

A New Approach to Community Flood Education

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ABSTRACT: Using evidence-based research, a new approach to community flood education is promoted that is relevant to both floodplain management and emergency management. The approach positions education as one of the main ways to build resilience to flooding in communities. It is based around the 'flood cycle' and uses practical learning methods that all communities and agencies can implement. The paper will use a series of case studies and examples from Victoria to highlight the flood education approach.

Introduction

According to the Australian Government, there are three ways to mitigate the impacts of flooding (Department of Transport and Regional Services, 2002):

1. *Flood modification* 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* 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* 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). Community education is now being viewed as an important 'response modification mechanism' to prepare people for flooding and recovery in these situations. Moreover, some researchers in emergency and floodplain management believe that 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).

What is Community Flood Education?

Dufty (2008a) defines community flood education as 'any learning process or activity that builds community resilience to flooding'.

The term 'education' is used here in its broadest sense and includes learning both in formal (e.g. schools) and non-formal (e.g. community events) settings. Community flood education can include:

- Public communications, information products and services e.g. publications, Internet sites, displays, promotional products, media liaison, advertising/marketing, public education campaigns.
- Training, development and industry-specific programs e.g. skills development courses, professional training, workplace induction programs, field days.
- Community development programs e.g. public participation programs, awareness-raising programs, discussion groups, developing education networks.

- Comprehensive personal education programs e.g. school curriculum, university curriculum, personal development courses, action research programs, community education courses.

Based on the above scope, terms sometimes related to community flood education such as 'awareness', 'public information' and 'engagement' are here captured under the one term: 'education'.

The term 'community' is also used in the definition above in its broadest sense and includes all spheres of government, business and industry and the general public. The 'community' is sometimes divided into 'sectors' for education programs as they each may involve different learning mechanisms. These community sectors include:

- Residents
- Businesses and Industry
- Schools, Universities and other places of learning
- Land uses of interest e.g. caravan parks, retirement homes
- Government agencies e.g. SES and their volunteers
- Local councils
- Special interest groups e.g. indigenous groups, Non-English Speaking Background (NESB) groups.

Importance of Community Flood Education

Recent studies have been conducted to attempt to quantify the impacts of community flood education in minimising flood damages and assisting in emergency management. Manoloche (2007) cites US data that indicates that high quality delivery of education, planning and response has resulted in a 70 percent reduction in insured damages over a ten-year study of commercial premises.

Ronan (2009) estimated that, based on this US study, Victoria could achieve and sustain from the same means a reduction of about 25 percent in actual damages i.e. about one-third of the commercial result achieved in the USA. Ronan notes that this assumes a gradual increase in benefit over ten years as the warning and education programs are developed and rolled out across the State.

Also in Victoria, Somek (2010) estimated that a coordinated flood risk strategy (including community flood education plans) could potentially reduce future flood risk in 50 years under a business-as-usual approach from \$745.5 million to \$410.6 million, or approximately \$334.9 million. 'This represents a 45 per cent reduction in future flood risk, and a real decrease in current flood risk. In addition to this, the implementation of a coordinated flood risk strategy on a state-wide basis is estimated to have a benefit-cost ratio of 1.4.' Community flood education obtained the best benefit-cost ratio of all initiatives in the flood risk strategy including emergency planning and warning systems (Somek pers. comm.).

Gissing (2003) found similar potential benefits of education and planning related to businesses in Kempsey, NSW. He found that if comprehensive flood action plans had been developed before the flooding of Kempsey in 2001, damage could have been reduced by an estimated 80 percent. A study by Wright (2001) of businesses in suburban Adelaide found lower, but still significant, economic benefits from preparedness measures using education. The study found that nearly 60 percent of the total direct flood loss exposure could be reduced by preventative measures and a further 16 percent by improved preparedness measures using education.

Community education can also have a significant impact on the effectiveness of flood emergency management. Observations from NSW SES (David Webber pers. comm.) show that in NSW communities where there has been little or no community flood education there were low evacuation rates (in the order of 10-20 percent) during floods, whilst there have been much higher rates (e.g. 75 percent) in communities such as Maitland and Lismore

where there was ongoing community education. It should be acknowledged that these latter areas also experience a higher rate of flooding than many other in NSW.

