Understanding the Message:
Social and Cultural Constraints To
Interpreting Weather Generated Natural Hazards

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Globally there is an increase in the social and economic impacts of all natural hazards, and especially those that are generated by weather systems. Climate change is a part of this process, but it is most likely that long-term climate change will first become evident as an increase in natural disasters, especially flooding and drought. However, a major cause of increasing natural disasters is the growth and relocation of population, concentrating into complex urban settlements that proliferate infrastructure and property in vulnerable floodplains and the coastal fringe. While Australia has experienced a decline in the loss of life from natural hazards, the loss to business, agriculture and the economy in general has increased exponentially. Weather generated natural disasters dominate the total disaster bill. Vulnerability to natural hazards may be reduced through hazard education and effective warnings.

The communication of weather information is inevitably a top down process. Understanding of information and in particular, warnings about hazardous events involves a public safety transfer of knowledge from highly specialised scientists through emergency managers, local politicians and the media, to every member of society. Research shows that selection, interpretation and expression of information and warnings occurs at institutional and societal levels. Both the media and the general public select, re-interpret, and weigh up information about weather and hazards, applying a complex set of attitudes, perceptions, experience and misinformation to the initial message. An understanding of how people interpret the message is essen-
tial to the accuracy and safety of warnings and forecasts. Examples and case studies from post-disaster and behavioural research carried out by the Centre for Disaster Studies, and hazard events illustrate the issues of understanding the message.

Increasing Vulnerability

Globally the vulnerability of humans to natural hazards is increasing. There are a number of causes and contributory factors to this. Firstly there may be an increase in the numbers and intensity of hazards in some locations as a consequence of climate change. The media likes to blame something dramatic like El Nino or La Nina and as many people believe that the climate is changing for the worse the dramatisation of catastrophe appeals to people’s fears. Because of the cyclical nature of climate this belief may always have existed, but there is now plenty of evidence that human induced climate change is a fact (Salt 2000; Smith 1998).

A second factor is the increase in the world’s population and the accompanying high rate of urbanization. In developing countries there are many more people in absolute terms, and in all parts of the world urbanisation is concentrating people into coastal cities. Natural hazards, whether they are increasing or not, are exerting an impact on a much larger population than in the past.

Thirdly urban development and urban sprawl are not just coastal, but they are primarily occurring on coastal lowlands and floodplains. More people, but especially more buildings and infrastructure are in hazard prone areas. Death rates from natural disasters have diminished in developed countries, but while some of this is attributable to warnings, knowledge and technology, death rates especially in cyclones have reduced because of technological advances in shipping and shipping communications, and a decline in the population of fishing fleets etc. In 19th and early 20th century Australia death in cyclones was strongly related to shipping losses. But while loss of life has gone down, the loss of buildings and infrastructure has risen exponentially, and costs of replacement even more dramatically. Thus vulnerability to hazards is increasingly the vulnerability of our structures, economy and lifelines.

A fourth factor contributing to vulnerability is an increasing rate of migration. People move much more frequently, greater distances and live in looser communities. Our urban communities contain geographically weaker but more complex networks (Marsh 2001; Sullivan 2003). Many people are unaccustomed to the new hazard threat upon moving, and thus have poor knowledge and little experience of the local hazards.
People also lose family connections and support structures. At the same time communities are becoming less of a geographical entity. We belong to communities of work, interests and shared views, and have much less to do with our neighbours. In the developing world there is a similar process of loss of community, weakening of networks and limited knowledge of hazards in the new place of residence, although it is argued that this is to some extent exaggerated by western observers (Bankoff 2001).

Levels of Vulnerability

Research carried out by the Centre for Disaster Studies following disasters in Northern Australia, coupled with vulnerability scenario analysis have demonstrated the need for accurate knowledge. Predictions were constructed into a number of storm surge scenarios for Cairns in Far North Queensland in order to illustrate the vulnerability of both the city’s people and their lifelines. A number of these were presented to the city council in a research project report at the end of 1997. The following table is a summary of one of the scenarios, in the middle range (King 2000). The number of residential buildings vulnerable to storm surge at this reasonably probable level (a severe cyclone crossing between mid and high tide) would affect a population of around 18,000 people, but only 20% of the city’s total housing stock. What was alarming about these scenarios was the proportion of lifelines, emergency services and the economic base of the city that would be flooded and possibly badly damaged.

