

In other words, flood-ready communities must be purposefully created. Once created, their flood-readiness must be purposefully maintained and enhanced.

Flood-ready communities are communities whose people will be capable of responding appropriately and in timely fashion to warnings – which in different environments might include stocking up on food and other essentials, raising or transporting commercial stock and household belongings out of harm's way, or evacuating by safe routes. Timeliness of actions must be stressed here. In many situations this means that people need to be carrying out their harm-reducing responses before floods have begun to arrive in their vicinities. For this to be possible, people must be able to have trust in the warning services being provided and in the competence of the SES to lead their responses: here, organisational credibility is a quality which must be built and nurtured. As far as the minds of community members are concerned, the goal is not simply one of raised awareness but rather the achievement of commitment to actions appropriate to the nature and severity of a coming flood.

None of this is easy to achieve, and it has probably not been fully achieved in any flood liable community in Australia. Public education about environmental threats, about how agencies deal with them and about how people should act before, during and after the impact of these threats, is still

not strong in this country – with the possible exception of the bush fire threat. This is but one more legacy of the response bias in traditional Australian emergency management. Equally, little has been done in most jurisdictions to ensure that the community sees agencies as competent in discharging their responsibilities.

Things are changing, however. The New South Wales SES has employed specialists in social marketing to develop and deliver flood education campaigns, and there has been considerable work done to develop appropriate conceptual frameworks (see, for example, Young and O'Neill, 1999). Equally the SES has participated or led in educational activities designed around the commemoration, in 'round-number' anniversary years, of severe floods including those which devastated the communities of the Macleay and Hunter River valleys in 1949 and 1955 respectively and which caused substantial damage in the town of Inverell (on the Macintyre River) in 1991. These commemorative events have featured public meetings to discuss floods, flood plans and flood management strategies, large numbers of radio interviews and newspaper articles on similar themes, the production of flood videos, the displaying of flood photographs and other flood memorabilia, guided tours to inspect and explain local flood mitigation systems, and other initiatives. Street parades featuring flood response agency personnel have been conducted, and school projects have been devised with flood themes. The events have produced lively discussions within communities about the likely effects of similar serious floods were they to occur today.

The floods of February and March 2001 on the north coast and in the north-west of the State were also used to build community understanding of the flood problem and its management, and to

improve the SES's understanding of community needs when floods occur. Soon after the floods, public meetings were held in the affected areas to take feedback, to identify better ways of communicating flood information, to ensure that the SES comprehends the expectations of people in flood liable areas – and to indicate to people what they can do on their own behalf to manage future episodes of flooding. Likewise, on the first anniversary of the March floods on the Clarence, Bellinger and Macleay Rivers the SES involved itself in lengthy talkback sessions on local radio stations to respond to questions and criticisms from members of the public. Further meetings and displays were held, for example to demonstrate to shopkeepers in flood liable areas how to sandbag their premises and to discuss on a one-on-one basis how people should react to flood warning messages forecasting particular flood heights and how they could produce their own family and/or business flood plans.

A central element of these commemorations, and of other flood education work elsewhere in the state, has been the production of large numbers of 'floodsafe' guides that are customised to local contexts. Six have been produced for the communities of the Macleay River valley (Kempsey and nearby areas), seven for the Clarence River valley from Grafton to the coast, five for Lismore to cover particular residential suburbs, the CBD and an industrial area, three for the Bellinger River valley, two for Inverell (one for businesses in the CBD and one for residential properties nearby), two for the Muswellbrook area (one for low-lying parts of the town and one for the nearly rural area) and others for Wollongong (a flash flood environment), Orange, Singleton, Denman, Forbes, Narrabri, Moree and Dora Creek (near Newcastle). The total number of guides produced to date exceeds thirty.

Each deals with the local problem, be it isolation, inundation or community disruption, and provides advice on how the relevant community should deal with it.

The guide for Orange deals specifically with the threat of dam failure, there being two local dams that have been found to be deficient in spillway design and/or structural integrity. This indicates an intention to produce guides which are truly tailored to local circumstances: future guides are expected to be published for aboriginal communities and caravan parks as well as for towns, parts of towns, city suburbs and rural communities.

These documents are a natural outgrowth of the flood planning process that produces much of the content and ensures that the brochures are locally relevant. The guides incorporate information on flood warnings and their meaning locally, describe methods of protecting belongings, identify evacuation routes and centres, provide important phone contact numbers and indicate where people can obtain additional, more detailed information. Within the obvious space limitations, the guides also contain relevant maps and local photos (where possible incorporating local landmarks). The SES sees scores of such guides being produced in the future as flood plan reviews are completed and local flood education campaigns are undertaken. The plans themselves need to be made publicly accessible too, for example by being placed in local libraries and being advertised and excerpted in local newspapers.

It follows from what has been said that the SES believes that educational campaigns need to employ a wide range of devices that can, in a sense, be layered upon each other. Partnerships with local councils, other organisations and sponsors should be developed, flood markers indicating the heights reached by past floods fixed to power poles or created as totem

poles, evacuation route signage utilised and radio and television community service announcements developed. All of these devices have been used in New South Wales. Resources have been limited, however, and the campaigns so far have been conducted on a rather piecemeal basis and without real follow-up.

New South Wales has a commendable tradition of floodplain management initiatives, but programs of community education designed to raise people's readiness for inevitable flooding have not been among the stronger elements of this tradition. After the floods of February-March 2001 along the length of the state's north coast, a consensus developed among local government councils in favour of a much greater emphasis on flood education – which traditionally has been funded very poorly by comparison with education about the much less costly threat of bush fires. There is a clear recognition now that because floods do not occur frequently in particular areas, levels of community readiness fall away to the point that people come to believe the flood problem has been 'solved' or no longer exists. The construction of levees to protect towns actually encourages this perception, even though no levees in the state are built to keep out genuinely severe floods. Overtopping should be regarded as inevitable in the bigger events – as happened at Ulmarra and Kempsey in March 2001 and as almost happened at Grafton at the same time. Action must be taken to counter the complacency that develops when levee protection is created, and the floodsafe guides applicable to leveed communities seek to inculcate an understanding of the limits of this protection.

In essence we must build flood readiness 'synthetically', in leveed communities and elsewhere, because nature does not bring floods often enough to a particular

area to create and sustain such experientially-based readiness by itself. In part, too, this work is needed because successful mitigation programs have tamed the flood threat without coming near to eliminating it.

