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Building community resilience to floods: the role of education (booklet)

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MOLINO STEWART

INTEGRATED SUSTAINABLE SOLUTIONS

BUILDING COMMUNITY RESILIENCE TO FLOODS: THE ROLE OF EDUCATION

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INTRODUCTION

Some four years ago when I started researching best practice in community flood education, an SES officer told me that I was venturing into a 'black hole'. I must admit that this was pretty close to the truth; there are though a few 'bright lights' (good education programs) in the dark void, most of which are highlighted in this book.

Apart from trying to fill the black hole of flood education, an underlying motivation for writing this book is my own experience of natural disasters and how communities cope with them.

In August 1990, my own home and business premises were flooded in the Hawkesbury River valley on the outskirts of Sydney. In the early and mid 1980s, I experienced crippling drought when I lived in Western NSW. More recently, living on the Central Coast of NSW I witnessed the devastation caused by the 'super storms' of 2007 that caused extensive flooding and wind damage in the region.

These experiences are etched in my memory - not only how my family and I coped with the disasters, but also how the communities dealt with and learnt from them.

My 'disaster experiences' gave me a realistic grounding as I researched and tried to identify best practice in flood education. I kept thinking of the affected communities that I lived in and how education could have helped them with the disasters when developing the approach outlined in this book.

I have also drawn on my long involvement in community education - especially environmental education - to provide practical ideas to design education plans and programs in this book. Other sources used to write the book include:

- Evaluations of natural hazard education programs and plans from around the world
- Psychological research into individual and community hazard preparedness
- Social research into flood preparedness and response
- Studies of community resilience.

The research that has enabled the development of the approach in this book has mainly been carried out for the NSW State Emergency Service (NSW SES) and the Victoria State Emergency Service (VICSES) and I acknowledge the help of their staff. My colleagues at Molino Stewart Pty Ltd also provided great assistance, especially by critiquing the approach.

The aim of this book is to provide education practitioners and floodplain and emergency managers with an understanding of the new approach to flood

education that has already been embraced by some agencies and shown early signs of effectiveness.

It should be noted that the book concentrates on flood education as this has been the primary focus of my research. However, its approach can be translated to education for other hazards e.g. bushfire, earthquake, drought, tsunamis. Also, although the book focuses on Australia, the approach can be used universally.

The book firstly explains the significance of flood education and its potential role in building flood-resilient communities. It then describes the new approach in this context, and explains how to design education plans and activities related to it.

I trust that this book will provide you with the background and some tools to commence or improve your flood education program.

Neil Dufty

1. THE NEED FOR FLOOD EDUCATION

Climate change will have a direct influence on the type, scale and frequency of disasters, emergencies and incidents Australia will face, including increased flooding, and more frequent intense storms, lightning events and bushfires.
(Anthony Bergin, Research Director of the Australian Strategic Policy Institute, 'The Australian', 8 March, 2008)

Public awareness of natural hazard issues is arguably the least practised and most poorly funded mitigation measure in Australia. With few exceptions, it is undertaken as a limited auxiliary activity to other disaster management initiatives, rather as a sustained strategic measure to raise public consciousness and understanding of hazard risks, impacts and minimisation.
('Natural Disasters in Australia: Reforming mitigation, relief and recovery arrangements', 2004, pp. 124-125)

Flood mitigation

Community awareness/education is now viewed as a legitimate and increasingly important flood mitigation measure.

The Australian Department of Transport and Regional Services (2002) identifies three main ways to mitigate the impacts of flooding:

1. Flood modification which aims to avoid loss by keeping the water away from development. This is the traditional form of mitigation, provided by structural measures (e.g. levees, detention basins, dams) aimed at modifying the flow of floodwater.
2. Property modification which aims to avoid or minimise loss by keeping development away from the floodwater using land use planning or building design, siting and materials.
3. Response modification which aims to modify human behaviour through activities such as education, warning systems and preparedness planning.

It has become increasingly apparent that flood modification measures by themselves cannot protect communities in all flood events. As a result, in recent times the emphasis of floodplain management has moved from the implementation of structural solutions such as levee banks to non-structural solutions such as flood warning, education and land use management (Victorian Flood Warning Consultative Committee, 2005).

'People need to respond to protect life and property in cases where water cannot be directed away from developed land or where flooding will exceed the design event' (Department of Transport and Regional Services, 2002, p 32). Community education is viewed as an important response modification mechanism to prepare people for flooding and recovery in these situations. Moreover, some researchers and managers believe the improvement in community education is 'the single most important action that could be taken to

improve flood warning and associated response in Australia' (Elliott et.al., 2003).

There has been a similar call to raise the status of education as a bushfire mitigation measure. According to the National Inquiry on Bushfire Mitigation and Management, 'there must be a national commitment to the development and implementation of bushfire and education programs throughout Australia. It is clear that education and knowledge about bushfires, their behaviour and how people can prepare and respond saves lives. Further, all Australians need to have a deeper understanding of the role of fire in ecological systems and the use of fire in the management of the Australian landscape' (Ellis, Kanowski & Whelan, 2004, p 37).

Resilience

Education not only can play a critical part in the mitigation of floods and other natural hazards, it can have a more intrinsic benefit for communities faced with potential natural disasters. Education can help build community resilience to natural hazards.

According to Paton (2006a), community resilience 'is a measure of how well people and societies can adapt to a changed reality and capitalise on new possibilities offered'. Resilience involves the ability of a community to not only resist and recover from a natural hazard event but also to adapt to the changes that the event may cause. It includes the ability of a community to learn from the flood experiences and to improve its systems and capabilities for the next event.

The opposite of 'resilience' is generally viewed to be 'vulnerability'. Whilst resilience refers to the community's ability to resist and adapt to a disaster, vulnerability usually refers to the tendency of something to be damaged in a disaster (SOPAC, 2004). However, according to Paton (2006b) and other researchers, this opposite relationship between resilience and vulnerability cannot be assumed. In fact, vulnerability factors may co-exist with factors that facilitate a capacity to adapt to adverse circumstances i.e. assist resilience (Cadell et.al, 2003). Paton (2006b) cites the example of some groups that would be seen as 'vulnerable' (e.g. ethnic minority status, age and poor educational status) but have demonstrated better than anticipated levels of community participation and empowerment.

Apart from its immediate economic and social benefits, community resilience has a critical role to play in two connected global issues – climate change and sustainability.

Climate change and sustainability

It will be crucial for communities to build their resilience to adapt to the impacts of 'accelerated' climate change.

Most climate change research predicts increases in the intensity and extent of natural hazard events across Australia in the next 50 years. For example, the Draft Garnaut Climate Change Review (2008) predicts that if there is no action on climate change, coastal communities will face significant risk from storms and rises in sea level, leading to localised coastal and flash flooding, as well as extreme wind damage. Most climate change models also show droughts becoming the norm and bushfires increasing as a result of higher temperatures.

The need for resilient communities becomes paramount to guard against these increased risks to safety and property. Tompkins and Adger (2004) stress the importance of community resilience-building in addressing the uncertain, yet inevitable, impacts of climate change. According to them, 'Communities need to enhance their capacity to adapt to the impacts of future climate change, particularly when such impacts could lie outside their experienced coping range.'

'Sustainability', although being a goal of many societies throughout history, was only placed formally on political agendas in 1987 and accepted as a widespread international policy in 1992 at the Rio Summit. At a national scale, Australia was an early leader in translating sustainability into policy and law, and state/territory regional and local bodies have also pursued it actively.