In comparison to this scenario for Cairns is the reality of what happened during floods in Townsville, 350 kms to the south of Cairns, during January 1998. A very similar situation occurred with 75% of emergency services cut off, 15% of dwellings flooded (7,500 households affected in all), over $70 million in claims with almost 2,700 commercial claims, 67% of roads flooded and 11% of households stating that they needed help during the flood.

This isolation effect of a natural disaster and the need for greater awareness have been picked up in the range of post disaster studies that have been carried out by the Centre for Disaster Studies. From all of these studies we can summarise seven main groups of impacts or issues. These are; 1 the unequal distribution of the impact; 2 loss of services during the event; 3 a lack of expectation of the impact; 4 late or minimal preparation; 5 community or neighbourhood response; 6 confusion concerning warnings and the media; and 7 a level of resilience.

Vulnerability to natural hazards is made complex by the seemingly parallel states of susceptibility to hazard and resilience, both amongst
individuals and in communities. Susceptibility and resilience are not opposite ends of a continuum. They may occur simultaneously, side by side or in contradiction. They are different states or responses that may even derive from the same characteristics of individuals and communities, although they are most often separate. Sullivan (2003) lists vulnerability indicators of susceptibility and resilience, suggesting a continuum on each indicator. He also provides emergency management definitions of these terms.

In all of the disasters studied by the Centre for Disaster Studies, only a portion of the community experienced severe loss or impact. These were places that were especially physically susceptible. Some such as the Black River Settlement outside Townsville, or housing along the terrace of the Cloncurry River, should never have been there in the first place. Apart from responsibility of local government, the residents of
these places were clearly ignorant of the hazard on their doorsteps. Other developments, such as the trend towards enclosure of spaces underneath houses (often as granny and teenage flats), equally exhibit an attitude that the flood hazard is no longer a threat. In these ways people have increased their susceptibility through ignorance, but many responded to the crisis by exhibiting endurance and community resilience.

The potential loss of emergency services and utilities during a hazard has already been illustrated in Table 1. Apart from the Townsville flood, this has occurred in many Australian natural disasters. Generally people expect that they will lose power and water for a while, but it is a more serious oversight for emergency service operations to be located in the more vulnerable parts of the city. This has been a historical trend, where these services have been sited in a central location, which in the case of the old city centres in coastal towns is most likely to be in the vicinity of the wharf and sea front. Thus during a major disaster in a city, the police, fire, ambulance etc. may not be able to get out of their buildings, let alone provide widespread assistance.

The most common response from people who have experienced major loss, was surprise and disbelief, often backed up from community and personal knowledge, that the river had never risen so high before, or the floodwaters had never been so extensive (King and Goudie 1997, Chamberlain et al 1981). This is usually quite true, for any individual, but the devastating natural hazard is a predictable process at the state level. People who experienced severe loss of property, experienced that loss precisely because they never expected it.

The disbelief is compounded by a universal lack of adequate preparations, whether for flood or cyclone, or at best hurried and minimal late preparations. Part of this derives from an attitude of endurance (the sense of living in a harsh environment and accepting the extremes of nature), apart from a desire to be in control and not to be panicked. The result is that people end up out of doors once the strong wind has already started and some debris becomes airborne, or as flood waters rise, they are out in deep water moving belongings, people and pets. This has happened in many instances in the dark. In remote communities the lack of preparation has also resulted in a widespread lack of food, necessitating expensive airlifts.

In many disasters people reported checking on or helping their neighbours (Sketchly and Sketchly 1999; King & Goudie 1997; King 1998). There were tales of genuine bravery and risk taking, some of which made good media stories. Most risk taking and rescue could have been avoided, if people had acted earlier, or structures had never been
built in such vulnerable locations. In the remote communities people expect to rely on their neighbours, but are unlikely to request assistance until the last minute. In the cities, the numbers of people needing help runs into thousands, so that reliance has to be on friends and neighbours. Clearly everyone in the community has to know how to deal with the hazard, because the reality is that during and immediately after an event, many thousands of people are going to be actively involved in providing assistance within their own communities.