Future directions

The flood management role of the New South Wales SES is quite different today from what it was only just over a decade ago. Naturally the real-time response activities remain, but the SES now seeks to play a larger part than previously in relation to prevention and preparedness functions. To do this it has become much more engaged with the efforts of other agencies than it used to be and much more concerned with interacting constructively with flood prone communities.

Much progress has been made over the last ten years in flood planning, flood warning and floodplain management endeavours and some gains have also been achieved in the field of flood education. Much more needs to be done, nevertheless. The flood planning process would benefit from further decentralisation to SES volunteers in the actual flood prone areas and this will happen gradually, though some outside professional expertise will still be needed. Another planning-related area which needs further development is that of flood exercises, whereby the combat and support agencies are able to practise their responsibilities in simulated flood scenarios. Some work has been done here, but the task is a large one with so many communities in New South Wales having serious flood problems. Given the lengthy periods that can occur in any river valley without significant flooding, frequent and thorough exercising should be a high priority to maintain agency readiness.

Perhaps the area where progress is most urgently needed is that of

community education about flooding and its management. This field has been poorly resourced, and what has been done has necessarily been done cheaply. With better funding it would be possible to mount regional campaigns using community service announcements on prime-time television. This is crucial to making other initiatives – floodsafe guides and commemorative activities, for example – more effective. Television remains the most powerful medium for getting hazard education messages across and adding value to lower-cost initiatives. Thus far the SES has not had the funds to utilise it, though these funds are being actively sought.

Flooding is the nation's most costly, but at the same time most manageable environmental threat, as the Bureau of Transport Economics (2001) has shown. It is important that we invest heavily in the mitigation of the damage which flooding does, and not only by building structures like levees. We must also build practices that help people to combat the threat and agencies that can plan and exercise effectively to ensure that the costs that floods wreak can be better contained.

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Chas Keys is Deputy Director General, NSW State Emergency Service.

Australian Aid: making a difference in times of disaster

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It also recommended that planning for malaria control in the next season begin immediately.

The group recognised the management of potable water and sanitation were difficult issues and more public health measures were needed to overcome deficiencies. In particular, urgent attention needed to be paid to water quality. A study of bacteria and parasites was needed in flood-affected areas.

The existing system to identify disaster victims and the analysis of the cause of sudden and unexpected death appeared deficient. A better system was seen as an important step in primary prevention strategies for public health in disasters, in particular epidemics.

After identifying the above issues and making its recommendations, the team conducted a bilingual training program in disaster management for 30 public health professionals. Presentations were delivered in English supported by slides and notes in Portuguese. Participants identified water and sanitation, together with rural access, as the key recovery issues in an emergency.

The training program ended with the development of outlines for a flood response disaster plan and a public health disaster management plan. The course was well received, as it was the first such training opportunity in disaster management for health.

At the end of the mission, the team delivered a formal briefing to a range of senior Mozambican officials outlining recommendations for the development of a National Disaster Management System and highlighting the importance of work to prevent emergencies the scale of the 2000 floods.

Volcano monitoring in Papua New Guinea

Papua New Guinea has many active volcanoes. Fourteen have erupted over the past 200 years.

In September 1994, Tavurvur and Vulcan volcanoes erupted, inflicting enormous damage on the northeastern part of the Gazelle Peninsula, including Rabaul town. The devastation badly affected the basic socio-economic infrastructure system in Rabaul Township and the surrounding villages and left a damage bill in the order of K280 million.

The eruption exposed weaknesses in the National Volcanological Service and consequently the ability of the PNG Government to provide an effective warning service for the community.

The first weakness was the monitoring equipment used throughout the country by the Rabaul Volcanological Observatory. It had deteriorated because of ageing exaggerated by the tropical environment.

The second was that the Observatory was not able to collect and analyse large amounts of data quickly.

The Australian Government agreed to assist the Government of Papua New Guinea in the form of a \$6.5 million project to upgrade and strengthen the National Volcanological Service to try to reduce the impact of active volcanoes on PNG communities. The project had two phases, starting in 1995 and largely ending by June 2000.

During the first phase, the Australian Geological Survey Organisation procured new monitoring equipment for the

Rabaul Volcanological Observatory. The second phase was specifically designed as the outcome of a needs analysis carried out by an AusAID sponsored mission just after the Rabaul eruption. The mission recommended an urgent programme of support be provided to the observatory which was unable to efficiently monitor the behaviour of the volcanoes and provide timely reports of events because of a lack of maintenance, equipment and staff.

To overcome these deficiencies the project responded in four ways.

It helped design and provide volcano monitoring recording equipment and sent specialist advisers to help with installation. It conducted training and established a geochemical monitoring facility.

Staff at the Rabaul Volcanological Observatory were given extra training in the analysis of information relating to volcanoes. A major geophysical survey was done of the deep interior of Rabaul volcano and dating of selected Rabaul rocks was undertaken to determine more precisely the eruptive history of the volcano.

Hardware and software were provided to the observatory so it could operate a Volcanic-hazard Mapping and Information System. The system is used for mapping and assessing areas of risk and in the production of hazard maps. Relevant datasets and training gave staff the ability to operate the system effectively.

The observatory was also given a general package of support in the form of a new four-wheel drive vehicle, internet connection, an improved telephone system and the production of a public-awareness video highlighting the dangers of active volcanoes.

New radio antennae were erected at the five high-risk volcanoes following negotiations with local

landowners or custodians over access to land.

There have been no identifiable environmental effects from the antennae.

Additional work has since been done to ensure specific elements of the project can be sustained. These include providing extra training to technical staff, establishing a remote centre at the headquarters of the Australian Geographical Survey Organisation, providing the Rabaul Volcanological Observatory with a comprehensive set of spare parts and components and a technician to install a remote site at Pago.

The extended project is scheduled to end at the end of 2002 at a cost of \$435,000.

Disaster Management in the Pacific

The Pacific is one of the most disaster prone areas in the world. Cyclones, droughts, active volcanoes, severe earthquakes, oil pollution, urban fires, aircraft disasters, tsunamis, coastal erosion, global warming, rising sea levels, El Nino and La Nina, armed conflict, civil disturbances, exotic animal and plant diseases and major health emergencies all afflict the region's small island states.

