Preparing for Severe Storms in New South Wales

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Of all the major types of natural disaster which can occur in New South Wales, severe thunderstorms have probably the lowest profile in the public mind. At present, for obvious reasons, the community is well sensitised to bush fires and droughts, and the numerous earthquakes reported in the state during 1994 have served to remind us of Newcastle and the havoc which earthquakes can bring. Floods, for now, are of little account, but it is only a year since the serious flood event on the Murray and Edward rivers and their Victorian tributaries - and most people remember the graphic footage of the evacuation of Nyngan in 1990 when the waters of the Bogan River overwhelmed the levee banks and flooded virtually every house in the town.

By comparison with these hazards, storms probably do not rate highly in the community's perception. Yet thunderstorm activity is common in NSW and it is undeniable that storms are both costly and dangerous. Only floods cause greater monetary losses: according to the Australian Water Resources Council (1992) the average annual cost of floods in NSW is $150M and that of storms is $110M. Other types of hazard rate much lower in dollar terms - though of course events such as bush fires and droughts can be enormously financially damaging in some individual years as indeed they have been in 1994. Most hazard types tend to be 'lumpy' rather than even in terms of their temporal occurrence.

Severe thunderstorms are relatively regular events, occurring frequently in the warmer months of the year (see Figure 1). In an average summer storm season in NSW there are literally dozens of thunderstorms which could cause damage to property, and some are severe enough to cause damage on a very large scale. In recent years there have been two exceptional storm events in Sydney - the March 1990 hailstorm over the western suburbs and the January 1991 wind, rain and hail storm over the north. In 1993 dollar terms, these two storms caused insurance losses of $329M and $193M respectively (Insurance Council of Australia, 1994), in addition to great inconvenience. Tables 1 and 2 summarise the impacts of the two events.

Many other severe storms have resulted in serious damage in recent years. Flash flooding after thunderstorms is a common occurrence in Sydney and in other urban areas, and there is growing evidence of tornado activity in various parts of the state. One tornado, in November 1993, caused damage to every one of the 115 dwellings of the village of Tucabia (near Grafton), and completely destroyed eight of them.

There can be no doubting the damage which storm activity can wreak. Deaths are not uncommon - about four occur on average each year in this state as a result of storms (Griffiths et al, 1993, 371) - and the potential is for even higher numbers in very serious events. It is virtually certain that we will eventually see a storm-related event which causes large-scale loss of life as a result of trees falling on houses or because of motor vehicle accidents on flooded or hail-strewn roads.

Table 1: Facts on the March 18 1990 Western Sydney Hailstorm

The storm struck Sydney at 4 o'clock on the afternoon of Sunday, 18 March. Heavy falls of hail occurred over a large area, with high winds. Many trees were toppled, bringing down power and telephone lines. Some hailstones with diameters of 8cm were recorded.

Large parts of Sydney were affected on both sides of the harbour, the most serious damage occurring in the Auburn and Bankstown areas. Thousands of houses sustained broken windows and damage to roofs, mostly because of hail. There were whole streets in which every house suffered damage.

The SES was deluged with more than 3,500 calls for help in the first two days after the storm. SES units had to be brought in from parts of Sydney which were little affected and from the Newcastle, Illawarra, Central West and Queanbeyan-Cooma areas.

SES volunteers, along with Bush Fire Brigades, NSW Fire Brigades and Army personnel, worked thousands of hours placing tarpaulins over damaged roofs and heavy-duty plastic over broken windows and removing fallen trees from houses and streets.

Over the first few days, assistance was provided to some 2,000 homes. The SES quickly ran out of tarpaulins and plastic sheeting and tens of thousands of dollars were spent on the purchase of additional stocks.

Because of the large number of damaged houses and the run on building supplies which developed, tradespeople were unable to complete the permanent repairs quickly. A wet and windy autumn led to many tarpaulins and plastic sheets ripping off and water entering some houses repeatedly. A near-continuous SES involvement was maintained for two weeks after the storm.

The total damage bill from the storm was, in 1993 terms, approximately $329M (as estimated from insurance claims: these exclude losses due to lost production, losses of income incurred during the clean-up, and general inconvenience).