The importance of resilience in relation to sustainability has been well documented. Critical to sustainability is the ability for systems to be ongoing and resilience helps to ensure this. According to Folke (2002), 'more resilient social-economic systems are able to absorb larger shocks without changing in fundamental ways'. Folke adds that 'management that builds resilience can sustain social-economic systems in the face of surprise, unpredictability and complexity. Resilience-building management is flexible and open to learning.'

Governments and communities are now starting to actively support the linkage between resilience-building and the broader goal of sustainability. For example, the US Federal Emergency Management Agency in 2000 produced 'Planning for a Sustainable Future' linking hazard mitigation and disaster management with resilience-building to achieve sustainable communities. Dovers (2004) further notes that 'sustainability and disaster management are closely connected in terms of substantive issues and of underlying research on policy challenges.'

2. WHAT IS FLOOD EDUCATION?

Learning is a process that influences the way people think, feel and act. We learn through experiences throughout our entire lives. Learning happens consciously and subconsciously. We often learn by interacting with people and our environment.

Education, of course, is closely connected to learning. The word 'education' comes from the Latin words 'educare', meaning to rear or foster, and 'educere', meaning to draw out or develop. Over time, its meaning has changed significantly and today is usually associated with the formal education system. But because we learn throughout our lives, it's important to look beyond education in schools ……
(Parliamentary Commissioner for the Environment, New Zealand, 2004, p.1)

Defining flood education

As the quote above suggests, 'education' should be viewed as a process of life-long learning that can be obtained through a variety of mediums, one of which is school. People and their communities can learn in many ways other than through the formal education systems. According to the NSW Council on Environmental Education (2006), these non-formal education mechanisms include:

- Internet sites
- Publications (pamphlets, brochures and posters)
- Media releases
- Field days
- Training
- Facilitation/community problem solving
- Community engagement programs
- Self-learning programs
- Action research program
- Personal development courses
- Advertising/marketing
- Public education campaigns
- Visitor services
- Discussion groups
- Providing technical advice
- Labelling
- Capacity building
- Libraries

- Lectures
- Displays and exhibitions

Based on this unbridled view of education, there are two main roles for it to build resilience to floods and other natural hazards in a context of climate change and sustainability. These two roles for flood education are:

1. To build competence (e.g. skills, networks, leadership)
2. To create change (e.g. in behaviours, systems)

The specific ways education can build flood resilience are outlined in Chapter 3.

The concept of 'community' used in this book is similarly broad to that for 'education'. Community is defined as 'the general public and all spheres of government, business and industry'. It can be viewed at different scales – from the local community level to regional, national and global communities.

In community education it is critical to understand the groups, networks, sectors and organisations that comprise the community and how these entities interact. Maguire and Hagan (2007) stress that, 'in order to truly understand the social impacts of disasters, and to manage and prevent adverse consequences, we must understand the impacts of disasters on particular groups. Moreover, it is important to identify the potential "fracture points" or social cleavages within a community. From this, it may be possible to predict future breakdowns in social resilience in disasters, and to design preventative measures.' They also note that 'the resilience of a community can vary with different types of disasters.'

Flood education planning (Chapter 9) and program design (Chapter 10) is described with respect to these community complexities.

'Awareness' and 'Education'

In attempting to define flood education based on the above understanding of 'education' and 'community', it is important to rationalise some technical terms used in this field. Numerous natural hazard programs are described as 'awareness and education' programs. To be pedantic (in leading to a simple definition), 'awareness' is an indicator/measure of knowledge or understanding e.g. '30 percent of the community were aware of the local flood gauge'. As education is a learning process that can impact on the level of awareness, the two terms should not be used in conjunction in a title.

Furthermore, many people use 'awareness' when they mean 'awareness-raising', which is a type of educative process. If used in this way it is a tautology to couple 'awareness' (for 'awareness-raising') with 'education'.

Moreover, the use of the term 'awareness' in conjunction with 'education' elevates it to a standing that is questionable, at best. Many natural hazard education programs are based on the premise that raising individual awareness

will lead to appropriate preparedness and response behaviours. According to Paton et. al. (2003), ‘It is frequently assumed that providing the public with information on hazards and their mitigation will encourage preparation. This assumption is unfounded.’ Several researchers, such as Boura (1998), have demonstrated that there is not a strong and causal link between being aware of a hazard and acting appropriately for that hazard.

The upshot of this is that there is no need to add ‘awareness’, or any other term (e.g. ‘preparedness’, ‘public information’), to ‘education’ to describe learning processes in the community.

The importance of awareness-raising in increasing preparedness and building community resilience is further discussed in Chapter 5.

Based on the discussion in this chapter, a simple definition of flood education is proposed - flood education is ‘any learning process or activity that builds community resilience to floods’.

3. A NEW APPROACH TO FLOOD EDUCATION

This approach aims to not just prepare communities; it aims to build overall community resilience to floods using education.

The approach is not just about flood awareness and behaviour change; it is about communities learning how to adapt to floods by improving their competencies and systems.

Underlying principles

A review of flood and other natural hazard education programs from around world (Molino Stewart, 2007) found that most programs appeared to be largely ineffective in preparing communities for flood events. This was mainly due to them being:

- Short term 'campaigns'
- Delivered in a top-down fashion
- Only information-centred
- Poorly designed
- Poorly evaluated.

A new approach is promoted in this book that will hopefully improve the effectiveness of flood and other natural hazard education programs by addressing these weaknesses. This approach aims to not just prepare communities; it aims to build overall community resilience to floods using education.

The approach is not just about flood awareness and behaviour change; it is about communities learning how to adapt to floods by improving their competencies and systems.

The new approach to flood education is based on five underlying principles:

1. Sustainability
2. Community participation
3. Lifelong learning
4. Continual improvement
5. Integration

The remainder of this chapter outlines the way each of these principles is addressed in the new approach.

Sustainability

As discussed in Chapter 1, community resilience is an important requisite for sustainability. As outlined in Chapter 4, education can help build community

resilience to flooding. A relationship between flood education and sustainability is therefore shown in Figure 1.

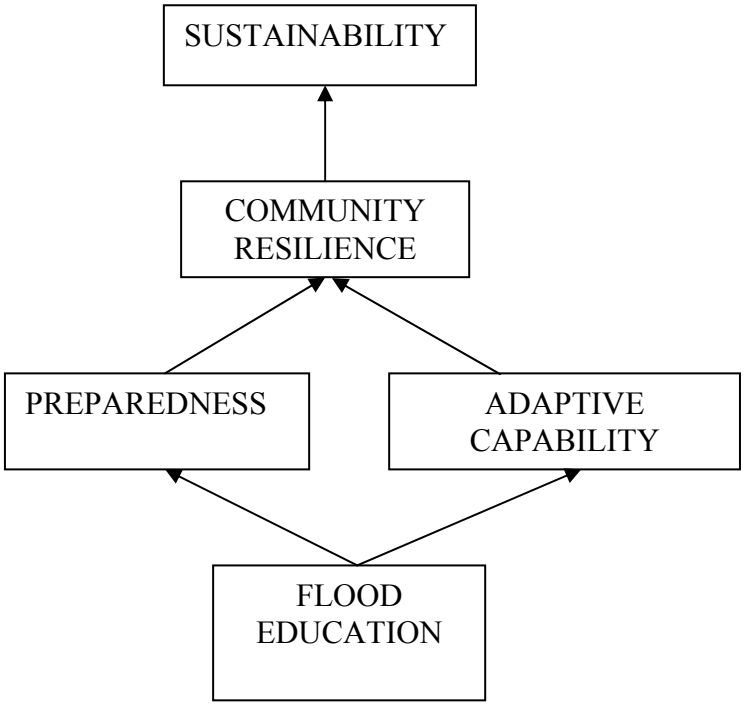

Figure 1 Relationship between flood education and sustainability

It should be acknowledged that flood education is only one mechanism to build community resilience and resilience-building is only one part of the pathway towards sustainability. The terms ‘preparedness’ and ‘adaptive capability’ are discussed in Chapter 4.