In the early 1990s tropical cyclone Ofa descended on Samoa, causing damage exceeding US\$100 million and in Fiji cyclone Kina left the government with a damage bill estimated at over US\$120 million. 1997 brought a drought to Papua New Guinea that saw streams, creeks and swamps dry up, rivers disappear, schools close, and major power cuts as lack of water reduced power-generating capacity. One assessment found 777,000 people facing famine. In the same country in 1998, a tsunami of up to 10 metres in height wiped out several villages and killed more than 2,000 people near Aitape.

The scale of lives and property lost to disaster in the Pacific is devastating, but even these statistics do not fully reflect the impact of disasters on the people of the Pacific. Though there is a great diversity of culture and conditions in the Pacific islands, all rely heavily on the exploitation of their natural resources for economic support. Forestry, fisheries, agriculture and tourism are the main industries, with differences of scale from subsistence to large commercial plantations. Each of these industries, and by extension the economy in general, are highly sensitive to their environment and to the weather. A disaster, such as a drought, impacts strongly not just on certain sectors of the community, but on everyone.

While reports by the United Nations Development Program have shown an increase in living standards in many Pacific countries, development is a fragile process. On top of direct economic losses, each time a disaster hits, scarce funds that could have been used for providing better education, health care or improvements in businesses and services must be diverted into disaster relief and rebuilding.

Costs are often extensive. Addressing the losses felt during Fiji's cyclone Kina used up almost 40 per cent of Fiji's capital budget. A United Nations task force stressed that unless preventive measures were taken, future disasters would account for a significant proportion of GDP. Rebuilding often suspends the development process and the frequency of disasters in the Pacific leaves little time to rebuild reserves and capacity to cope before the next one hits. A descending spiral of increased poverty and vulnerability is a serious threat.

In the past, these disasters were seen as overwhelming and unavoidable, as 'Acts of God'. Gradually this attitude is changing as the capacity to manage events and reduce vulnerability has

improved. Specific units within government agencies have taken on responsibility for disaster management activities and some resources have been set aside for mitigation.

Pacific Islands are beginning to recognise though that this issue requires more than the attention of a small part of a single agency. Disasters are a national priority and coordination of planning and resources is needed across government. Appreciation is also growing that the development of response capability is important, but so is preparedness, mitigation and recovery.

To this end, 15 countries are working together with the South Pacific Applied Geoscience Commission, known as SOPAC, on a program that takes a new approach to disaster management in the Pacific.

SOPAC is based in Fiji and is a regional organisation that provides technical advice, training and research assistance to member countries. It is divided into units that focus on mineral, water, and energy resource management, hazard assessment and coastal monitoring. Members include Cook Islands, Federated States of Micronesia, Fiji, Guam, Kiribati, Marshall Islands, New Zealand, Niue, Papua New Guinea, Samoa, Solomon Islands, Kingdom of Tonga, Tuvalu and Vanuatu, and Australia, which provided SOPAC with \$1.3 million in funding in 2000–01. (French Polynesia and New Caledonia are Associate Members.)

Since its commencement in July 2000, the Disaster Management Unit at SOPAC, with funding from AusAID and the New Zealand Government, has undertaken an ambitious new program which emphasizes preparedness, mitigation and a comprehensive, integrated risk management approach. The unit works at several

levels in the community. Training is provided to key disaster management personnel within each country to assist them to design, maintain and evaluate disaster management plans. The intention is that these officers not merely implement plans adopted from larger countries. Each will become skilled in creating their own plans and adapting existing methods to the particular needs of their countries.

Disaster plans will not relate only to a single agency, but incorporate negotiation and coordination with a range of stakeholders. To support this more extensive process, the Disaster Management Unit has established the CHARM model (Comprehensive Hazard and Risk Management) that provides guidelines for an integrated national planning process. Though based on the Australia/New Zealand Risk Management Standard, CHARM is being developed to reflect the unique needs and conditions of the Pacific Islands.

Considerable effort is also going into building networks between National Disaster Management Offices in different Pacific Island countries and counterpart agencies in Australia and New Zealand. This will allow information and expertise to be shared and development of a fuller understanding of regional hazards.

The Disaster Management Unit program also works with non-government organisations, the private sector and the broader government to build an appreciation of the importance and potential benefits of risk management, in the context of disaster management, as a basic approach underlying the core functions of many agencies.

Conclusion

The above country examples are just some of the ways in which the Australian Government, through AusAID, has responded to natural and humanitarian crises around

the world. The Government believes it has not only a moral obligation to assist in times of crises but a responsibility to do so for sound social, economic and security reasons.

Through its aid program, AusAID is assisting vulnerable countries to become better prepared for crises. In partnership with these countries, it is giving local people increased confidence and knowledge to put in place measures to reduce the impact of damaging natural events. It is helping build a level of resilience to deal with the financial, social and emotional effects of disasters.

More than ever the aid program is also attempting to reduce vulnerability by supporting activities and approaches that minimise the possibility of conflicts and are responsive both during and after conflicts to restoring the basis for development. This has been clearly evident in AusAID's approach to East Timor where emergency relief has quickly been replaced by long-term sustainable projects.

The Australian Government's aid program does not profess to have all the answers. However it does have the will and the experience to make a substantial contribution to the alleviation of suffering brought about by natural and man-made disasters in developing countries, particularly in the Asia-Pacific region.

This paper was prepared by the Public Affairs Unit of the Australian Agency for International Development (AusAID).

EMA Update

Emergency Management Australia provides national leadership in the development of measures to reduce risk to communities and manage the consequences of disasters. EMA Update keeps AJEM readers abreast of the courses and activities that assist in this aim.

DEVELOPMENT

EMA Local Government Emergency Management Capability Development Project

The Australian Local Government Association (ALGA) and EMA are partners in a joint project aimed at boosting local government emergency management capability.

A consultative workshop will be held at the EMA Institute on 18 September 2002, bringing together representatives of State and Territory Local Government Associations, State and Territory emergency management agencies and local government emergency management practitioners to discuss options and to develop an implementation plan for the project. Initial discussion has centred on developing a resource 'tool kit' for Local Government, including delivering training in community based ERM that is tailored for use by local government. Other options will be discussed at the workshop.