Preparing for storms: the State Emergency Service

The State Emergency Service Act 1989 identifies one of the Service's many functions as acting as 'the combat agency for damage control for storms and tempests'. This is largely a response function, there being nothing that can be done to **prevent** storm activity, but there is much that is necessary to ensure that the Service is thoroughly prepared for the storm response role. Storm response, incidentally, is by far the most important SES field activity in Sydney, greatly exceeding flood work, search and rescue tasks and the myriad other functions which the Service's volunteer members perform within the metropolitan area.

Table 2: Facts on the January 21 1991 Northern Sydney Wind, Rain and Hailstorm

The storm struck between 4.30 and 4.45 pm, crossing northern Sydney in a SW-NE direction. Wind gusts up to 250-290km/h were experienced, along with hailstones up to 4cm in diameter and very heavy rain.

Areas of most severe damage stretched from the Warrawee-Turramurra area to Duffys Forest, with significant damage occurring to property in the Ku-ring-gai, Hornsby and Warringah council areas.

100-120 houses were totally destroyed and about 6,000 received moderate to severe damage.

164,000 subscribers lost power.

Damage to Telecom lines and property amounted to over $1M and to Water Board property about $1.2M. About 200 public buildings, including schools, were damaged.

Access to and within the affected area was greatly restricted because of fallen trees and downed power lines.

The Hornsby and Ku-ring-gai SES organisations received approximately 12,000 requests for assistance.

More than 60 SES units were employed in the response, some of them coming from country areas of the state as far away as Bombala and Muswellbrook.

Major operational support was given by the Police, NSW Fire Brigades, the Bush Fire Brigades, the Roads and Traffic Authority, the Water Board, local councils, Telecom, electricity authorities, Public Works, the Department of Community Services and the Army.

A total of 126,000 person hours was worked in the first two weeks after the storm in response and clean-up work.

Vast quantities of vegetative material were deposited at tips in the northern Sydney area.

The total cost of the storm, estimated from insurance claims, was $193M in 1993 terms.

The SES's preparation for storm response takes two forms - skills training and management training. Large numbers of volunteers regularly train and practise the manual skills needed for storm response work. These include the removal of trees from houses, the covering of broken windows and damaged roofs, the clearing of road and driveway access and the rescue of trapped and injured people. This training involves chainsaw operation under difficult conditions and features work with ropes, tarpaulins, plastic sheeting and ladders. First aid training is a prerequisite for all SES volunteers who may need to work in the field on storm-related operations. State-wide, the organisation has some thousands of volunteers who are trained for such activities.

While skills training has a long history in the SES, training specifically for the development of managerial capabilities is relatively recent. Such capabilities, it has become apparent, are especially important in the management of the larger events when there are significant problems of achieving adequate appreciations of what has happened and of prioritisation when the response task is

complex, many-faceted and of considerable scale. Senior SES personnel have in recent years been given specific training in the principles of reconnaissance and assessment as well as in control, command and co-ordination and in operations room procedures. This training, much of it delivered through tabletop exercises simulating the effects of major storms, is designed to augment decision-making skills one step removed from actual field operations: in effect, there has been an increased focus on the 'stand-back management' of storm response work to complement the traditional emphasis on on-site activities.

The 1990s have seen several major storm response operations in and around Sydney, and accordingly there have been numerous opportunities for SES personnel to practise their skills and other training. The fact that a number of the storms have produced work on a scale beyond that which could expeditiously be dealt with by a single local SES unit has meant that field crews have frequently needed to travel out of their own areas. Most storms which cause damage to more than a few buildings, in fact, require out-of-area assistance and thereby help a number of SES units to practise their skills. The large number of severe storm events which have caused widespread damage in recent years has ensured that the SES is better practised in its responses now than ever before.

Ensuring that the community is prepared

It is a fundamental principle of emergency management that communities which understand the hazards they face and know how to prepare for and react to them will have a better chance of mitigating the effects of disaster than those which do not (Natural Disasters Organisation, 1989, 6-9). Thus a 'prepared community' is necessary if the effects of vulnerability to hazards - whether they be gas leaks, bush fires or storms - are to be reduced.

In Australia, there is much still to be done to create a high level of community preparedness for disaster. One of the proofs of this statement is the surprise that is frequently expressed by people when disaster strikes - especially if the event is of a severity which is outside their recent memory.