Molino Stewart (2008) investigated the responses to Gippsland Floods of June 2007 and November 2007. As a result of community education initiatives conducted by VICSES after the June 2007 flood, almost all residents in the Tinamba and Newry communities had home emergency plans and this was seen to play an important part in preparedness and response during the November 2007 flood.

The importance of community flood education in flood mitigation is amplified with the future uncertainties of climate change. In relation to the impacts of climate change, Bergin (2008) stresses 'We will need to step up our efforts in warning and educating the public about extreme weather events and disasters'.

Building Resilience through Education

The importance of building community resilience to natural hazards has been strongly supported by politicians and experts alike. According to The Hon Robert McClelland MP (21 August 2008), 'a resilient community has the capacity to better withstand a disaster and its consequences'. 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.'

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 flood experiences and to improve its systems and capabilities for the next event. 'Systems' in this context not only refer to those in emergency management (e.g. warning systems, communication systems) but also social and economic systems (e.g. support systems, business continuity). 'Capabilities' of a community include its leadership, networks, skills, knowledge and ability to communicate.

Figure 1 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.

As shown in Figure 1, 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.

Several ways to build community resilience to flooding include:

- Community education and capacity building e.g. building community leadership, networks, resourcing, partnerships
- Warning systems
- Planning e.g. floodplain management, emergency response and recovery
- Emergency response systems and capabilities
- Structural works e.g. levees, detention basins.

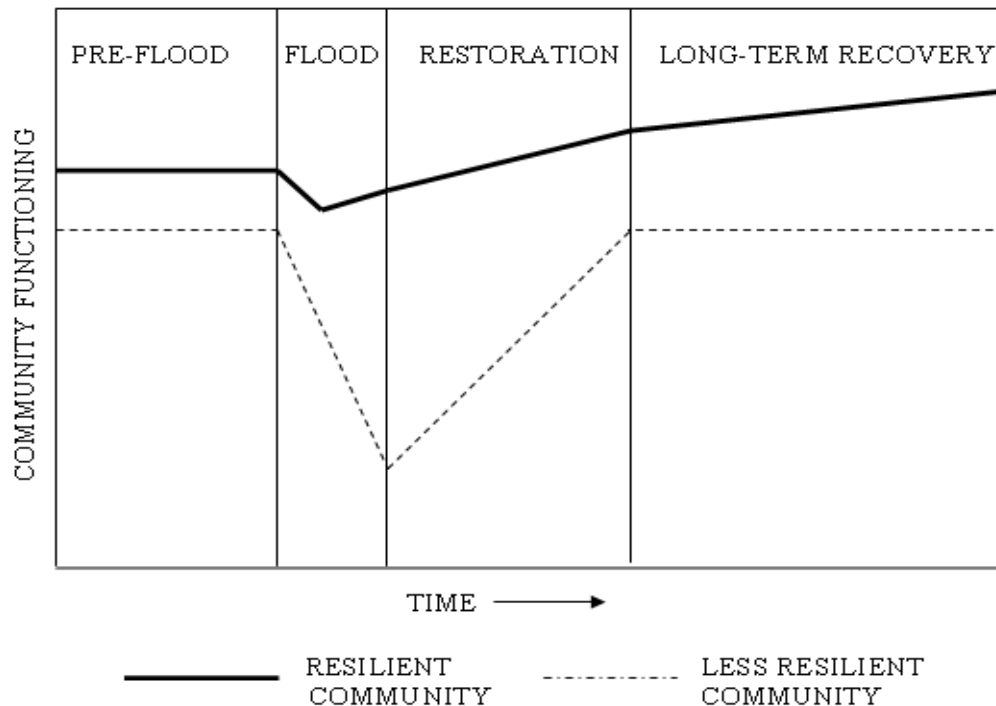


Figure 1 Differences between a resilient and a less-resilient community (modified from Mayunga, 2007)

Challenges for Community Flood Education

A challenge for any community hazard education is to be effective in assisting resilience-related learning 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 flooding which several communities view as being of comparatively low risk in their complex 'hazardscape' (Molino Stewart 2003, Molino Stewart 2005a, Molino Stewart 2005b).