For further information contact: Rob Cameron,
Ph: 02 6266 5408, Email: robert.cameron@ema.gov.au

Disaster Loss Assessment Guidelines

EMA and Queensland Department of Emergency Services (Qld DES) have co-sponsored the development of *Disaster Loss Assessment Guidelines* providing a methodology to assess impacts of disasters and assist in the evaluation of disaster risk treatment options. Professor John Handmer and staff from the Centre for Risk and Community Safety Research developed the Guidelines under contract. A case study on severe flooding experienced in the north Queensland in January 1998 accompanies the publication. EMA is sponsoring the national dissemination of the Guidelines during 2002/03, and in conjunction with Qld DES and other stakeholders, is developing ways of ensuring that capability enhancement flows from the development of the methodology.

For further information contact: Rob Cameron,
Ph: 02 6266 5408, Email: robert.cameron@ema.gov.au

EMA Emergency Management Projects Program

The EMA Projects Program fosters projects that help improve Australia's capabilities for preventing or dealing with natural or technological hazards and disasters.

The EMA Projects Program Selection Committee met on 5 June 2002 to consider over one hundred applications. The 14 projects selected for funding in 2002/2003 are as follows:

- Emergency rescue game (02/02), Michael Bartlett, Bartlett Games, Kingston, Tasmania.
- National standards for disaster victim identification in Australia (03/02), Superintendent Andrew Telfer, Australasian Disaster Victim Identification Committee.
- Spatial decision support systems for hazard risk management (04/02), Dr Andre Zerger, Department of Geomatics, University of Melbourne, Victoria.
- Disaster preparedness and recovery for communities (05/02), Professor Colin Pearson, Cultural Heritage Research Centre, University of Canberra, ACT.
- Establishing a fire disaster preparedness framework for significant private cultural collections in regional Victoria (06/02), Ms Robyn Sloggett, University of Melbourne Conservation Service, University of Melbourne, Victoria.
- Engaging industry with the emergency management competency standards (07/02), Ray Fogolyan, Public Safety Industry Training Advisory Body, Victoria.
- Weather extremes: mitigating the impact (08/02), Jeana Kriewaldt, Australian Geography Teachers' Association (Inc), Victoria.
- Flood action plans for industrial concerns, based on a case study for Penrith/Emu Plains, Western Sydney (09/02), Sonia McManus, Macquarie University, NSW, and D I Smith, Centre for Resource and Environmental Studies, ANU, ACT.
- Volunteers – Making the most of learning (10/02), Associate Professor John Henry, Research Institute for Professional and Vocational Education and Training, Deakin University, Victoria.
- Development of a dynamic transport planning tool for emergency evacuations under Australian conditions (11/02), Professor Peter Stopher, Institute of Transport Studies, University of Sydney, NSW.
- The researching, trialing and refinement of a fire safety educational puppet show for Pre-school to Year 3 students (12/02), Hugh & Ross Childers, Mana Puppets, Queensland; and Associate Professor John Lidstone, Queensland University of Technology, Queensland.
- An extension of everyday lives: identification of the strategies undertaken by women as household managers to reduce the impact of the hazards of the Northern Australian wet season on their families (13/02), Dr Alison Cottrell and Ms Linda Anderson Berry, James Cook University, Townsville, Queensland.
- Development of community capacity assessment methodology as applied to disaster management capability (14/02), Dr Graham Marsh, RMIT University, Melbourne, Reverend Sydney Smale Victorian Council of Churches, and Philip Buckle, Department of Human Services, Victoria.
- Management of unaffiliated volunteers in disaster response and recovery in NSW (15/02), Kaye McCulloch, Coordinators of Volunteer Education, Referral & Resource Services (COVERRS), NSW.

For further information contact: Rheannon Nicholson, Ph: 02 6266 5497, Email: rheannon.nicholson@ema.gov.au

PLANNING & OPERATIONS

New Zealand Urban Search and Rescue Exercise

Exercise Phoenix was held in New Zealand during the period 24-26 July 2002. Hosted by the Ministry for Civil Defence and Emergency Management the exercise aimed at testing the NZ response to a major earthquake including procedures for acceptance and coordination of international humanitarian aid.

Representatives from the United Nations, Singapore, the USA and Australia participated in the exercise. EMA sponsored a small Australian team representing the advance elements of an Australian Urban Search and Rescue Task Force.

A number of lessons from the Exercise are relevant to similar disasters in Australia and the National Urban Search and Rescue Working Group will address these issues for Australia.

*For further information contact: Trevor Haines,
Ph: 02 6266 5169, Email: trevor.haines@ema.gov.au*

United Nations General Assembly Resolution on Strengthening International Urban Search and Rescue Assistance

EMA has continued to play a significant role in the development of a United Nations General Assembly Resolution on Strengthening International Urban Search and Rescue Assistance. Turkey is to sponsor the draft Resolution at the 57th Session of the UN General Assembly in late 2002.

EMA participated in a meeting at the United Nations in New York in early June aimed at briefing countries that had not participated in the initial development work and seeking their support for the project.

*For further information contact: Rod McKinnon,
Ph: 02 6266 5328, Email: rod.mckinnon@ema.gov.au*

Chemical Biological Radiological Preparedness

A review of Australia's Counter Terrorism arrangements following the events of 11 September 2001 in the United States, identified a need to enhance Australia's capacity to respond to deliberate Chemical, Biological and Radiological (CBR) incidents. This resulted in \$17.8 million being identified in the May 2002 Federal Budget for the enhancement of Commonwealth, State and Territory capabilities for responding to CBR incidents.

EMA has been tasked to manage the project involving the acquisition of equipment for State and Territory first responders and the conduct of specialist training. Equipment will be procured for detection and identification, personal protection, decontamination, casualty extraction and management, and general support.

*For further information contact: Don Patterson,
Ph: 02 6266 5165, Email: don.patterson@ema.gov.au*

Communications Planning

EMA recently participated in a meeting of the International Telecommunications Union in Geneva as a member of the Australian Communications Authority (ACA) Australian delegation.

EMA's participation arose from a recommendation of the inter-governmental Spectrum Harmonisation Committee, which sought representation from the Emergency Management sector.

Delegations prepared background information and recommendations for consideration at the World Radio Conference 2003. The subject matter related to identification of globally/regionally harmonised bands for the implementation of future advanced solutions to meet the needs of public protection agencies, including those dealing with emergency situations and disaster relief.

*For further information contact: Mark Sullivan,
Ph: 02 6266 5050, Email: mark.sullivan@ema.gov.au*

Exercise SAGIP 2002

EMA recently participated in Exercise SAGIP 2002, the 3rd International Working Group and Exercise on Multinational Disaster Response and Humanitarian Assistance. The exercise was held in Manila and was hosted by the Philippines Office of Civil Defense.