Through the linkages shown in Figure 1 there are opportunities for flood education and education for other natural hazards (e.g. bushfire, earthquake, tsunami) to become part of ‘education for sustainability’ initiatives.

Community participation

The ‘traditional approach’ to flood education - still in widespread use - informed the community about floods and their risks through the dissemination of prepared material. It sometimes emphasised actions people could undertake to protect themselves and their property. According to O’Neill (2004), this approach ‘was often one-off and one-way, and assumed that the audience was an undistinguishable group of individuals who had the same needs and values’.

The traditional approach is based on the premise that raising individual awareness will lead to preparedness which, as discussed in Chapter 2, is tenuous at best. Moreover, based on several evaluations of natural hazard education programs, the traditional approach to flood education has been

shown to be relatively ineffective in initiating appropriate preparedness and response behaviours.

A more participatory approach to community flood and other natural hazards education is now promoted. According to Paton (2006b), 'Participation in identifying shared problems and collaborating with others to develop and implement solutions to resolve them engenders the development of competencies that enhance community resilience to adversity.'

In this participatory approach, emergency management agencies act more as facilitators to communities rather than directing change in a 'top-down' manner. They also can help the community build its capabilities (e.g. networks, leadership, competencies, systems) for preparedness, response and recovery.

The participatory approach enables communities to develop, implement and evaluate their own education programs with the input of expert education guidance as required. More details about community flood education planning and evaluation can be found in Chapters 9 and 11 respectively.

The participatory approach, although relatively new to flood education, is well acknowledged and used in other forms of community education. For example, in education for sustainability, according to Tilbury and Wortman (2004), 'genuine participation is essential to building people's abilities and empowering learners to take action for change toward sustainability'.

Lifelong learning

As discussed in Chapter 2, education in this book is viewed as a process or activity that assists in lifelong learning. This idea of lifelong learning is especially appropriate to flood education as a flood event can affect all ages, and some people several times throughout their lives.

The principle of lifelong learning has ramifications for how flood education is delivered. Many flood education programs have been delivered as intense 'campaigns' lasting for short periods e.g. up to one year. Although these programs may have some short-term impacts (e.g. increased awareness, preparedness), these impacts tend to peter out due to lack of reinforcement and unless a flood occurs during the 'impact period', they can be almost as ineffective as doing nothing.

Because learning is life long and needs to be continually nurtured (and a flood can occur at any time) community flood education needs to ongoing, varied and appropriate to all ages. The development of community flood education plans is promoted in Chapter 9 as a way to address ongoing learning.

Continual improvement

Continual improvement is an acknowledged tenet for most private and public organisations. It enables them to move towards greater success and impact.

Evaluation is an important tool in identifying ways to continually improve. As factors may change that affect a community's ability to resist and recover from a flood event, it is critical to be regularly evaluating and improving all aspects of flood mitigation and emergency planning, including flood education.

Furthermore, as noted in Chapter 1, 'resilience' implies an ability of communities to learn from and improve after a flood event. Continual improvement - through education and evaluation – is therefore also appropriate post-flood to better prepare for future floods.

As noted at the start of this chapter, flood education around the world has generally been poorly evaluated: in many cases, not evaluated. This has stymied opportunities to improve practices in flood education and effectiveness in communities.

Evaluation conducted before, during and after a flood education activity or plan is implemented will help guide continual improvement in helping communities learn to become more flood-resilient.

Evaluation of flood education is further discussed in Chapter 11.

Integration

The impacts of flood education initiatives will be limited if conducted in isolation. Flood education should be an integral part of floodplain management and emergency management.

More specifically, community flood education plans touted in this book should be integrated with plans such as:

- Disaster plans
- Emergency flood plans
- Floodplain management plans.

Some researchers (e.g. Finnis, 2004) support a cross-hazard approach to community education where appropriate. This would mean that flood education would be integrated where possible with general hazard education programs if there is a complex hazardscape (i.e. range of hazard risks). The benefits of this approach include:

- Economies of scale for managers from integrating education programs across hazards.

- Reinforcement of preparedness behaviours where there are similar behaviours required across hazards.
- Use of same community groups and personnel for all hazards.
- Building community capacity (e.g. competencies, leadership) across hazards.

Ideas for integration are further discussed in Chapter 9.

4. HOW CAN EDUCATION BUILD FLOOD RESILIENCE?

The aim of flood education is to help build flood resilient communities. Resilience not only refers to how well a community can anticipate, prepare for, respond to and recover quickly from floods but also its ability to learn from and improve after flood events.

What is a flood-resilient community?

Figure 2 shows theoretically the difference between a flood resilient community and a less resilient community. Note that the y-axis is 'community functioning' – how well individuals and organisations are performing their normal functions.

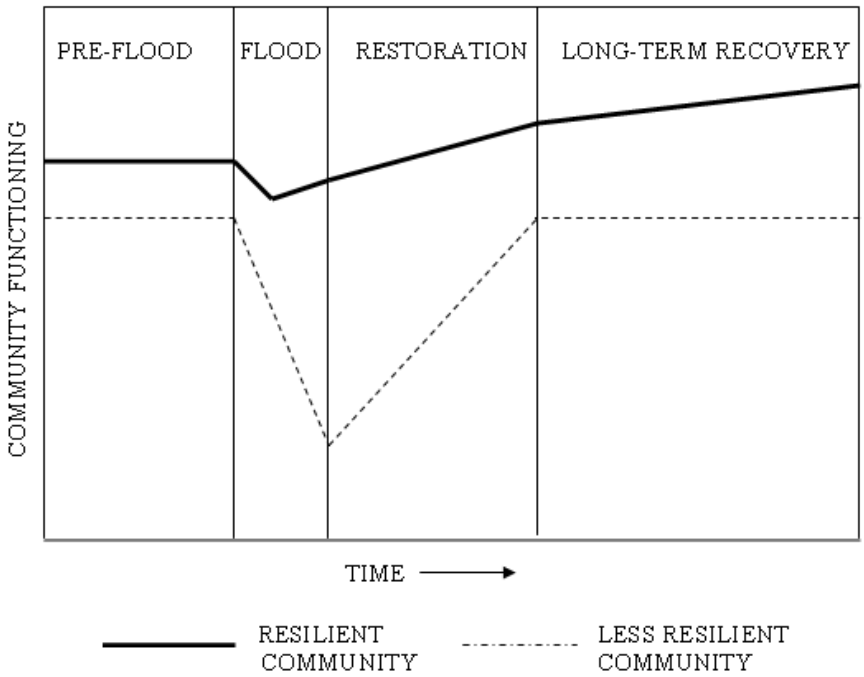

Figure 2 Differences between a resilient and a less resilient community (modified from Mayunga, 2007)

As shown in Figure 2, the 'resilient community' will often experience less flood impacts to its normal functioning, while the 'less resilient community' will experience greater impacts to the same level of flooding. It is also clear that the less resilient community will take longer to recover i.e. to come back to normal functioning. Furthermore, the resilient community will most likely improve its functioning through learning from the flood event.