Furthermore, the challenge for flood and other hazard education is arguably much more difficult than for many 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) that can easily become part of everyday lifestyle.

In addition, flood education has to encourage the initiation and maintenance of preparedness activities for which there can be numerous psychological barriers to uptake.

Several researchers have identified some of these barriers to the uptake of preparedness behaviours. For example, 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 – people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives. ('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 (Bennett and Murphy, 1997) ('No amount of preparedness will help')
- Normalisation bias – Viewing a hazard as a common event that will not vary in impact ('Kempsey 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')

A new approach

Using evidence-based research, a new approach to community flood education is promoted below that is viewed as potentially more appropriate and effective than most previous education programs. The new approach involves changes to the following aspects of community flood education:

1. The participation of the learners
2. Focus on building resilience
3. Links with the 'flood cycle'
4. Evaluation of flood education programs
5. Links with other flood mitigation and resilience-building plans and methods
6. Longevity of the flood education program.

1. The participation of the learners. Several studies in the past few years have found the traditional approach to community flood education of 'top-down' provision of information to be relatively ineffective. 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 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 receiving information and acting appropriately for hazards.

A more participatory approach to community flood and other hazard education is now being 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 (e.g. self-efficacy, action coping, community competence) that enhance community resilience to adversity.'

In a national review of natural hazard community education, awareness and engagement programs for the Australian Government, Elsworth et. al. (2009) promote active community participation as part of their model for effective programs. They stress programs 'would be greatly improved if they involved active community participation during their development and implementation. Levels of community participation of this kind that move towards wide consultation, collaborative development of activities and programs and democratic forms of policy-related decision-making require conscious design, considerable effort in implementation and on-going evaluation'.

In this more 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 capacity (e.g. networks, leadership, competencies) for preparedness, response and recovery.

Based on this preferred participatory approach, there are implications for the type of community education resources produced by emergency management agencies. The research favours those education resources that help people actively develop their own plans for flooding rather than ones that simply provide awareness information. These education resources should be tools for the engagement of people, families, businesses and communities in deciding on their own way to prepare for, respond to and recover from a flood.

Another approach to community education and behaviour change that is relatively recent is Community-based Social Marketing (CBSM). Developed by Canadian psychologist Dr Doug McKenzie-Mohr, CBSM is 'an attractive alternative to information intensive campaigns. In contrast to conventional approaches, community-based social marketing has been shown to be very effective at bringing about behaviour change. Its effectiveness is due to its pragmatic approach. This approach involves: identifying barriers to a sustainable behaviour, designing a strategy that utilises behaviour change tools, piloting the strategy with a small segment of a community, and finally, evaluating the impact of the program once it has been implemented across a community' (CBSM web page: www.cbsm.com). The approach has been largely untried with community flood education.

As noted above, community resilience not only includes preparedness but also systems and competencies required by people and communities to coordinate and utilise these behaviours. Capacity building (e.g. building leadership, networks, partnerships) and skill training (e.g. of staff, volunteers) are important mechanisms in developing these non-behavioural aspects of community resilience and each have their own set of leading practices.

2. Focus on building resilience. In the past, most flood education only focussed on raising awareness of flood risk and increasing preparedness.

There has been considerable research into the way individuals and communities prepare, respond and recover in relation to hazard events. Learnings from this research can help inform leading practice in community flood education.

For example, Paton (2006a) has found that community resilience-building involves:

1. Preparedness – the process by which behaviours and resources (e.g. emergency plans) that facilitate coping with the hazard event are developed and maintained
2. 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.

Paton et al. (2003) have shown that there is a complex psychological process for people to carry out preparedness actions.

Other researchers such as Ronan and Johnston (2005) stress the importance of the youth-school-family network in building community resilience to disasters. Ronan and Johnston base this view on research that shows that 'youth and families comprise risk groups for increased problems following a hazardous event'. They argue that, 'a focus on educating youth, the adults of tomorrow, has considerable promise. However, in terms of more current concerns, youth also link into the family setting who, in turn, link into multiple community settings and groups'. They add that 'hazards education in schools can play a vital role in increasing a community being ready, willing, and able to do what is necessary to prepare for and respond to a disaster'.