Nineteen countries from the Asia/Pacific region, Europe, USA and the UK attended to further develop a framework for multinational cooperation crafted during SAGIP 2000. The Director General Emergency Management Australia, David Templeman, led the Australian delegation.

*For further information contact: Steve Banks,
Ph: 02 6266 5505, Email: steven.banks@ema.gov.au*

Urban Search and Rescue Training in Fiji

Emergency Management Australia, the New Zealand Ministry for Civil Defence & Emergency Management and the United Nations Office for the Coordination of Humanitarian Assistance recently sponsored an Urban Search and Rescue Course in Fiji. The Australian Capital Territory Emergency Services Bureau assisted by the New South Wales Fire Brigades and the New Zealand Fire Service conducted the course.

The course was the first of its type to be conducted in the South Pacific and provided first responders with the basic knowledge of search and rescue operations in a structural collapse environment. A total of 30 participants from police, fire, ambulance and the military from Fiji, Tonga, Papua New Guinea, Samoa and Vanuatu attended the five-day course.

*For further information contact: Trevor Haines,
Ph: 02 6266 5169, Email: trevor.haines@ema.gov.au*

EDUCATION & TRAINING

Guidelines for Emergency Managers Working with Culturally and Linguistically Diverse Communities

Australia's culturally and linguistically diverse communities (CALD) are a particularly vulnerable part of Australian society in the context of emergencies. Many variables may contribute to this vulnerability, including language, culture and familiarity with the environment in which they live. A set of guidelines for emergency managers, who are working with CALD communities, has been developed collaboratively as a result of a national workshop held at the Emergency Management Australia Institute in May 2001. The guidelines have been designed to assist emergency managers and practitioners to work proactively with CALD groups in their communities, with the aim of assisting to create a safer, more sustainable community.

The guidelines will be launched at a media event later this year. The electronic version can be sourced through EMA's website (www.ema.gov.au) and hard copies of the guidelines can be obtained through your State/Territory emergency management organisation after October 2002.

For further information please contact: Louise Mitchell, Ph: 03 5421 5264, Email: louise.mitchell@ema.gov.au

Recovery Management Program Redevelopment

Feedback from practical situations and evaluations from participants in the course in Recovery Management is informing the redevelopment of recovery management training at EMA.

The program has been expanded considerably in consultation with key stakeholders. The context and scope of the new program will allow much greater exploration of current recovery management practices and ideas.

The new structure consists of one pre-requisite module – Context of Recovery Management – and five interchangeable modules, to allow participants to select their specific areas of interest.

Participants who have completed the existing course in Recovery Management will be credited as having completed the new Context of Recovery Management module.

Modules currently planned for development are:

- Context of Recovery Management
- Community Based Recovery Management
- Planning and Managing Recovery
- Community Engagement/Needs Assessment
- Centre Management and Operation
- Recovery Services

The content will be mapped to relevant national competency standards to provide maximum value for participants.

A pilot of selected course modules is planned for October 2002, with the redevelopment project scheduled for completion by early 2003.

For further information, contact: Margery Webster, Ph: 03 5421 5283, Email: margery.webster@ema.gov.au

Graduate Certificate in the field of Emergency Management

A research project to determine the likely demand and preferred structure and content for a Graduate Certificate in the field of Emergency Management is almost complete.

Interim findings indicate a high level of demand for such a program. Most respondents have worked in the field of emergency management for 6 years or more and many for more than 9 years. Interest came from people with a range of educational experience from year 12 through to those who already hold Masters degrees. The preferred structure was for core and elective subjects including a research, action learning or work-based project. In relation to content, the preference was for contemporary issues in the field and management skills in the context of emergency management. The Project Reference Group will meet shortly to progress the recommendations.

If you require further information contact: Dianne Cooper, Ph: 03 5421 5274 or Email: dianne.cooper@ema.gov.au

Flexible Learning

Consultation to inform a flexible learning strategy for the Institute has commenced. Past participants in EMA courses and also potential learners will be consulted to identify the level of interest in flexible learning and the preferred mode and media for delivery. In addition, managers from a range of emergency management agencies will be interviewed to assess workplace support for this mode of learning. Advice on the infrastructure required and professional development for staff to support this approach will form part of the strategy.

For further information contact: Colin Fjford, Ph: 03 5421 5290 or Email: colin.fjford@ema.gov.au

Emergency Management Assessor Network

EMA is working with the Emergency Management Sector Working Group to establish a network of assessors of emergency management competency standards. A small number of emergency management agencies are implementing the standards and are keen to ensure quality and consistency in assessment decisions. There is also growing interest from non-emergency service industries such as local government and mining and petrochemicals industries. A workshop will be held in September to trial moderation instruments.

Further information contact: Susan Henry, Ph: 03 5421 5276 or Email: susan.henry@ema.gov.au

EDUCATION & TRAINING

Social Perspectives on Disaster Workshop

The *Social Perspectives on Disaster Workshop* was held at the Institute from 2 to 5 July 2002. Fifty-two people were involved in the Workshop, including 11 international participants. The program included presentations and discussions on Emergency Management in a Changing World, Disaster Consequences, Equity and Contemporary Approaches to Risk.

Outcomes included:

- Identification of potential research partnerships between EMA and a number of overseas based organisations; and
- Identification of processes for ongoing global exchange of information on social issues as they relate to disaster management.

Presenters will be providing papers for inclusion in both the *Journal of Mass Emergencies and Disasters* and the *Australian Journal of Emergency Management*. A Workshop report is also to be compiled in conjunction with James Cook University, summarising each of the presentations and discussion sessions of the Workshop. This will be found on the EMA website, www.ema.gov.au

Occasional Workshop Series

EMA conducted another workshop in the *Occasional Workshop* series on 26 August 2002. The purpose of this workshop was to again provide an opportunity for a small group of senior emergency managers to share experiences with an international researcher. This time the guest was Ken Mitchell, who is Professor of Geography at Rutgers University. He is currently Chair of the Study Group on the Disaster Vulnerability of Megacities, has served on hazards and disasters committees of the National Research Council (USA) and is adviser to US and international hazards management agencies. The report of this workshop will be found on the EMA website, www.ema.gov.au.

