February, 2011

Implications of recent research in community flood education

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IMPLICATIONS OF RECENT RESEARCH IN COMMUNITY FLOOD EDUCATION

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ABSTRACT

Community flood education is a fast evolving field with recent research offering possible new directions for it that have implications for floodplain and emergency management.

This paper reviews the recent research in the light of a paper presented to the 2008 FMA Conference outlining a new approach to community flood education. The recent research supports several of the main components of the 'new approach' but also identifies additional components, issues and challenges for the effective delivery of community flood education.

INTRODUCTION

At the 2008 FMA Conference, Webber and Dufty (2008) promoted a new approach to community flood education that:

1. Defined community flood education as 'any learning process or activity that builds community resilience to flooding'.

2. Called for floodplain and emergency management authorities to involve communities more in the development, implementation and evaluation of community flood education programs.

3. Outlined a model of appropriate engagement and learning activities that increase flood preparedness levels, improve responses to flood warnings and encourage learning for improvement after a flood event.

4. Encouraged the development of ongoing local community flood education plans in key flood-affected communities.

Since this paper was delivered, there has been considerable research within the evolving field of natural hazard education. There has also been research in other aspects of floodplain and emergency management that has relevance to community flood education. Both sets of research can be used to test the Webber and Dufty approach and to further provide directions for community flood education.

There has been an upsurge in interest in natural hazards education since 2008. This is due to several triggers including:

- The position of the Australian Government that building community resilience is a key strategy in adapting to the impacts of climate change. 'Given the expected increased regularity and severity of natural disasters arising from extreme weather events, governments recognise that a national,

coordinated and cooperative effort is required to strengthen Australia's capacity to withstand and recover from emergencies and disasters. COAG therefore agreed to a new whole-of-nation, 'resilience' based approach to natural disaster policy and programs, which recognises that a disaster resilient community is one that works together to understand and manage the risks that it confronts' (COAG, 2009).

- The increasing acknowledgement by natural hazard-related managers that in many scenarios, education plays a critical, and in some cases, only method to mitigate the impacts of natural hazards.

- The perceived need by some emergency management authorities to review and enhance existing natural hazard education, awareness and engagement programs.

- Recommendation 2 of the 2009 Victorian Bushfires Royal Commission to 'revise the approach to community bushfire safety' in that State.

The following paper outlines findings of recent relevant research that can provide evidence-based directions for future community flood education strategies and programs. It also discusses some implications and challenges emanating from the research for floodplain management authorities, emergency managers and flood-affected communities.

RECENT RESEARCH

There are four categories of recent research covered in this paper.

1. Economic research
2. Social research
3. Education evaluation
4. Emergency management research and reviews.

Economic research

This type of research estimates the benefits and costs of a particular intervention such as 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 State flood risk strategy (including use of community flood education plans and programs) 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'. Community flood education obtained the best benefit-cost ratio of all initiatives, including emergency planning and warning systems, in the flood risk strategy analysis (Somek pers. comm.).

Prior to 2008, 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.

Social research

Social research uses a range of quantitative (e.g. surveys) and qualitative (e.g. focus groups) methods to, in this case, understand the flood awareness, preparedness levels, and flood response and recovery behaviours of communities.

Some social research is designed to gauge the impacts of a particular intervention e.g. use of a flood emergency number, flood warning information, new education program or event. It is reasonably easy to specifically gauge the immediate impacts of an education intervention (e.g. whether residents have received an education DVD, residents' recognition of the emergency number), more difficult to isolate medium-term impacts of an intervention (e.g. on the number of resident and business flood emergency plans, other flood preparations) and even more difficult to gauge longer term impacts related to a flood (e.g. on changes to evacuation rates during a flood), particularly if the flood occurs several years after the intervention.

Although there are the above and other limitations, social research can provide some evidence-based data that can be used to shape future flood education strategies and programs.