As a result of this research, Ronan and Johnston promote the development of home and school emergency plans based on the '4Rs' – risk reduction, readiness, response and recovery – and identify a range of education techniques to develop and maintain these plans.

3. Links with the 'flood cycle'. As for other floodplain management and emergency management activities, community flood education should link to the pre-flood/flood/post-flood cycle that governs the PPRR model.

Related to the 'flood cycle,' 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 2.

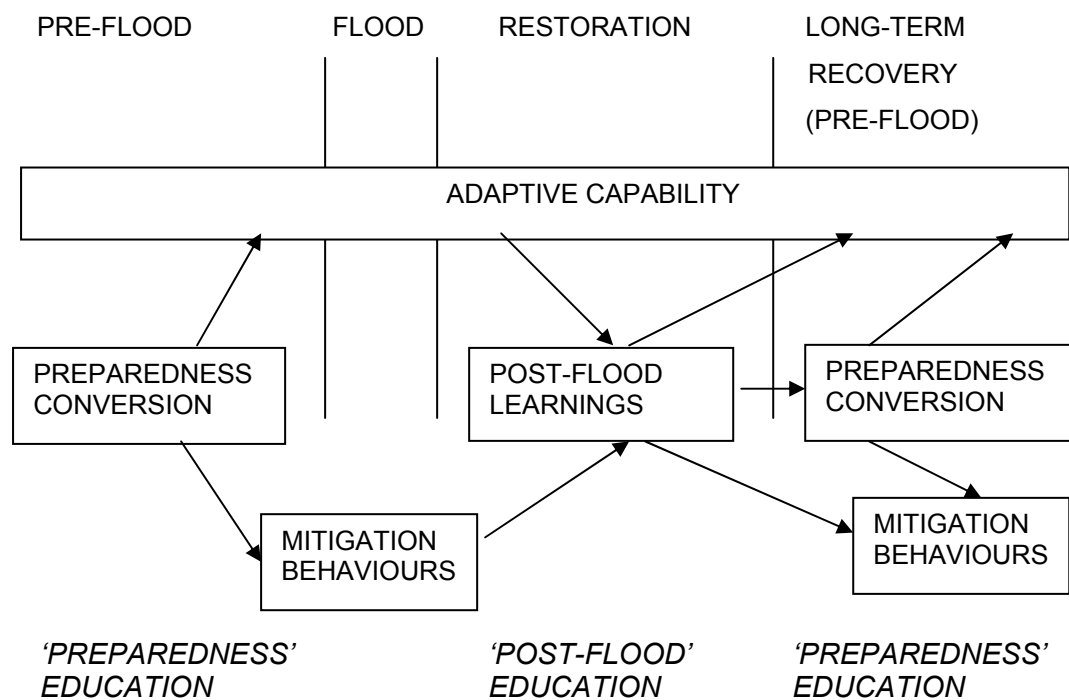


Figure 2: Four functions of flood education related to the flood cycle

As shown in Figure 2, 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.

4. Evaluation of flood education programs. Evaluation is a practical management tool for understanding and improving the performance of projects/programs, and demonstrating the impact of these projects/programs.

According to Stevens, Gilbert and Elsworth (2008), 'systematic monitoring and evaluation of community education, awareness and engagement programs for natural hazards is the exception rather than the rule. Some agencies have good systems for monitoring activities and the dissemination of information; however research into outcomes in terms of effectiveness of the information in changing attitudes, patterns of thinking, and behaviours is fairly scarce'.

There could be a variety of reasons for this relative lack of evaluation including time constraints, staff confidence in conducting evaluations and perceptions of the importance of evaluation e.g. the view that evaluation is an afterthought.

It should be noted that evaluation is a well-established field and there are numerous program evaluation frameworks that can be adapted for community flood education. A few attempts have been made to design evaluation frameworks for community flood education programs. Duffy (2008b) developed a framework for evaluating community flood education programs based on an evaluation technique known as the 'program logic model'.