Disaster Awareness & Education Resource Kits

Disaster Awareness and Education resource kits are available to educators and contain information pamphlets, action guides and a copy of the 48-page *Hazards, Disasters & Survival* booklet. The kit is a useful reference for school projects or for general community education and interest in hazards, disasters and how to prevent and prepare for them.

For further information contact: Greg Moore, School Education Officer, Ph: 03 5421 5242 or Email greg.moore@ema.gov.au

COMMUNITY AWARENESS Community Awareness within EMA

The *Surviving Cyclones* – A5 fold out colour pamphlet – developed by EMA in partnership with the Bureau of Meteorology has been revised and features a complete new look, comprising layout, images and the focus of information.

Copies of this pamphlet will be available mid-October through all State/Territory Emergency Services.

Staff Changes at EMA

Merrick Chatfield has resigned to take up a position as Deputy Director at the Asian Disaster Preparedness Centre (ADPC) in Bangkok. His resignation marks the end of an era. Merrick started with the Institute in 1975 and left in 1980, returning in 1987. Over the last ten years he has had three leaves of absence – two to ADPC and one to VicSES.

Andrew Coghlan is on long service leave, returning early in 2003. Bruce Gray will replace Andrew in the position of National Training Consultant – Disaster Recovery. Bruce has been working in the State Emergency Recovery Unit of the Victorian Department of Human Services and has recently been involved in recovery planning for Foot and Mouth Disease.

James Gustus has returned to the Victorian State Emergency Service as a Senior Emergency Management Officer, based in Benalla after completing a 12-month secondment at the Institute.

New faces in the EMA library

Over the past nine months, there has been a considerable changeover of staff within the EMA Library, situated in the Emergency Management Australia Institute at Mt Macedon.

In December 2001, Christine Jenkinson moved from the position of Library Manager to the role of EMA Community Awareness Program Manager. Linda Hansen recently joined the Library in the role of Library Manager in June 2002. Giovanna di Natale was appointed to the new position of Reference Librarian in December 2001. In June 2002, after 12 years of service to the Library, Sharon Bradley, transferred to the Business Management group of EMA resulting in a vacant Library Technician position. Craig Irvine currently fills this role.

In addition to these internal changes, the Library was relocated from its position within Defence Library Service to rejoin Emergency Management Australia within the Attorney General's Department, resulting in a greater freedom of operation for the service.

Despite the changes and upheavals, the Library collection continues to expand and services offered pre-December 2001 continue uninterrupted. The collection of books, reports, conference proceedings, videos, and emergency management plans remains intact and is being constantly updated. Titles available within the Journals Collection are increasing and this is reflected in the Library catalogue.

The staff changes provided the Library with an opportunity for a review and evaluation of library functions. Consequently some changes have already been implemented – a lounge area has been created just inside the library entrance doors, where clients can peruse some of the most recently arrived general interest magazines, conduct research or view a video from the collection. Before long, the library will conduct a stocktake and an innovative new library management system is also expected within the next few months.

For further information Email: ema.library@ema.gov.au, or visit the Library pages of the EMA website (<http://www.ema.gov.au>).

CONFERENCE DIARY

Date: September 17–18, 2002

Location: St. Louis, Missouri, USA

Title: Connecting Communities: Emergency Preparedness and Security Regional Forums

Detail: The first of a series of two-day forums intended to help metropolitan areas and their surrounding communities become better prepared to respond to emergency situations in the coordination, communication, planning and practice of safety and security measures.

Enquiries: E-mail: Tami von Isakovics at Isakovics.Tami.Von@fia.dot.gov

Website: <http://www.transit-safety.volpe.dot.gov/>

Sponsor: USA – Federal Transit Administration (FTA).

Date: September 22–24, 2003

Location: Ancona, Italy

Title: ERES 2003 Fourth International Conference on Earthquake Resistant Engineering Structures

Detail: Paper Deadline: 28 March 2003

Enquiries: Conference Secretariat, ERES 2003, Wessex Institute of Technology, Ashurst Lodge, Ashurst Southampton, SO40 7AA, U.K

Tel: 44 (0) 238 029 3223

Fax: 44 (0) 238 029 2853

E-mail: gcossutta@wessex.ac.uk

Website: <http://www.wessex.ac.uk/conferences/2003/eres03/index.html>

Date: September 24–26, 2002

Location: Bali, Indonesia.

Title: Regional Workshop on Best Practices in Urban Disaster Mitigation: Lessons Learned from the Asian Urban Disaster Mitigation Program and Other Initiatives

Enquiries: ADPC, P.O. Box 4, Klong Luang, Pathumthani, 12120 Thailand.

Tel: (66) 02 524 5354 or (66) 02 524 5355

Fax: (66) 02 524 5350 or (66) 02 524 5360

E-mail: audmp@ait.ac.th

Website: <http://www.adpc.ait.ac.th/audmp/rllw/default.html>

Host: Asian Disaster Preparedness Center (ADPC).

Date: September 27–28, 2003

Location: London, Ontario, Canada

Title: Dealing with Disaster

Detail: Emphasis will be placed on the understanding of the interaction between social and environmental factors.

Enquiries: Sandra Doyle, ICLR, University of Western Ontario, 1389 Western Road, London, Ontario, Canada N6A 5B9

Tel: 0011/0018 (519) 661 3234

Fax: (519) 661 4273

E-mail: ssdoyle@uwo.ca

Website: <http://www.iclr.org/>

Host: The Institute for Catastrophic Loss Reduction.

Date: October 3–6, 2002

Location: Antalya, Turkey

Title: Ninth International Symposium on Natural and Human-Made Hazards: Disaster Mitigation in the Perspective of the New Millennium

Detail: Submit abstracts to haz2002@metu.edu.tr by May 30, 2002

Enquiries: To receive conference announcements via e-mail, pre-register at haz2002@metu.edu.tr

For conference program and registration details, see <http://www.hazards2002.metu.edu.tr/>.