All of the Australian Centre for Disaster Studies’ post disaster studies contained questions on warnings and messages from the authorities. The media transfers messages, so that part of usual preparation is to have a working battery radio. Prior to and during an event both television and radio stations relay cyclone and bad weather warnings. The technical language of warnings has caused some confusion, but the Bureau of Meteorology has responded by simplifying its messages. There is also discussion over the use of sirens, and the location and use of emergency shelters. But after all disasters the greatest criticism has been against the media, for inconsistency in the timing of broadcasts of messages, and for either exaggerating or playing down a threat (Berry 1999a; Berry 1999b; King & Goudie 1997; King 1998). There is an expectation gap between the public and the media, in which commercial television receives the greatest criticism. Despite advances in communication technology, remote communities in North Queensland occasionally still fail to receive any warning at all, as transmitters fail, or remote area broadcasts are made from very distant locations where there is no knowledge of local conditions. This was the experience of Wujal Wujal aboriginal community on Cape York Peninsula as Cyclone Rona passed virtually overhead.

Finally there is a level of resilience inherent in communities, that emerges from the interviews and responses of participants. Natural disasters such as floods and cyclones in Northern Australia are seen as part of the pattern of life and seasons. A lack of physical preparedness is countered by a higher level of mental preparation, or perhaps risk acceptance. The disaster is usually primarily an economic one as damage and crop loss devastates a region, and the response to this is to clear up, rebuild, re-plant and get on with life.

Thus during and immediately after a disastrous hazard, people are isolated and on their own. They need to know what to do and how and when to respond. In particular they need to know how to mitigate against disaster, especially if they live in a hazardous location, or to entirely avoid such a location. They need to have complete awareness of the haz-
ard they face, the preparations that they must make in order to mitigate its impact, appropriate behaviour during the passage of the event, and behaviour and actions immediately after the disaster that will minimise the impact and maximise the efficacy of the clear up and recovery.

**Science, Institutions and the Media**

Much of the information that is needed to deal with a disaster or hazard is provided by the Local Council, or the State Emergency Services, police and other emergency services, Non Government Organizations, scientists and leaders of society, but the media is most frequently used as the means of transfer of this knowledge and information. This has been and still tends to be the means of transferring hazard awareness—from the top, down. Such a process assumes that experts have full knowledge, that the media etc. will responsibly and truthfully pass on that knowledge, and that the public will accurately absorb that knowledge and respond rationally. None of these assumptions is reliable.

The experts and leaders—scientists, government organizations, interest groups, political groups and stakeholders—have competing interests and powerful agendas. All are engaged in competition for resources or support or power. The politics of the knowledge industry, and even knowledge itself, is driven by competition, responsibility, litigation and self interest. What we term academic debate is often viewed by the public as disagreement and lack of full knowledge. An example is global warming and climate change. When scientists put forward different or opposing views about global warming many people perceive this as weakness and uncertainty, thereby reinforcing the lack of hazard preparation and awareness (Glantz 1998; The Economist 2002).

Journalists often report poorly and are accused of misrepresentation, misunderstanding, inaccuracy and distortion (Henderson-Sellers 1998; Ploughman 1997). Consequently people distrust the media. Post disaster studies consistently recorded criticism of the media for the manner and timing of warnings. This is in contrast to the generally favourable opinion of Bureau of Meteorology warnings and information. Commercial television was criticised the most with people finding fault in their manner of sensationalising or delaying information on cyclones or potential floods. Local radio was generally assessed the most favourably. The local person is perceived to know what is going on. This
extends to the Bureau of Meteorology where forecasts and warnings from Brisbane are perceived to be less accurate because they are not emanating locally (Anderson-Berry 2002).

The media blatantly sensationalises. They select the dangerous, the dramatic, the scandals and blame, and are likely to illustrate inappropriate behaviour—cars and people going through flood waters, reporters braving cyclonic winds. The aftermath focuses on damage, loss and blame, while warnings may exaggerate, play down or misinterpret the message (Henderson-Sellers 1998). Glantz (1998) showed how the media seized on El Nino as a sort of mythical monster, responsible for all manner of anomalies and extremes in the weather. El Nino, once personified, was then sensationalised.

The public, as recipients of warnings and hazard information, is not homogenous, rational or even necessarily interested. The public exists in heterogeneous communities of networks, interests and places. Society is demographically, socio-economically, ethically and culturally diverse. Advertisers recognise this diversity, they research it and they target diverse groups and communities accordingly.

Hazard information comes across with all other advertising, usually swamped in a mass of information and exhortations that we have programmed ourselves to ignore, or at least to give scant attention. Commercial advertisers fight for our attention with massive budgets, while government bodies compete with very limited resources. Advertisers target demographic groups to the extent that television programming as well as magazines etc have manipulated demographic appeal of programs to fit with the needs of the advertisers. Advertisers link their messages and products to lifestyle, fantasy, humour and image and are still ignored by consumers. Little of this targeting is done by scientists and institutions in imparting hazard information. It is thus not surprising that official top down messages are missed, ignored, misinterpreted and misunderstood. Just as the media selects what interests it, so too do the rest of hazard information recipients select and interpret from what the media presents them. Information has been filtered in various ways before it can start to influence behaviour.