For some hazards, of course, it is possible to identify highly hazard-aware **parts** of communities in which people are adept at preparing for and reacting to the hazard. Farmers, for example, are well used to handling floods: the frequency of floodplain inundation, combined with the losses which will ensue if stock and equipment are not moved expeditiously, give farmers an expertise generated by experience. For quite different reasons, Queenslanders and Northern Territorians are likely to be relatively adept at handling tropical cyclones by responding appropriately. In this case the extreme severity of the event tends to focus the community's consciousness, while the long lead times associated with cyclones provide opportunities for real-time public education at a highly 'teachable moment' (Filderman, 1990, 223) when community interest is readily aroused.

In all likelihood, there are no major segments of the community in NSW which can be said to be sufficiently understanding of the threat of severe storms to be well prepared for them. There is, as a result, a significant educational challenge for those organisations which are involved in the business of mitigating weather-related hazards: the challenge is to create a more storm-aware and storm-prepared community.

In NSW, both the State Emergency Service and the Bureau of Meteorology are developing initiatives designed to improve community preparedness for severe storms. These initiatives relate to the development of **storm warnings** and the promotion of **public awareness** of storms and how to prepare for and react to them. We deal with each of these in turn.

Storm warnings

For some years, the Bureau of Meteorology's NSW regional office has provided a warning service specifically relating to the prediction of severe storms. Normal meteorological monitoring allows the forecasting, a day or two in advance, of atmospheric conditions which will favour the development of thunderstorms. Generally, hot, humid days when fronts are approaching are ripe for thunderstorm activity: as such a day progresses, developing storms are monitored on radar and by the Bureau's network of storm spotters. If the storms appear likely to reach certain thresholds of severity (hailstones of 2cm diameter or greater, winds gusts of 90km/h or greater, very heavy rain which could produce flash flooding, or the potential for tornadic activity), the Bureau will release Severe Thunderstorm Advices or Severe Thunderstorm Warnings for broadcast by radio stations as follows:

(1) **Advices** provide general information, usually up to six hours ahead of the predicted severe thunderstorm activity and for whole weather forecast districts (see Figure 2). They indicate that thunderstorm activity is probable, describe the weather phenomena the storms are likely to bring (hail, winds or heavy rain), and carry the suggestion that 'people should keep a look out for thunderstorms and if storms are approaching should stay inside'. This suggestion is attributed in the Advice to the SES.

(2) **Warnings** provide more specific information when severe storms are detected and apply only to Sydney and surrounding areas. They are valid for shorter periods (up to three hours), describe the weather phenomena expected, identify the **particular** areas within and around Sydney in which storms will occur (Figure 3) and provide suggestions as to what people in these areas should do. Again, the advice is attributed to the SES and varies according to the 'content' of a predicted storm as follows:

- ♦ If strong winds or hail are predicted, people are advised to:
  - Ensure that loose objects around their houses are tied down, brought inside or otherwise secured.
  - Put vehicles under cover.
  - Stay inside away from windows.
  - Ring the SES for help if their house is damaged.
- ♦ If very heavy rain and flash flooding are mentioned, people are advised to:
  - Keep children away from drains, streams and street gutters.
  - Avoid driving through water of unknown depth.
- ♦ If tornadoes are mentioned, people are advised to move or stay inside and to take refuge in the strongest part of the house. Usually this is the bathroom.

Both advices and warnings are faxed to radio and television stations for immediate broadcast. SES

and Bureau staff are presently visiting radio and television stations within the warning area to impress upon their production and executive staffs the importance of the service and to enlist station support in broadcasting the relevant information in a timely fashion.

Public awareness

Warnings work best if they are effectively 'seed-bedded'; that is, if people are educated appropriately about the warnings themselves and about the hazards to which they relate. To achieve this in the case of storm warnings, people must be made aware **before** a storm strikes of the existence and content of the warning service: once this is done, the knowledge which is implanted is intended to be 'activated' when the warning itself is heard.

A major tool for raising community awareness about how to prepare for severe storms is the **Severe Storm Action Guide**, which is sponsored by Emergency Management Australia and distributed in NSW via the State Emergency Service. The Guide, which is in the form of a double-sided magnetised card suitable for attachment to refrigerators, provides advice for before-storm, during-storm and after-storm situations and gives information on emergency assistance (see Figure 4). It is used in various of the strategies being employed by the SES to promote awareness of the dangers of severe storms and to educate people about actions which will promote safety and help prevent damage. A second tool is the **Lightning Protection Action Guide** (Figure 5), which can be used for similar purposes.