Host: The International Society for the Prevention and Mitigation of Natural Hazards

CONFERENCE DIARY

Date: October 10–11, 2002

Location: New Delhi, India
Title: Women and Disaster Management
Enquiries: Indian Environmental Society, U-112, Vidhata House, Third Floor, Shakar Pur, Vikas Marg, Delhi-110092, India.
Tel: (911) 204 6823/24
Fax: (911) 222 3311
E-mail: iesenro@del2.vsnl.net.in
Website: <http://iesglobal.org/>
Host: Indian Environmental Society

Date: October 15–18, 2002

Location: Shanghai, China
Title: Fifth International Conference of Local Authorities Confronting Disasters and Emergencies – LACDE 5
Detail: LACDE International Secretariat, c/o Union of Local Authorities in Israel, 3 Heftman Street, P.O. Box 20040, Tel Aviv 61200, Israel
Enquiries: General Conference
Tel: +972 3 695 5024
Fax: +972 3 691 6821
E-mail: ulais@netvision.net.il
Website: http://www.ulai.org.il/f_lacde.htm OR Mr. Zhang Qi, Shanghai Municipal Civil Defense Office, 593 Middle FuXing Road, Shanghai 200020, China;
Tel: 00 86 21 628 33910
Fax: 00 86 21 647 26679
E-mail: mfbmsc@stn.sh.cn
Website: <http://www.ulai.org.il/lacde.htm#5th>

Date: October 23–25, 2002

Location: Binghamton, New York
Title: 2002 Applied Geography Conference
Detail: Includes sessions on hazards, environment issues, and related applications and techniques
Enquiries: Burrell Montz, (607) 777 2615 e-mail: bmontz@binghamton.edu or
Graham Tobin, (813) 974 4932 e-mail: gtobin@chumal.cas.usf.edu

Date: March 8–12, 2003

Location: Reno Hilton, Reno, Nevada, USA
Title: 2003 National Disaster Medical System Conference
Detail: The 2003 National Disaster Medical System (NDMS) Conference is designed to promote interaction between local, State and Federal public health practitioners and policy makers. Expert faculty from a variety of local, State and Federal agencies as well as from volunteer and academic entities will present over 75 accredited educational sessions on key topics such as Weapons of Mass Destruction (WMD), clinical medicine, mental health, response teams, and international coordination. Networking with these expert faculty members as well as many of the Nation's leaders in the field of emergency management will give participants access to the latest in emergency response and coordination capabilities.
Enquiries: Tel: USA 1 800 872 6367 (and press the 'star' key)
E-mail: ndms@usa.net
Website: www.oep-ndms.dhhs.gov

Date: 16–18 October, 2002

Location: Sydney, Australia, Manly Pacific Parkroyal
Title: Annual Conference of the Australasian Coroners' Society: Disaster victim identification and disaster management.
Detail: The conference will feature sessions of interest not only to coroners but also to other professionals in the coronial system, including forensic scientists, pathologists, counsellors and practitioners. A number of speakers from Australia and overseas will provide an insight into various aspects of, and differences between coronial jurisdictions. The Conference will provide opportunities for information sharing and for continued debate and discussion. It will also promote a closer relationship between coronial jurisdictions including emergency and investigative personnel.
Enquiries: Diane Flecknoe or Michelle Cookson
Tel: 8584 7760
E-mail: diane.flecknoe@agd.nsw.gov.au or michelle.cookson@agd.nsw.gov.au

CONFERENCE DIARY CONTINUED

VICTORIA

Date: October 26, 2002

Location: MFESB Training College, 619 Victoria St., Abbotsford, Vic
Title: Combined Emergency Services Seminar Committee 24th Annual Seminar: Victoria – Are You Prepared?
Detail: One-day presentation on various aspects of the above theme. The conference, as always, is designed for hands-on people and planners in the emergency management field.
Enquiries: Bob Wardzynski, Registrar, PO Box 52, Briar Hill, Vic, 3088
Tel: (03) 9432 5300 Fax: (03) 9432 3656
E-mail: cessi@omega.au.com
Website: www.cess.au.com

QUEENSLAND

Date: September 27–29, 2002

Location: Gold Coast, Australia
Title: Australasian Fire Authorities Council (AFAC) Conference 2002
Enquiries: AFAC Conference Manager, C/O Intermedia Convention and Event Management, P.O. Box 1280 (Unit 11, 97 Castlemaine Street), Milton QLD 4064 Australia
E-mail: afac2002@im.com.au
Website: <http://www.fire.qld.gov.au/afac/>

SOUTH AUSTRALIA

Date: October 17–18, 2002

Location: University of Adelaide, Adelaide, South Australia
Title: Australian Earthquake Engineering Society
Detail: Total risk management, emergency management, seismology, seismic upgrades of the built environment, media management, role of insurance in earthquake preparedness and recovery are the themes of this conference. In addition to oral presentations from notable experts in the field, ample time will be devoted to poster sessions for detailed discussion and for connecting with other people in widely differing fields but with a common interest in earthquakes. There will also be a shake table demonstration.
Enquiries: Barbara Butler, PO Box 829, Parkville VIC 3052
Tel: (03) 8344 6712 Fax (03) 8344 4616
E-mail: b.butler@civag.unimelb.edu.au
Website: www.aees.org.au

CALL FOR PAPERS

Date: October 19–25, 2002

Location: Adelaide, South Australia
Title: ANCOLD Conference, 2002: Dams – Future Directions in Demanding Environments
Detail: More than ever before dams, both existing and proposed developments are coming under greater scrutiny in terms of their impacts on natural, social and economic environments. Achieving an equitable balance between minimising negative impacts and maximising benefits is a major challenge. How is the challenge to be met?
Enquiries: To receive up-to-date information about the conference, visit the ANCOLD web site at: <http://www.ancold.org.au> or alternatively the conference web site at: <http://www.plevin.com.au/ANCOLD>

INTERNATIONAL

Date: September 22–24, 2003

Location: Ancona, Italy
Title: ERES 2003 Fourth International Conference on Earthquake Resistant Engineering Structures
Detail: Paper Deadline: 28 March 2003
Contact: Conference Secretariat, ERES 2003, Wessex Institute of Technology, Ashurst Lodge, Ashurst Southampton, SO40 7AA, U.K.
Tel: 44 (0) 238 029 3223 Fax: 44 (0) 238 029 2853
E-mail: gcossutta@wessex.ac.uk
Website: <http://www.wessex.ac.uk/conferences/2003/eres03/index.html>

VICTORIA

Date: 6–10 May 2003

Location: Hotel Sofitel, Melbourne
Title: 13th Annual WADeM-World Congress on Disaster and Emergency Medicine
Detail: WADeM is calling for the submission of papers for the 13th World Congress on Disaster and Emergency Medicine. Abstracts must be submitted by 29 November 2002 to www.wcdem2003.com
Contact: Website: www.wcdem2003.com

Interesting Websites

Australasian Disaster & Hazard Research Directory
 Making a Decade of Hazards Research - (1996)

The Australasian Directory is published by the Australian Committee of the International Decade for Natural Disaster Reduction and the Australian Emergency Management Institute (AEMI), and is available to the staff of the Natural Hazards Research Centre at Macquarie University, Sydney. It is a part of the research project on the Australasian South Pacific South East Asia region and a guide to the region's hazards.