**World Views**

We live simultaneously in worlds of science and myth and need each. Myths and all other beliefs are rational interpretations of a complex world. Scientists often fail to recognise myths and beliefs as rational and assume that their knowledge is the only and absolute truth. Almost...
all cultures on earth, including western society, have fatalistic beliefs—
“God’s will”, “when your number’s up”, etc, and still in the insurance
industry, “Acts of God”. Fatalism, even if almost subconscious, justi-
fies lack of mitigation or preparation.

Recent research (Monaghan et al 2003) has identified powerfully
held beliefs among Aboriginal people in communities around the Gulf
of Carpentaria and Kimberley regions of Northern Australia, of control
over cyclones. These variously involve the power of individuals to turn
cyclones away, or to split cyclones so that their power is diminished. In
these communities significant proportions of the population who have
or share this power, would not believe that they needed to be evacuated
or sheltered in the face of a severe cyclone. Presumably the failure of
this power to work on a cyclone would be interpreted, quite rationally,
as poor preparation, commitment or purity on the part of the practitioner.

Underlying the belief systems of western society are biblical views
and stories, including Noah’s flood, and Jesus calming the storm. Thus
all fundamentalist Christians and to a lesser extent many of the less
devout, see natural hazards as the work of God, and quite likely a pun-
ishment for social wrongdoing. In particular, the Biblical story of Joseph
in Egypt predicting years of plenty and years of famine is a clear recog-
nition of climatic cycles, but in the context of this story a spiritual tool
was required to make sense of and to impart this knowledge. The ancient
Egyptians kept intricate flood records of the Nile, and could accurately
predict the areal extent and impact of the annual flood, but they incor-
porated this scientific knowledge into their spiritual beliefs.

Different worldviews and belief systems at least partially influence
the way in which many people interpret hazard information. Science
cannot automatically override these beliefs and attitudes (Skertchly &
Skertchly 2000).

Cyclone Awareness and Knowledge

The Australian Centre for Disaster Studies engaged in research with
the Bureau of Meteorology to examine public knowledge of weather
and cyclone information and terms. A random sample survey was con-
ducted by telephone in Townsville and Cairns. Both of these cities are
in the Northern Tropics of Queensland; a region that regularly experi-
ences tropical cyclones (hurricanes) and floods. As an example of the
problem of communicating hazard messages, a selection of some of the
results are presented below in tables 2 to 5.
Over three quarters of households had some sort of cyclone information in the house and almost half had lived in the town for over 20 years (including those who had been there all their lives, most of whom were over 20), so cyclone awareness could be expected to be reasonably well developed. Recent in-migration and mobility of the population is a feature of these two cities, in common with many other coastal locations in Queensland. However, the survey suggests that it is not only the recent arrivals who have poor hazard knowledge. Almost three quarters know that a category 5 cyclone is the most severe, but the fact that around a quarter did not, means that warnings will be quite meaningless to a sizeable proportion of the people. Commonly used warning terminology such as ‘storm surges’, ‘cyclone watch’ and ‘cyclone warnings’ are not properly understood by the vast majority of the sample population in both Cairns and Townsville. It is also interesting that knowledge is almost equally poor in both cities. During the last six years Cairns has been impacted by three significant landfalling tropical cyclones and has been targeted by large research studies and awareness campaigns. The random telephone survey of over 400 households in each city, showed no statistically significant differences between the respondents in each city.
in terms of age category and gender. While there are differences in levels of awareness and knowledge between the cities, these three examples indicate that the majority of people do not understand the hazard terminology correctly and there is clearly not a higher level of awareness amongst the Cairns sample, despite a greater impact of both hazards and awareness campaigns. As Tables 3 to 5 illustrate, knowledge of the meanings of storm surge, cyclone watch and cyclone warning is very poor. The survey shows that most adults do not know what they are being told, and may not be expected to respond appropriately.