Flood education is one way to help to facilitate change in communities from being less resilient to more resilient to flooding and to maintain this resilience. Other ways include through financial assistance, infrastructure, community strengthening activities and capacity building.

The four functions of flood education

In this new approach, there are four functions of flood education in building flood resilient communities.

1. *Preparedness conversion.* Helping people, organisations and communities learn how to commence and maintain preparations for flooding.

2. *Mitigation behaviours.* Learning what to do before, during and after a flood.

3. *Adaptive capability.* Learning how to change and maintain social systems and build community competencies (e.g. skills, leadership) to minimise the impacts of flooding.

4. *Post-flood learnings.* Learning how to improve 1, 2 & 3 above (i.e. preparedness levels, mitigation behaviours and adaptive capabilities) after a flood event.

These functions are related to the 'flood cycle' in Figure 3.

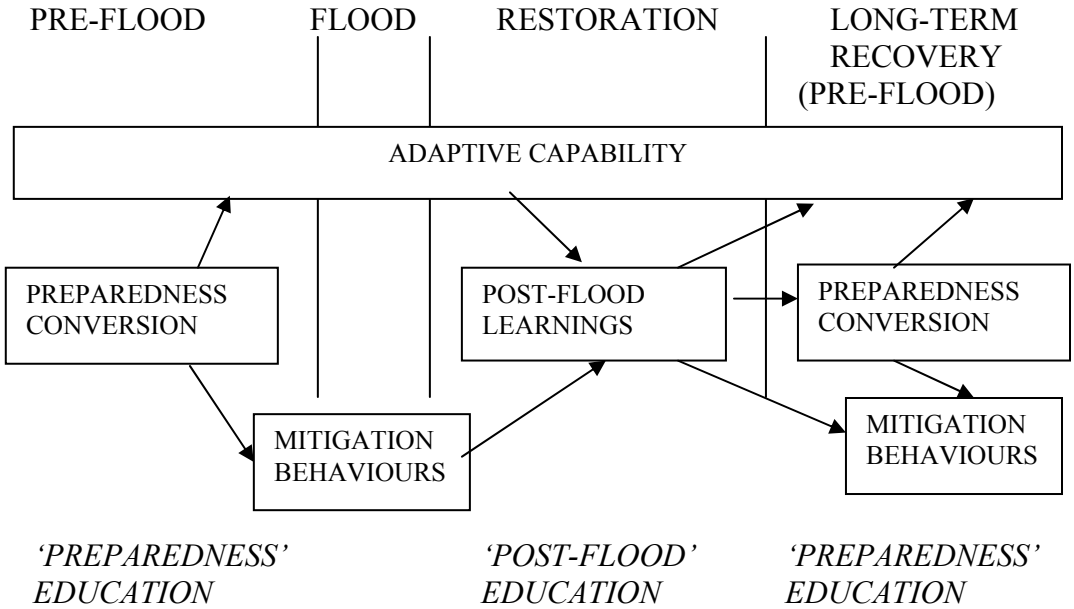

Figure 3 Four functions of flood education related to the flood cycle

As shown in Figure 3, pre-flood or 'preparedness' education should aim to help people, organisations (e.g. businesses) and their communities commence and maintain preparations for flooding and to build competencies and systems to adapt to flood events. 'Preparedness conversion' is a prerequisite - especially in communities where preparedness levels are low - for individuals, organisations and communities to commence preparedness planning and then to learn

appropriate mitigation behaviours and how to improve their competencies and systems (‘adaptive capability’) to resist and recover from flooding. The education for ‘mitigation behaviours’ should occur prior to and immediately after a flood – but also could occur during a flood, if floodwaters rose slowly.

During the restoration after a flood, education has another important role in helping individuals, organisations and communities learn from their flood experiences (e.g. the effectiveness of mitigation behaviours and adaptive capability) and use these learnings for improvements in future flood events. Another phase of education then commences as long-term recovery becomes the pre-flood part of the new cycle.

Most attempts at flood education to date only focus on ‘preparedness conversion’ and improving ‘mitigation behaviours’, with little done on building ‘adaptive capability’ and community learning after floods. The new approach promoted in this book calls for education activities related to all four functions as required.

Each of the four functions of flood education is described in more detail in the subsequent chapters.

5. PREPAREDNESS CONVERSION

A first challenge for flood educators can be the lack of motivation in the community or parts of the community to prepare for flooding. Through an understanding of psychological models and barriers relating to preparedness, educators with communities can develop effective ways to motivate people to prepare for flooding.

An important initial step in gauging preparedness levels and possible barriers to preparedness is to use social research such as surveys and focus groups. This research can provide an insight into what sectors of the community are poorly prepared and education activities can be designed to encourage them to prepare. The research can also provide baseline data to help evaluate the impact of education and other interventions on preparedness levels.

One limitation of social research is that it usually gauges self-reported preparedness levels and may not validate people's actual preparedness actions or knowledge e.g. their development of an emergency kit, understanding of evacuation routes.

Psychological models

Researchers have developed theoretical models to help understand how people take up preparedness behaviours. For example, Paton et al. (2003) developed and tested a psychological model of preparedness to assist both research and the formulation of practical risk communication strategies.

As shown in Figure 4, Paton's model consists of three stages:

STAGE 1 – *Precursors*. The motivation to prepare for a hazard is determined by 'critical awareness' (the extent to which people see the hazard issues as important to think about and discuss on a regular basis), 'risk perception' (the level of perceived threat or risk posed by a hazard) and 'anxiety' related to the potential hazard.

STAGE 2 – *Intention formation*. Outcome expectancy, self-efficacy and problem-focused coping are all predictors of the intention to prepare. (terms are defined in the Glossary)

STAGE 3 – *Conversion to preparedness*. Prominent moderators for the conversion of intention to actions include the 'time frame' within which people estimate or assume that the next hazard will occur and their levels of trust in the sources of information.

Note in Paton's model that 'awareness' is only one of several factors that lead to preparedness.

Paton's model has been validated through extensive research and could guide the design of education activities aimed at helping people prepare for flooding.