The NSW State Emergency Service (NSW SES) has carried out a social research program in a sample of NSW communities since 2005. Although each community had findings peculiar to their own flood histories, there was a general finding that those communities with low levels of community education and/or no recent flooding had low flood risk awareness and preparedness levels. There was also a poor recognition level (average 16%) across the communities sampled of 132 500 as the number to call for flood emergency assistance (GNS, 2005, 2006, 2007, 2008).

The Hunter-Central Rivers Catchment Management Authority has also commissioned social research (Micromex 2007, 2010) to examine trends in flood risk awareness, preparedness levels and potential response behaviours of Maitland residents. This research also examined the recognition and uptake of flood information and

education initiatives. It should be noted that Maitland has implemented an ongoing flood education strategy since 2007.

In the Maitland research, concern about flooding had dropped from 28% in 2007 (after the June/July flood) to 19% in 2010. The perception of the threat of flooding to low-lying communities had also dropped marginally from 92% in 2007 to 87% in 2010.

Eighty six percent of Maitland residents thought that they knew enough about the risk of flooding in their local area, which has increased significantly from previous years (2007 = 78%, 2005 = 69%). Eighty four percent of residents thought that they knew enough about what to do in the event of flooding in the area, which has increased significantly from 2005 (71%). Nineteen percent of residents had undertaken measures in the case of a flood emergency, which is statistically similar to 2007 (21%). Knowledge of evacuation procedures is moderate to high, with 69% of respondents stating in 2010 that they were thought they knew enough about the evacuation procedures in the event of a flood in their area. These results can at least partly be attributable to ongoing education in the area.

However, in the 2010 survey, only eight percent of Maitland residents knew the 132 500 number to call for emergency assistance in floods (a level similar to previous years). Over half did not know the number and 33% said they would call Triple 0. There were also a number of specific learning needs identified by the respondents.

Social research after a flood can give an indication of improvements to resilience including through education. For example, 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.

Emergency agencies through their own observations can also provide an insight into the impact of education programs on community preparedness responses. For example, 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 others in NSW.

Education evaluation

Since 2008, several evaluations have been conducted to examine natural hazard education programs with a view to improving future programs. The most significant of these evaluations was a ‘National Review of Community Education, Awareness and Engagement (EAE) Programs for Natural Hazards’ conducted by RMIT University for the Australian Emergency Management Committee (Elsworth et. al., 2009). The RMIT study reviewed ‘close to 300 separate programs and activities for natural

hazard community education, awareness and engagement. Evaluation studies of 14 of these initiatives were located and reviewed in detail'.

The Review found that 'the diverse EAE initiatives presently developed or planned have considerable potential to achieve appropriate desired outcomes at the individual (resident, household, family) level and, more broadly, for localities, communities and agencies'. The Review identified and recommended several improvements to EAE including:

- 'Localising' programs and activities where possible.
- Improving program design using a theory-model approach.
- Developing programs that focus on achieving different processes along the pathway from 'risk awareness' to 'preparedness' that are integrated in a general plan for enhancing natural hazard preparedness in a locality or region.
- Linking with other natural hazard management plans, research etc. and using a multi-hazard approach where possible.
- Conducting and reporting frequent evaluations of programs to continually enhance the evidence-base for what works in particular contexts.
- 'Seeking to optimise the balance between "central" policy positions, agency operational requirements, and specialist expertise on the one hand and community participation in planning, decision-making, preparation and response activities on the other'.

Floodplain and emergency management research

Research in floodplain management and emergency management can have implications that involve community flood education. For example, Haynes et. al (2009) reports on a collaborative literature survey of research concerning conditions under which a shelter-in-place strategy may be feasible. By reviewing fatalities related to flash flooding and current research on sheltering-in-place versus evacuation, the study found that 'neither strategy is without risk and more research is needed to guide decision-making by emergency managers. In the end, emergency managers and the people directly at risk need to be able to assess the relative risks of alternative strategies'.