Various strategies are being employed to foster community awareness about storms and storm warnings, some involving media organisations and some not. Amongst the media strategies are the following:

(1) The 'Huey' cartoon campaign sponsored nation-wide by Emergency Management Australia and delivered using community service advertisement time on radio and television. This campaign was run during the 1993-94 summer storm season in NSW and is being repeated during the 1994-95 season. The campaign stresses preparedness for storms and advises listeners and viewers as to the availability of the Severe Storm Action Guide.

(2) The use of weather bulletins on television. Each evening at the end of the main television news bulletins there exists an opportunity to address very large audiences about storms. For several reasons, it is unlikely that television stations will be particularly useful in the carriage of actual warnings - the nightly news occurs too late in the day for most storms, and aggregation means that warning messages will be irrelevant to much of the audience - but television could nevertheless promote appropriate before, during and after-storm activities. News stories could also be used to promote awareness of storm activity and mitigative behaviour.

(3) The use of the brochures as the bases for such stories in suburban or regional newspapers or in mass-circulation magazines. There are two major suburban newspaper chains in Sydney, and the possibility exists of the syndication of material along with photographs of the effects of past storms and of activities in response to them.

(4) Interviews of emergency service and Bureau of Meteorology personnel on radio and television and in the print media. These could be used to discuss preparedness-related activities, preferably early in the storm season and on the anniversaries of significant and well-remembered storm events.

A number of non-media strategies are also being pursued. A variant of the Severe Storm Action Guide developed by the State Emergency Service is being sponsored by a major bank and by several councils: this brochure is available on the counters of the bank's branch offices and in the offices of the sponsoring councils. Other commercial sponsorships are possible. Likewise, brochures have been made available to Neighbourhood Watch Co-ordinators for distribution through their neighbourhood committees, and are used in SES recruitment drives and at disaster- and rescue-related expositions.

No single one of these strategies is likely, by itself, to create a massive increase in the community's awareness of storms and storm warnings. A **mix** of strategies of different sorts should, however, promote awareness by creating broad market penetration. The strategies should be numerous and, collectively, of wide compass.

Conclusion

At a time when bush fires and the drought bulk large in the community's consciousness, there is a danger that severe storms will be forgotten as significant threats to life and property. Yet thunderstorms are frequent and damaging visitors to NSW every summer, and it is important that the public be well prepared for them. A well-practised combat agency exists to help the community contain the damage which storms inflict, and warnings are routinely broadcast when storms are likely or approaching. Much still remains to be done, however, to educate the community about what can be done to mitigate the effects of such storms. Between them the SES, the Bureau of Meteorology and Emergency Management Australia have developed a number of strategies to raise public awareness about storms, storm warnings and appropriate preparatory and response activity for people to follow.

References

Australian Water Resources Council (1992) Floodplain Management in Australia. Water Management Series No 2, Department of Primary Industries and Energy.

Filderman, L. (1990) Designing Public Education Programmes: a Current View, in Handmer, J. and Penning-Rowsell, E. (eds), Hazards and the Communication of Risk, Brookfield: Gower Publishing Co, 219-31.

Griffiths, D. J., Colquhoun, J. R., Batt, K. L. and Casinader, T. R. (1993) Severe Thunderstorms in New South Wales: Climatology and Means of Assessing the Impact of Climate Change, Climatic Change, 25, 369-88.

Insurance Council of Australia (1994) Major Disaster Since June 1967, revised to 31 December 1993, unpublished.

Natural Disasters Organisation (1989) Commonwealth Counter Disaster Concepts and Principles, Australian Counter Disaster Handbook, Vol 1.

Note: The Bureau of Meteorology is continually expanding its volunteer Severe Thunderstorm Spotter Network. People interested in acting as spotters should contact the Bureau toll-free on 1800 060292 or write to the Bureau of Meteorology, PO Box A737, Sydney South, NSW, 2000.

Community Preparedness for Disaster, Resource and Environmental Studies No. 10, Australian National University, Centre for Resource and Environmental Studies, 27-34, 1994.