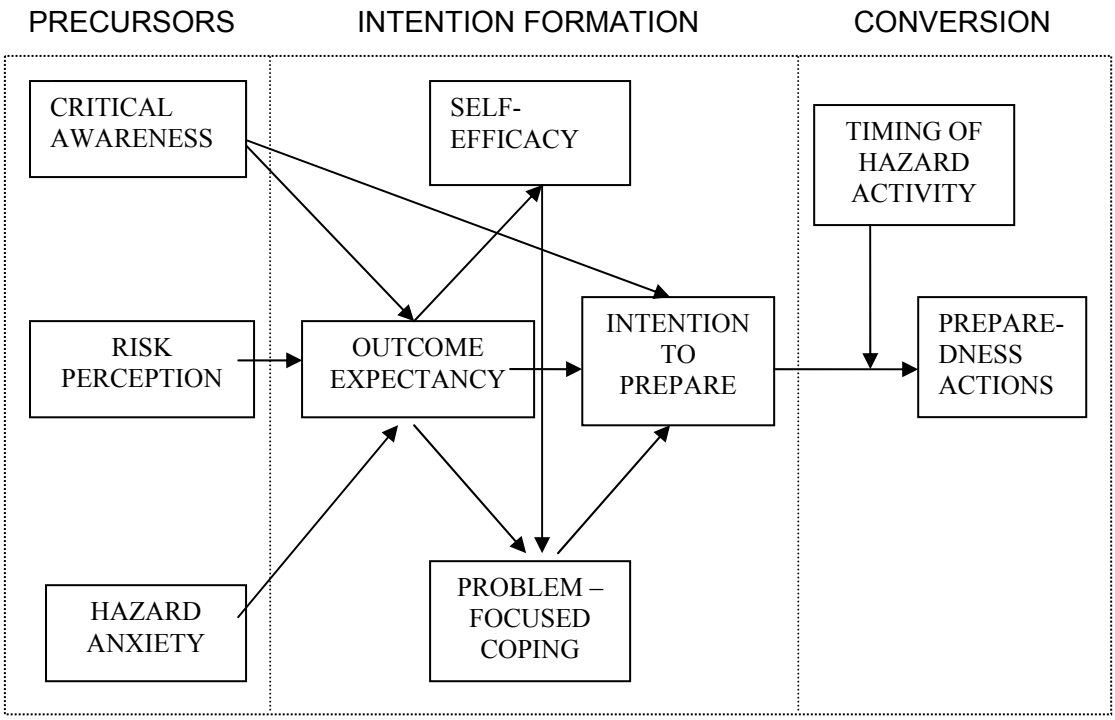

Figure 4 Socio-cognitive model of preparedness (from Paton et.al. 2003)

Barriers to preparedness

The barriers that may impede preparedness should also be investigated. Several researchers have used social research and other studies to identify barriers to the uptake of preparedness behaviours. Through a comprehensive literature review, Finnis (2004) identified the following barriers to the uptake of these behaviours:

- *Risk perception* – where people do not internalise the risk of a hazard ('That event is never going to happen')
- *Unrealistic optimism* – the illusion of personal invulnerability that can cause a denial of risk ('It's never going to happen to me')
- *Response efficacy* – ('I don't have the time/money/skill to prepare', "There are more important things to think about', 'I can't be bothered')
- *Outcome expectancy* – the perception of whether personal action will effectively mitigate or reduce a problem or threat ('No amount of preparedness will help')
- *Normalisation bias* – Viewing a hazard as a common event that will not vary in impact ('Our town has floods all the time, and I survived those')

- *External locus of control* – people believe that forces outside of their control are the ruling forces ('Disasters are an Act of God', 'If it is meant to happen…..')
- *Transfer of responsibility* – believing that others are responsible for preparedness and response ('The SES will be there to help me').

Gissing et al. (2005) identified four barriers to the uptake of a toolkit that helps businesses plan for flood preparedness and response. There barriers were:

1. *Scepticism*. Many businesses surveyed felt there was a low risk of flooding and that losses would not be great if a flood eventuated.

2. *Trust.* There was a high level of trust in the emergency agency (NSW SES) in a community (Wagga Wagga) that had not experienced a significant flood for a relatively long period of time.

3. *Self-confidence.* Some businesses believed they knew what to do to prepare and respond to a flood (and therefore did not require guidance). Other businesses had a fatalistic view, demonstrating a lack of confidence in being able to do anything to mitigate flood impacts.

4. *Priority.* Lack of time was cited as a reason for not carrying out flood planning.

Any barriers to preparedness should be identified in the community and education activities designed to help break them down.

Another challenge for education to commence preparedness is the complex nature of communities. Some communities are isolated; some part of a metropolis.

As Maguire and Hagan (2007) note, 'Even relatively straightforward communities contain multiple social groups, and these groups differ in significant ways. Groups may differ in terms of their socio-economic status, their degree of geographic isolation, or vulnerability to psychological trauma'. Educators therefore need to understand and work with these community sectors or 'groups' in the design, delivery and evaluation of all flood education activities including those that encourage people to prepare for flooding.

Some examples of education processes that could be used to help 'convert' people to preparedness and maintain this preparedness include:

- Risk perception. Helping people understand flood risks to them.
- Critical awareness. Encouraging discussion about flooding and its importance

- Barriers to Preparedness. Identifying people's barriers to preparedness and helping them overcome barriers
- Outcome expectancy. Showing impacts of flooding and importance of preparedness
- Personal competencies. Building skills in confronting problems related to flooding
- Trust in information. Demonstrating trust in flood information and advice
- Timing of next hazard event. Showing that flooding is inevitable in a floodplain.

6. LEARNING FLOOD MITIGATION BEHAVIOURS

Special challenges for flood education

The challenge for hazard education is to be effective in promoting appropriate preparedness, response and recovery behaviours in an environment characterised by infrequent hazard activity, and to maintain this state of readiness over time (Paton et al., 2003). This challenge is exacerbated for 'flood' which some communities view as being of comparatively low risk in their complex hazardscape (Molino Stewart 2003, Molino Stewart 2005a, Molino Stewart 2005b).

The challenge for flood and other natural hazards education is arguably much more difficult than for other community education programs designed to change and maintain behaviours. For example, waste education and stormwater education encourage people to carry out regular activities (e.g. recycling, not littering, minimising phosphorus use) as part of our everyday lifestyle. On the other hand, flood education has to help people learn to act appropriately before, during and after events that are irregular, that may be very infrequent and not part of everyday thinking and living.

Furthermore, flood education needs to help people carry out behaviours to mitigate the impacts of flooding that may be different for certain flood scenarios. For example, in a 'riverine' flood, with plenty of notice, an appropriate behaviour could be to wait for an evacuation order or to evacuate triggered by a flood warning or river height. On the other hand, due to lack of evacuation time and danger with fast rising floodwaters, the appropriate behaviour in a 'flash flooding' scenario may be not to evacuate ('shelter in place') or to vertically evacuate where possible.

Flood action plans

With this challenge in mind, it is recommended that individuals, homes and organisations (e.g. businesses, local councils, government agencies) develop and maintain their own flood action plans that list appropriate actions before, just prior to, during and just after a flood .

There are a plethora of generic flood education guides that help people to develop these flood action plans. Many of these are located on websites such as the Emergency Management Australia site at www.ema.gov.au.

Both NSW SES and VICSES have produced 'toolkits' to help people identify appropriate mitigation behaviours and develop their own flood action plans. These toolkits include flood action plan flip charts that can be affixed to fridges or cupboards and be easily accessed in the home. NSW SES has produced a 'riverine' and a 'flash flooding' version of the flip chart. VICSES has developed an emergency action plan that can be used not only for flood but also other hazards such as fire.

NSW SES has also developed an interactive web-based toolkit to help businesses identify appropriate actions to reduce flood damages and ensure staff safety and to develop a flood action plan as part of business continuity planning.

Although these generic guides appear useful in helping people and organisations plan for and carry out appropriate mitigation behaviours, they need to be supplemented with local flood guidance for each community. This local guidance should explain the specific flood scenarios for that community and any mitigation behaviours related to these scenarios. If possible, using the participative approach outlined above, this local guidance should be developed with local communities.

An example of this local guidance is the FloodSafe Guides, produced by NSW SES. These Guides provide background information and mitigation actions for specific communities and even sections of a community e.g. Kempsey Businesses. The Guides can help people and organisations in these communities with 'local knowledge' to put into their flood action plans.

Evaluations of the impact of these and similar education tools have shown that ongoing community discussion and interaction about flooding is critical for the uptake and maintenance of flood action plans. Communities should decide on the best ways to continue this discourse. Some possible ways include:

- Educative stalls and displays at events such as field days, agricultural shows highlighting mitigation behaviours and flood action planning
- Media releases related to mitigation behaviours and need for flood action plans
- Use of SES volunteers and other community representatives in informal chats about mitigation behaviours
- Use of SES volunteers and community leaders in helping people and organisations to complete and update their flood action plans
- Problem solving meetings related to flooding scenarios with community groups e.g. retirement villages, chambers of commerce, progress associations, schools.