Table 3. Understanding of the Meaning of Storm Surge. Townsville and Cairns

<table>
<thead>
<tr>
<th>Meaning of Storm Surge</th>
<th>Cairns Percent</th>
<th>Townsville Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raised dome of water</td>
<td>3.2</td>
<td>0.7</td>
</tr>
<tr>
<td>Higher sea level</td>
<td>16.6</td>
<td>9.2</td>
</tr>
<tr>
<td>Wind raising the sea</td>
<td>8.3</td>
<td>4.8</td>
</tr>
<tr>
<td>Higher tide</td>
<td>31.4</td>
<td>29.5</td>
</tr>
<tr>
<td>Backup of water</td>
<td>1.4</td>
<td>2.1</td>
</tr>
<tr>
<td>Flood</td>
<td>5.7</td>
<td>0.5</td>
</tr>
<tr>
<td>Strong winds</td>
<td>1.2</td>
<td>0.5</td>
</tr>
<tr>
<td>Other</td>
<td>9.1</td>
<td>11.4</td>
</tr>
<tr>
<td>No response</td>
<td>1.4</td>
<td>0.7</td>
</tr>
<tr>
<td>Don't know</td>
<td>21.5</td>
<td>19.8</td>
</tr>
<tr>
<td>Raised dome of water &amp; other combinations of responses</td>
<td></td>
<td>5.1</td>
</tr>
<tr>
<td>Higher sea level &amp; other combinations of responses</td>
<td></td>
<td>15.8</td>
</tr>
</tbody>
</table>

Source: Bureau of Meteorology and Centre for Disasters Studies Telephone Survey 2002

Risk Acceptance

Risk acceptance emanates from all of the social characteristics that have so far been discussed and involves both the more and the less vulnerable. The wealthy may be able to recover from disaster more quickly, the poor and disadvantaged may have no other choice (Sidle et al 2004). Thus many people will end up living in vulnerable locations because either it is a risk considered worth taking for the sake of the view etc—river or beach frontage—or low rental properties in hazardous locations are all that can be afforded.

Lack of awareness and preparedness also reinforce risk acceptance. Risk is increased by poor knowledge, sometimes through the fault of the resident, but sometimes coming from the negligence, or fear of political or legal repercussions, of a local council or business (the tourist
industry for example, who would rather gamble with increased risks to tourists than lose business). Flood zoning worries residents that their property values will be diminished, and they would rather ignore the threat or continue in ignorance. At the same time, as has already been explained, people live in an atmosphere of information overload in which they are accustomed to filtering out things that they are not interested in or do not wish to hear.

Risk taking also involves a level of resilience of individuals and communities. Living in the north of Australia involves accepting regular heavy wet seasons that bring floods, isolation and inconvenience. It is the pattern of the seasons that is accepted with commonsense and self-reliance. Growth of population may be reducing community cohesion and self-reliance, but that is not to say that these characteristics are not present and relatively strong.

Finally risk acceptance involves those who are risk takers. Not only are these terms used extensively in relation to business, employment and lifestyle, they are portrayed, especially to men, as virtues. The pos-

Table 4. Understanding of A Cyclone Watch. Townsville and Cairns

<table>
<thead>
<tr>
<th>When Does a Cyclone Watch Begin</th>
<th>Cairns percent</th>
<th>Townsville percent</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incorrect Answer</td>
<td>95</td>
<td>94</td>
<td>94.5</td>
</tr>
<tr>
<td>Correct Answer- &quot;within 48 hours but not within 24 hours&quot;</td>
<td>5</td>
<td>6</td>
<td>5.5</td>
</tr>
<tr>
<td>Total Numbers</td>
<td>493</td>
<td>415</td>
<td>908</td>
</tr>
</tbody>
</table>

Source: Bureau of Meteorology and Centre for Disasters Studies Telephone Survey 2002

Table 5. Understanding of Meaning of Cyclone Warning. Townsville and Cairns

<table>
<thead>
<tr>
<th>When Does a Cyclone Watch Begin</th>
<th>Cairns percent</th>
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Source: Bureau of Meteorology and Centre for Disasters Studies Telephone Survey 2002
itive side is competitive success and heroism; the negative is inappropriate behaviour, stubbornness and lack of commonsense. The 1998 Sydney Hobart yacht race was a classic example of risk acceptance on the part of the participants, with subsequent attempts to blame weather forecasters for the disaster. As the Coronial Inquest suggested, the organisers and participants were aware and prepared but believed they could cope and probably suppressed their own fuller knowledge of likely conditions (New South Wales Coroner 2000). This is no different to informed members of the public going ahead with opting to live in a hazardous location for the other location advantages such as scenery etc. (Hopkins 1999).