Social research (e.g. surveys, focus groups) is an important tool in collecting community data (e.g. awareness, preparedness, response) that can inform an evaluation framework. Although relatively scant at this stage, there are some evaluations in flood and other hazard community education that can provide learnings to help identify leading education practice.

5. Links with other flood mitigation and emergency management plans and methods. Many flood education programs have been developed and implemented in isolation of floodplain and emergency management plans. Community flood education should be integrated with leading practices in floodplain management and emergency planning as it is part of building resilience through these processes. For example, community flood education plans should be part of local flood plans. An understanding of flood risk and community vulnerability in relation to this risk should be factors in the design of appropriate local flood education activities.

Gissing, Keys and Opper (2010) stress that 'community education is an essential part of any flood warning system as there is a positive linkage between community preparedness and warning systems. Well prepared communities respond better to emergency warnings and improve the effectiveness of these systems.' They add that 'community education is particularly vital in flash flood environments, where flooding may occur quickly without official warnings being received by affected communities, requiring community members to respond appropriately to environmental signals alone. Education is critical in ensuring that the community is able to recognise environmental signals and respond appropriately.

Some researchers (e.g. Finnis, 2004) support a cross-hazard approach to community education where appropriate. This would mean that flood education would be part of 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 single community preparedness groups for all hazards
- Building other community capacity (e.g. competencies, leadership) across hazards.

6. Longevity of the flood education program. Many flood education programs have been 'campaign-style' and of short duration. Research across community education has shown that unless learning is maintained, the learning outcomes (e.g. preparedness behaviours, risk awareness, attitudes to flooding) can be lost within 12 months. As a flood can occur at any time, a flood education campaign or short-lived program can be useless if a flood occurs at least 12 months after it is completed. Furthermore, newcomers who did not receive the

education campaign or short program miss out on the I and thus may be disadvantaged when a flood occurs. Long-term planning and implementation is therefore critical to useful community flood education programs.

A local flood education plan is a useful way to ensure the longevity of flood education activities in the local community. This is critical because of the uncertainty of when the next flood may occur.

The local flood education plan should be developed, implemented and evaluated by a local committee usually consisting of resident (urban and rural) and business representatives, local council and State government agency staff including SES.

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.

It cannot be assumed that the local committee has specific flood education expertise. SES and other agency education staff can provide expert education guidance for these committees as required.

Local flood education planning should be designed in consideration of the four roles of community flood education 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), particularly those that are most vulnerable to flooding.

Local flood education plans should strongly promote and support the development of home and business flood emergency plans. 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.

Where possible, local flood education plans should 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.

Local community flood education plans, should be integrated with other local floodplain management and emergency management plans. For example, a local flood education plan should be part of the local flood plan.

A reasonable lifespan for the local education plan is three years. At the end of the plan's life, a new plan should be designed using evaluations of the old plan and its activities.

According to Webber and Dufty (2008), 'early indications show the merits of communities having local flood education plans'. Although the impacts of these plans have not yet been fully evaluated, 'the main benefits of these local flood education plans at this stage appear to be:

- More community ownership in flood education processes
- Flood education activities planned for local needs
- 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
- Flood education to be linked in with other local floodplain and emergency management planning where possible
- Higher levels of preparedness and appropriate actions during flood events (from post-flood analysis and anecdotal evidence)'.

Conclusion

Community flood education is becoming an increasingly important flood mitigation and emergency management mechanism, particularly in the light of climate change predictions. It should be designed to help build community resilience to flooding through learning.

Some traditional community flood education programs have been found to be ineffective and inappropriate in building community resilience. Extensive research shows programs that have the following characteristics have greater promise of success:

1. Strong participation of the learners in the design, implementation and evaluation of community flood education programs
2. Focus on building community resilience including learning for preparedness, building capabilities and systems
3. Linkages of education activities with the 'flood cycle' and the PPRR model
4. Evaluation of flood education programs including related to learning outcomes
5. Linkages with other flood mitigation and resilience-building plans and methods such as flood plans
6. Uses a method such as a flood education plan to ensure longevity of education implementation in communities.

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