Education during a flood

Recent research by VICSES has also shown the merit of using a community facilitator or educator to help communities in riverine areas to respond with appropriate mitigation behaviours, just prior to and during a flood event. Flood education activities in this context could include doorknocks, community meetings, delivery of printed information and general advice during the flood event. Note that this initiative is only useful in riverine scenarios where there is a lag between the onset of heavy rain and possible inundation – it is therefore not

appropriate to flash flooding situations or riverine flooding where floodwaters rise relatively quickly.

Education during recovery

Education also has an important role in helping people, businesses and their communities in recovering from a flood, especially a flood disaster. There are a series of behaviours that can be learnt between floods that can assist in the recovery phase. For example, the NSW SES lists the following behaviours for households in its Draft Home FloodSafe Toolkit:

- If evacuated, wait for permission from emergency services to return home.
- If required, seek welfare assistance from the Department of Community Services.
- Before entering any flood-affected part of your home, ensure its safety is checked. Checks should investigate at least:
  - Structural safety of the building
  - Safety of electrical and gas supplies and equipment and whether the sewerage system is working properly.
  - Potential slips, trips and falls with mud and water
  - Any venomous spiders and snakes
  - Any debris
- Wear non-slip footwear, protective clothing and puncture-resistant gloves while cleaning up, and use disinfectant.
- Never consume food or liquid that has been in contact with floodwater.
- Help neighbours and others that have been affected by a flood.
- Replace damaged floor coverings, furniture and fittings with flood resistant ones.

These and other site-specific behaviours should be reinforced through a range of education methods during the recovery phase. These education methods could include:

- Advice from emergency agencies and their volunteers
- Announcements and reports through the media
- Information through word-of-mouth e.g. using community leaders, networks
- Information at community meeting points e.g. hotels, clubs, libraries.

Education can also assist in the psychological recovery from a flood disaster. Studies by researchers such as Norris et. al. (2002) show that a disaster such as a major flood can cause psychological problems including anxiety-based symptoms (including acute and posttraumatic stress disorder), heightened stress levels, health-related problems (e.g. sleep disorders), secondary stressors (e.g. family conflict, work and financial problems) and loss of social support and normal coping skills.

Although it can be argued that help with these problems should be conducted only through psychologists and trained counsellors, education can play a supporting role. For example, Ronan and Johnston (2005) have developed an education program that addresses hazard readiness and recovery through school, youth and family interactions.

7. BUILDING ADAPTIVE CAPABILITY

What is adaptive capability?

Community resilience to flooding involves more than preparedness and the ability to carry out appropriate behaviours in response to a flood event. According to Paton (2006a), the resilience, or 'adaptive capacity', of a community also includes the systems and competencies required by people and communities to coordinate and utilise these behaviours and resources to confront and adapt or adjust to the hazard event. The adaptive social systems and competencies are here grouped and termed the 'adaptive capability' of a community. Figure 5 shows some of these competencies and systems.

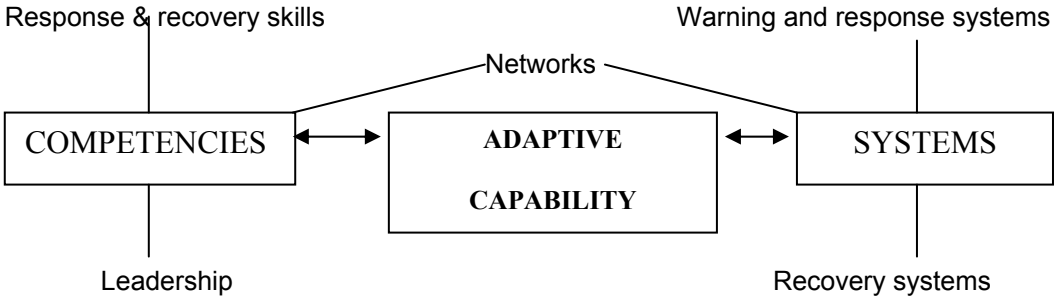

Figure 5 Adaptive capability for floods

The development of a community's adaptive capability in relation to flooding should be an ongoing process and could form part of broader community development or strengthening initiatives.

As noted previously, the multi-faceted nature of communities should again be acknowledged in flood education related to adaptive capability. Some community 'groups' may be especially vulnerable and need special assistance in building their capabilities to adapt to flooding.

Education to build adaptive capability

There is an important role for flood education in helping communities, or parts of communities, build their capabilities to adapt to flooding. They can do this through learning associated with:

1. Improving competencies
2. Systemic change

Ways that education can help communities build their competencies to resist and recover from flooding include:

- Training of key community people (e.g. leaders, SES volunteers, media) in aspects of response and recovery

- Problem-solving sessions with community groups to explore how community can work with emergency authorities to resist and recover from different local flood scenarios
- Oral histories about previous floods and how the community adapted to them
- Information sharing (e.g. through community groups, discussion ‘salons’) about how the community can adapt to flooding
- Forums to develop community-based solutions to flooding problems.

Flood education can also help communities learn about systemic change required to build their resilience. These social systems could include flood warning systems, institutional systems related to flooding (e.g. local flood plans), evacuation and recovery systems. Learning activities related to improving these systems could include public meetings, planning forums, research (e.g. into best practices), SWOT sessions and After Action Reviews (AARs) or post-disaster de-briefing sessions.

8. POST FLOOD LEARNINGS

As discussed in Chapter 1, resilience not only includes a community's ability to resist and recover from a flood but also to learn and improve from it. According to Maguire and Hagan (2007), 'An optimal recovery involves not just returning to an initial equilibrium point. Rather, by adapting to new circumstances and learning from the disaster experience, higher levels of functioning (and thereby resilience) can be attained.'

As noted in Chapter 4, the community learnings from a flood event should feedback to improve future flood preparations including flood education. Learnings should inform flood education programs that help people 'convert' to preparedness, learn appropriate preparation, response and recover behaviours and build the community's competencies and systems to better adapt to future flooding. As such, the post-flood learnings are a critical part of the evaluation of local flood education plans promoted in Chapter 9.

Some examples of education activities to help communities and emergency agencies learn together from a flood event include:

- Social research (e.g. surveys, focus groups) to find out effectiveness of warning systems, evacuation, recovery support, flood education etc. and how they can be improved
- Community de-brief meetings to identify problems in preparation, response and recovery and possible improvements.
- Discourse through the media e.g. letters to the editor, poll about flooding.
- Personal anecdotes about flood experiences and ways to better prepare, respond and recover in the future.
- Reviews and learning by businesses possibly as part of improving their business continuity plans
- Reviews and learning by households of home emergency plans in the light of the recent flood
- Input from personal and community learnings ito agency reviews and coronial inquiries.

Note that, using the participatory approach, these learning activities are best designed by emergency management agencies with community representatives.

Specific education activities could also be designed in liaison with post flood counselling services to support the psychological recovery of individuals and vulnerable groups.

9. LOCAL FLOOD EDUCATION PLANS

A major problem with flood education is that it has been treated as low priority by many floodplain management and emergency management organisations. As such it has been, at best, an add-on to structural and other non-structural activities. In many cases, it hasn't been part of flood planning.