Warnings Education

Assessment of cyclone warnings has been carried out for a number of years. For example, Southern (1980) concluded that the Pilbara community understood warning terminology well and responded appropriately. However Oliver (1989: 70) concluded in Queensland that “there is a more immediate prospect of improving the understanding of and response to cyclone warnings than there is of making dramatic improvement in forecasting skills.” He drew attention to discrepancies that people noted between their own cyclone experience and the weather forecast. Forecasting retains a level of uncertainty in the face of unpredictable phenomena, like the path and progress of a cyclone. However the primary gap between forecast and actual experience is less likely to be the fault of the forecast so much as a failure on the part of the recipient of the warning to understand the enormity of the hazard. This lack of expectation has been a frequent comment during post disaster surveys.

Earlier literature describes top down information dissemination, but as late as 1997 the United Nations International Decade for Natural Disaster Reduction secretariat still described ‘warnings’ education as heavily top down (IDNDR 1997), although they were cognisant of the diversity of target groups. Dilley (1998) stresses information exchange between early warning and response communities (specifically forecasters and in this case, the governments of developing countries), but views the impacted community as passive recipients. The process is top down, but it is primarily concerned with the dissemination of hazard knowledge to developing countries, especially the status of El Nino. Parker (1999) outlines a method for evaluation of a cyclone warning system and relates it to other gradual onset warning systems such as for floods and droughts. It gives a very detailed list of criteria, groups of
people, institutions and technology etc. that contribute to the effectiveness or otherwise of the system. The paper underscores the need for community involvement, awareness and multi targeted groups, and this seems to be predominantly where we are at the present.

Golden and Adams (2000) reiterate the problem of improvement in warning technology while poorer attention is applied to the warning process. They stress the need for interaction between the physical and social sciences and see technological solutions as part of a process of disseminating warnings (in their case tornadoes.)

Hooke and Pielke (2000) argue that forecasting is a fully integrated system. Kirschenbaum (1992) although not dealing with a weather related disaster, researched evacuation of a community and records the importance of community, neighbours, mutual support and thereby active participation of community members in the evacuation process. This example is from Israel, that is a more hazard aware population, and it is a significant study of bottom up cooperation.

Research by Anderson-Berry (2002) in North Queensland has shown a level of mistrust of authorities, especially where evacuation is concerned. She has concluded from her extensive studies of cyclone awareness the need for community involvement and empowerment, not only in response, but in mitigation of vulnerability and public education.

Globally there is a shift in public education thinking from education, which is an action of the educator to the learner, to learning, which is an action of the learner (Nielsen & Lidstone 1998). This trend to student centred learning is in all aspects of education and must be incorporated more effectively into warnings and awareness education. In requiring the learner to be the actor, the process of information dissemination has to become primarily from the bottom up, or from individuals outwards within their communities (Bacot et al 1998; Parker 1999; Balluz et al 2000; Fordham 1998).

Bottom up education is not easy to achieve, but there are some examples. Mitigation strategies can be planned by communities in consultation with or facilitated by the local council. Council clear ups prior to the cyclone season involve a community response and action that acknowledges the hazard and the season. The media must be engaged continuously and fed interesting stories and information, ideally written for them, but in the style that they use. Television weather forecasters have an opportunity to define and explain terminology, at least some of the time. Information packages and materials need to be targeted at socio-economic, demographic and cultural/ethnic groups (Asgary and Willis 1997; Enders 2001). Education can be interactive. An example
is the Stormwatchers game produced by the Centre for Disaster Studies. This is aimed at upper primary children, with scenarios that include ethnic, gender and socio-economic diversity in an unstated way. The game is interactive so that the child must operate actions that simulate cyclone preparation in order to progress. Learning occurs at a variety of levels.

The basic message is involve the community, prompt them to be the actors in taking information, and diversify the message. The warnings must remain clear and standardised, but the routes to understanding them must be as diverse as the people. Finally all of this emphasis on community involvement and understanding assumes an ongoing reliance on science, on the accuracy and precision of warnings and the timeliness and effectiveness of their dissemination. A more bottom up approach to hazard education will not negate the need for excellent top down scientific knowledge.

Acknowledgements

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Notes

1. Full reports of post disaster studies and hazard research are at the Centre for Disaster Studies website at http://www.tesag.jcu.edu.au/CDS/Report.htm

2. This large ocean going yacht race held immediately after Christmas every year from Sydney to Hobart in Tasmania enters dangerous waters in Bass Strait—a severe storm in 1998 caused the loss of life of several sailors.

References