The purpose of the Directory is to provide a comprehensive and up-to-date listing of research projects and organisations in the field of natural and technological hazards. It is intended to be a valuable resource for researchers, students, teachers, and the general public. The Directory is a free service and is available on the Internet.

The Directory is available in both print and electronic formats. It is published annually and is available in both print and electronic formats. It is published annually and is available in both print and electronic formats.

For more information, please contact the Australian Committee of the International Decade for Natural Disaster Reduction, c/o the Australian Emergency Management Institute, c/o the Natural Hazards Research Centre, Macquarie University, Sydney, Australia. Tel: (61) 2 951 5555. Fax: (61) 2 951 5556. Email: nhrc@ema.gov.au

Australasian Disaster and Hazard Research Directory

Originally funded by the Australian Committee of the International Decade for Natural Disaster Reduction and the Australian Emergency Management Institute (AEMI) and undertaken by the staff of the Natural Hazards Research Centre at Macquarie University. The present directory is concerned primarily with research related to natural hazards, interpreted broadly and recognises the many important synergies between natural and technological hazards.

<http://www.es.mq.edu.au/NHRC/ema.html>

Geoscience Australia

Australian Geological Survey Organisation (AGSO). This site contains comprehensive geoscientific databases covering earthquakes, tsunamis, landslides, petroleum information, gravitational maps etc.

<http://www.ga.gov.au>

Bureau of Meteorology, Australia

Designed for aviation, marine, defence and general users, this site includes weather charts, radar images, satellite images, marine weather, rain and temperature maps, seasonal outlooks, climate averages, climate data sourcing, hydromet advisory services and water resources.

<http://www.bom.gov.au>

The Official New York City Website

Office of Emergency Management, New York

Featuring prominently on the *What's On* page in the Office of Emergency Management Section of the site is a photographic report on the visit by Australian Consul-General, Kenneth Allen. The purpose of the Consul-General's visit was to present an award to the OEM saluting the dedication, professionalism and sacrifice of the America emergency management team during the World Trade Center Disaster. The award was a framed display of public safety badges from agencies around Australia.

<http://www.nyc.gov>

School Education Website

Further improvements to the *Disaster Education in Schools* website include a new look and feel and improved navigation via a search engine. The site holds a wealth of resources for students, teachers and parents including a disaster investigation area, fact sheets, project and homework help area, an image gallery, lesson plans and links to state and territory resources.

- Links to the EMA Library allow teachers and school librarians to borrow teaching resources.
- Student activities such as "Create Your Own Tornado" that were produced for the CSIRO student magazine – The Helix – were recently added to the Activity Centre.

Plans are in place for the *Disaster Education in Schools* website to undergo a full audit. The aim of the audit is to further develop the site to include a comprehensive cover of information, activities and educational programs, across appropriate key learning areas of the primary and secondary schools curriculum.

The latest resource to be published on the website is the *Hazards Folder* by Chris Dolan. It is an issues-based teaching resource for the middle and upper levels of secondary schools.

www.ema.gov.au/schools.html

Read any good books lately?

We are always on the look-out for book reviews. If you have read any interesting books or articles relevant to emergency management send them to the AJEM Editorial team:

The Australian Journal of Emergency Management
 PO Box 3492
 Manuka ACT 2604
 Tel: (02) 6295 3662
 Email: ajem@ema.gov.au

Erratum

The autumn edition of the Journal included an article by Anita Fletcher entitled *Wollongong storm on August 1998: a survey of affected residents two years on*. Table 2 appearing on page 38 made reference to water depths in homes affected by the Wollongong storm of 17 August 1988. The depths were incorrectly reported in centimetres in the table. The figures should have been reported in millimetres.

NATIONAL SEMINAR AND WORKSHOP SERIES

Find out how you can better use the tools of Spatial Information Technology.

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- Data capture systems and techniques for emergency management
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- Program 1 – Predominantly for CEOs and senior management
- Program 2 – Predominantly for middle management, front line operational staff and senior spatial information personnel.

Venues for 2002

Australian Capital Territory

Canberra Program 1 Thursday 10 October
Program 2 Wednesday 9 October

Northern Territory

Darwin Program 2 Thursday 26 September

Queensland

Brisbane Program 1 Wednesday 18 September
Program 2 Tuesday 17 September
Cairns

Rockhampton Program 2 Monday 23 September
Program 2 Friday 20 September

Tasmania

Hobart Program 1 & 2 Friday 6 September
Launceston Program 2 Tuesday 3 September

Western Australia

Albany Program 2 Friday 4 October
Perth Program 1 Wednesday 2 October
Program 2 Tuesday 1 October

A National Emergency Management Spatial Information Network workshop will be held in Canberra on Friday 11 October 2002. (Please note seminars have been held in other States in August)

Registration

Visit www.geolnsight.net.au for more details and online registration, or contact Karen Baskerville at the Geolnsight Project Office on (02) 6254 3911 e-mail geolnsight@technik.com.au

Australian Disasters Conference

Safer Sustainable Communities – 2003 Australian Disasters Conference

'Community Safety is Everyone's Business'

Planning is continuing for the 2003 Australian Disaster Conference, which is to be held in Canberra from 9–11 July 2003. The theme for the Conference is 'Community Safety is Everyone's Business'.

The proposed objectives of this important national conference are to bring together people from all areas of emergency management and provide an opportunity to:

- share information on recent developments and research in emergency management;
- highlight successful initiatives in community safety and sustainability;
- explore common issues, emerging trends and approaches to emergency management;
- build partnerships between government, private, non-government and community sectors and expand professional networks; and
- work together on achieving safer, sustainable communities.

To register your interest and to ensure you receive further information and regular updates via our mailing list email the Conference Coordinators enquiry@einsteinandedison.com.au, or phone Liz or Katie on 02 6232 4240.



Getting The Message Across Getting The Message Across

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Thursday 5th - Friday 6th September 2002

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