Furthermore, where it has been supported by these organisations, flood education has generally been carried out as a one-off, short term 'campaign' of less than six months. This has been mainly due to funding limitations and lack of recognition of the value of flood education in floodplain management and emergency management planning. Most of these campaigns are conducted in a 'top-down' authoritative way with little community participation in the formation, delivery and evaluation of the education program.

There is some new evidence to show the value of longer term community flood education programs in comparison to these education 'campaigns'. For example, research by NSW SES has shown that communities that received longer term (over one year) education programs have shown significantly higher preparedness levels and a greater willingness to evacuate.

Using the participatory approach, a relatively new way to formalise longer term flood education activities is through 'local flood education plans'. These plans are developed, implemented and evaluated by local committees usually consisting of resident (urban and rural) and business representatives, local council and State government agency staff.

Local flood education committees

In some communities, local flood education committees need to be formed to manage the development of the local flood education plans. In other communities, the management of a flood education plan can be subsumed into the function of an existing floodplain management or emergency management committee. In every case, there needs to be local commitment and drive to ensure the success of the plans.

A local flood education committee could consist of:

- Local residents
- Rural landholders (if applicable)
- Local business representatives
- School principals
- Representatives from other sectors and groups e.g. schools, caravan parks
- Local council staff

- Emergency agency staff
- Other agency staff e.g. Catchment Management Authorities.

It may be necessary to select non-agency members of the committee through an expression of interest process advertised through the local media.

It cannot be assumed that the local committee has specific education expertise, especially related to the flood education functions identified above. Education practitioners, such as those from emergency agencies, can provide expert education guidance for these committees as required.

Content of local flood education plans

Local flood education planning should consider the four functions of community flood education described in this booklet i.e. preparedness conversion, mitigation behaviours, adaptive capability and post-flood learnings. It should also relate appropriate learning activities to different community groups or sectors (e.g. ethnic groups, businesses, rural landholders, residents).

Local flood education plans should strongly promote and support individual, home and business flood action plans (see Chapter 6). They also should build community capacity where appropriate (e.g. networks for learning, training of volunteers) and engage the community in the planning, implementation and evaluation phases.

To date, flood education plans have or are being developed in several communities in NSW. Although the impacts of these plans have not yet been evaluated, the main benefits of these flood education plans at this stage appear to be:

- More community ownership in flood education
- Greater recognition and support of flood education by floodplain management and emergency management authorities
- Flood education activities planned for local needs
- Information and resources are better distributed in areas of need
- Feedback and engagement processes are at a wider and more complex level
- Flood education activities to be rolled out systematically over time
- Improvements to be made to local flood education through planned evaluation
- State-wide and regional education initiatives to be utilised where appropriate to the local situation.

A good example of a local flood education plan is that developed for the Maitland area in the Hunter Valley of NSW. The flood education plan was developed by representatives of local rural landholders, businesses, town residents, Maitland City Council, NSW SES and the Hunter-Central Rivers

Catchment Management Authority. A copy of the plan can be obtained from the Hunter-Central Rivers CMA.

There is also research that shows that a cross-hazard approach to community resilience education has merit, not only in economies of scale and avoiding duplication of community effort, but also using standard preparedness messages and education activities (e.g. preparing personal or business hazard emergency plans instead of just flood preparedness plans). Furthermore, where possible, local flood education plans could be part of local hazard education plans (e.g. in communities at risk from both bushfires and flooding) developed by a local hazard education committee or, especially in smaller communities, a progress association or other community representative group.

Specifically, a local flood education plan should consist of at least:

1. A background explaining the local flood scenarios, warning systems, community features (e.g. preparedness levels, vulnerable groups).
2. Vision, outcomes and main strategies to achieve the outcomes
3. Implementation plan in table form that shows the main education activities (see Chapter 10) for each strategy, a timeframe for rollout, responsibilities and costing for each activity.
4. An evaluation plan (see Chapter 11) to show how the education plan and its outcomes will be assessed and improved during the life of the plan and at the end of the plan.

It is suggested that the plan has a life of three years before it is revised and the new plan activated. A flood, whenever it occurs, may also precipitate a review of the local flood education plan.

10. DESIGNING FLOOD EDUCATION ACTIVITIES

Identifying appropriate education activities

In designing appropriate and effective flood education activities that can be part of the local flood education plan, it is firstly critical to:

- Understand communities
- Understand flood scenarios and risks
- Understand emergency planning.

As well as understanding possible flooding scenarios and adhering to leading education practices, it is also important to understand the local community in the design of community flood education programs and activities. This is best achieved through community participation and social research in the design process.

The boundaries of communities can be arbitrary but is generally easily determined by local residents. In rural areas, communities may be centred on 'districts', hamlets or small towns. Regional centres are generally viewed as one community, although in some cases, are divided by physical or demographic features into discrete communities. Some larger regional centres have suburbs which can constitute separate communities.

In cities, the delineation of communities may be more difficult as although there are 'suburbs', community networks may be more extensive and their boundaries blurred. A local government area or catchment may therefore be a better unit for a community education program than a particular suburb.

Furthermore, there are many people that reside in one community and work far across the city in another. Some travel to school in different communities; come recreate in different communities. Understanding the movement of people in the urban environment is critical to the design of a flood education program.

The multi-faceted nature of communities should also be understood. The community can be divided by 'sectors' (e.g. business, government agencies, residents, rural landholders), 'organisations' (e.g. caravan parks, retirement homes, schools) or by 'groups' based on certain common features e.g. age, ethnicity, education, socio-economic background. It is important to examine the vulnerability of these sectors, organisations and groups in the design of local flood education activities.

In designing education activities it is then important to:

1. Choose activities that are appropriate to whichever of the four functions of flood education (see Chapters 5, 6, 7 & 8) you need to focus on.
2. Choose activities that engage and interact with target audiences.
3. Choose activities related to the targeted parts of the community.

Use of the Internet

In relation to the second point above, many organisations use the Internet as their main means of educating people about flood risks and preparedness behaviours.

Although there is an acknowledged increasing use of the Internet, several social research studies of flood–affected communities have shown that people generally use other means to learn about flooding. Depending on the type of community (e.g. urban, rural, non-English speaking, indigenous), people learn about flooding mainly through word-of-mouth, events (e.g. field days), the media and through their groups and networks (e.g. newsletters). The exception to this trend is the relatively high number of hits on the Australian Bureau of Meteorology website where people are seeking weather forecasts, including flood warnings as an event unfolds.

It also should be noted that the use of the Internet for flood information may be limited during floods due to electricity failures and inundation.

The Internet should therefore be viewed as a useful repository of flood information and a reference but should not be used as a primary education tool, particularly to engage communities.

Business and school education

In relation to the third point above, it is important to link flood education activities into existing programs and systems where possible. For example, a business flood toolkit or local business flood education guide should be developed in the context of business continuity planning and through the local chamber of commerce and other business groups where possible.

School flood education activities are most effective when designed as lessons that help teach learning outcomes from appropriate syllabuses. This will help to ensure that they are part of annual teaching programs in schools and not ‘one-offs’ or extra curricular activities.

11. EVALUATION

A major deficiency of many flood education plans, programs and activities is a lack of evaluation to design them, track their progress and ultimately gauge their effectiveness. Evaluation should be an integral part of the design and implementation of local flood education plans and their activities.

Evaluation should be carried out before, during and after the implementation of education plans and activities.

Forms of evaluation

Owen (2006) identifies five forms of evaluation:

- *Proactive* - carried out before plan/activities and could include needs assessment, research review, review of best practice
- *Clarificative* – carried out at the beginning and during plan/activities and could include logical framework analysis
- *Interactive* – aims to improve plans/activities during their life and could include action research, quality review
- *Monitoring* – this fine-tunes plans/activities and could include performance assessment, systems analysis
- *Impact* – conducted at the end of a plan or activity and could include performance audit, objectives-based assessment.

All of these forms can be used in the evaluation of a local flood education plan or flood education activities.

Example of flood education evaluation

A challenge for flood education evaluation is that the ultimate test of a flood education plan and activities occurs with a flood event. Nevertheless, even beforehand evaluation can gauge the appropriateness and effectiveness of the plans and their education activities by measuring success in the following:

- Appropriateness of education activities in the Plan
- Delivery of the plan actions and education activities
- Levels of community preparedness
- Competencies and systems in place to adapt to a flood event.

After a flood, evaluation can be used to gauge the following in relation to flood education plans and activities:

- Response including use of appropriate mitigation behaviours to a flood event
- Recovery after a flood event

- Learnings and improvements to preparedness, competencies and systems after a flood event.

A framework for this type of flood education evaluation is provided in Table 1.

Table 1 An evaluation framework for a local flood education plan

Evaluation focus	**Evaluation methods**	**Indicators**	**Timing**
Appropriateness of the design of the Plan including education activities	(list ways to identify and choose education activities in the Plan)	(measures to gauge success)	(when evaluation is to be conducted)
Improvement of the Plan during its life	(list evaluation methods used to improve Plan)	(measures to gauge success)	(when evaluation is to be conducted)
Achievement of the Actions in the Plan	(list ways to ascertain whether Actions have been carried out)	(measures to gauge success)	(when evaluation is to be conducted)
Effectiveness of the Plan	(list methods to determine effectiveness by comparing planned outcomes e.g. preparedness levels with actual outcomes)	(measures to gauge success)	(when evaluation is to be conducted)
Flood response and recovery	(list methods to determine the effectiveness of the Plan in community flood response and recovery)	(measures to gauge success)	(when evaluation is to be conducted)
Post-flood learnings	(list methods to evaluate learnings of the community after a flood in relation to community improvements in preparedness levels, competencies and systems)	(measures to gauge success)	(when evaluation is to be conducted)

A major tool in this evaluation should be social research to help measure these ‘indicators of success’. This social research can include surveying of landholders and others affected by flooding, focus groups, interviews, de-briefing meetings and oral histories. Anecdotal observations from landholders

and emergency agencies should be useful in adding to the more quantitative methods.

Where possible, the evaluation of community education plans and programs should involve the community or its representatives. Participatory evaluation involves local stakeholders in problem identification, evaluation design, data collection, analysis and use of results. Stakeholders include those who affect or are affected by the policies, decisions and actions of a program. Participatory evaluation has already shown to be effective in several fields including sustainable development, health and agriculture (McDuff, 2002).

12. SUMMARY

The main points to note in the new approach to flood education outlined in this book are:

- Flood education is 'any learning process or activity that builds community resilience to flooding'.
- Flood education will become increasingly important to help communities adapt to the impacts of flooding related to 'accelerated climate change'.
- Flood education also has a role, as part of 'education for sustainability', in helping communities move towards sustainability.
- Flood education should be delivered in a way that communities are empowered to research, plan, implement and evaluate their own learning activities.
- Emergency management agencies should act as 'consultants' to communities in flood education (e.g. as facilitators, resource providers, change agents, coordinators) rather than directing the change process in a 'top-down' manner.
- There are four functions of community flood education related to the 'flood cycle' – preparedness conversion, learning mitigation behaviours, learning how to build adaptive capabilities and learning from flood events.
- Flood education should be delivered in communities on a regular basis and not as a one-off 'campaign'.
- A 'local community flood education plan' is an effective way to deliver flood education to communities and parts of communities.
- Local flood education plans should be based on the four functions of flood education and developed by community representatives with emergency management authorities.
- Flood education programs and plans should be evaluated as they proceed, to ensure continual improvement.
- Social research should be used as an important tool in the planning, implementation and evaluation of flood education programs and plans.
- Opportunities for the integration of flood education in cross-hazard (and cross-agency) programs and plans should be identified and implemented where possible.
- Flood education planning should be part of floodplain and emergency planning processes.

13. MOLINO STEWART SERVICES

Molino Stewart is an environmental and hazard management consultancy firm based in Parramatta, NSW. The firm was founded by Company Principals Peter Stewart and Steven Molino in 1995. It employs specialists in the fields of hazard management, education, ecology, planning, GIS, community consultation and engineering.

Molino Stewart has particular expertise in aspects of floodplain management including evacuation planning, flood education, evaluation of warning systems and flood-related urban planning. The firm produces *Floodplain Manager*, a periodical that is distributed throughout Australia.

Molino Stewart can assist communities and agencies with a range of flood education projects related to the approach in this booklet. These projects could include:

- Facilitation to assist community committees develop their local flood education plans
- Expert guidance in the development of flood education plans, programs and activities
- Evaluation of flood education programs and plans
- Social research including post-flood reviews e.g. of warning systems, community preparedness and response, impact of flood education programs and plans
- Development and delivery of training programs
- Development of school education programs (e.g. lessons, learning activities) based on relevant curriculums
- Preparation of community engagement tools e.g. personal and business flood planning guides.

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15. GLOSSARY

Adaptive capability: the systems and competencies required by people and communities to coordinate and utilise behaviours and resources to confront and adapt or adjust to the hazard event.

Community: includes all spheres of government, business and industry and the general public

Critical Awareness: extent to which people think and talk about hazards

Empowerment: multi-dimensional social process that helps people gain control over their own lives. It is a process that fosters power (that is, the capacity to implement) in people, for use in their own lives, their communities, and in their society, by acting on issues that they define as important.

Evaluation: an objective and considered assessment of the efficiency, effectiveness and appropriateness of a project or program

Flood education: is any learning process or activity that builds community resilience to flooding.

Hazardscape: the landscape of many hazards. The interaction among nature, society, and technology at a variety of spatial scales creates a mosaic of risks that affect places and the people who live there. The term is normally used in reference to a specific place or region.

Outcome expectancy: the perception of whether personal action will effectively mitigate or reduce a problem or threat

Participation: the active and constructive engagement of people. It is a bottom-up process within which people enter (and often help create) spaces for interaction and influencing of decision-making mechanisms.

Preparedness: the process by which behaviours and resources (e.g. emergency plans) that facilitate coping with the hazard event are developed and maintained

Problem–focused coping: involves confronting the hazard problem and represents a mechanism for facilitating resilience

Recovery: the process of returning to "normality" *after* an emergency occurred. The post-disaster phase that is also used to increase safety and preparedness

Resilience: describes the capacity of systems to maintain their integrity and the relationships and balance between elements in the presence of significant disturbances by drawing upon internal resources and competencies to manage the demands, challenges and changes encountered

Risk perception: the level of perceived threat or risk posed by a hazard

Self-efficacy: people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives. It influences people's receptivity to information and the likelihood of their adopting risk reduction behaviours

Sustainability: means that decisions made by the present generation will not reduce the options of future generations, but will pass on to them a natural, economic and social environment that will provide a high quality of life

Vulnerability: refers to the inability of people, organizations, and societies to withstand adverse impacts from multiple stressors to which they are exposed. These impacts are due in part to characteristics inherent in social interactions, institutions, and systems of cultural values.