The study also concluded that 'key groups who should be targeted through dedicated community education programs include males under the age of 29 years, the elderly and the very young, with the primary message of don't drive, walk or ride through floodwater'. However, the study did note that 'educational warnings frequently fail and providing young people with the knowledge that experts think they need in order to reduce risks is no guarantee that they will act in the ways that emergency managers want them to. This fact significantly complicates the task of emergency risk management and must be a central consideration when developing policy related to shelter-in-place'.

IMPLICATIONS

Much of the above and other recent research generally supports the 'new approach' to community flood education promoted by Webber and Dufty (2008). In particular, there is strong endorsement for a more inclusive approach that allows community participation in local community flood education plans. In the fact, the RMIT study (Elsworth et.al., 2009) argues that from the National EAE Review 'community participation is both the most important and most general of the recommended principles. Community participation in natural hazard safety might be viewed in at least three ways:

- Active participation by community members in the design and implementation of agency and government programs
- Programs that, themselves, entail the active involvement and participation of community members
- Community members actively participating in planning and preparation to enhance their own (and family and neighbours) safety'.

The idea promoted by Webber and Dufty of developing local community flood education plans is intuitively sound – a flood can happen at any time and thus learning must continually be provided and reinforced instead of offered in a 'one-off campaign'. Recent evidence shows that ongoing education programs such as that in Maitland can raise and maintain flood awareness and preparedness levels, although these can also be improved significantly after a flood. There also are education benefits in response behaviours including in increasing evacuation rates. Further education work needs to be done in continually reinforcing learning around the 132 500 number and improving levels of flood risk awareness especially during drought years and in areas such as Maitland where new residents are moving in.

There needs to be further acknowledgement of the opportunity of education to build both agency and general community flood resilience. Webber and Dufty link community flood education to resilience based on research such as that conducted by Paton et. al. (2003) and Ronan and Johnston (2005) which shows that learning should not only be related to raising flood awareness and preparedness levels but also to appropriate response, recovery and post-flood improvement. Not only is behaviour change required to achieve this but also learning related to improving flood-related competencies (e.g. agency, volunteers, broader community) and systems (e.g. forecasting, warning, incident control systems). A challenge for agencies and flood-affected communities is to scope learning for resilience (i.e. what is involved to build resilience? where is learning applicable?) and respective responsibilities (i.e. who does what?) for providing the education.

There are several other issues and challenges for community flood education shown by the recent research that builds on the Webber and Dufty approach.

There is a need to improve the evaluation of community education programs and plans to provide an evidence-based understanding of their impact and provide guidance for continual improvement. In a preliminary scoping study for the EAE National Review, Stevens, Gilbert and Elsworth (2008) concluded that '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'. One of the recommendations of the 2009 Victorian Bushfires Royal Commission was to 'regularly evaluate the effectiveness of community flood education programs and amend them when necessary'.

There are several models to provide a framework for the evaluation of natural hazards education programs. For example, the Bushfire CRC (2009) through RMIT University has researched and developed a program logic evaluation framework for bushfire education programs that can be easily transferred to flood education. The framework encourages the assessment of program inputs, outputs and outcomes (short-term, medium-term, long-term).

The recent research also demonstrates the importance of flood education as a flood mitigation method. As shown in the research, education can have considerable benefit-cost advantages and significantly reduce the cost of damages across communities.

Although it appears to have significant value on its own, this is compounded when integrated with warning systems, planning and other mitigation methods. In relation to warning systems, Gissing, Keys and Opper (2010) note 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.'

Thus, there is a need for better integration of education into floodplain management and emergency management plans and processes. Multi-hazard education opportunities should also be identified and taken up where possible.

Education related to the draft national position paper on flash flooding that emanates from the research cited above (Haynes et.al., 2009) requires careful consideration and clarity. Gissing, Keys and Opper (2010) stress 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'. Although evacuation is preferred in the draft position paper over shelter-in-place, it is critical to educate the community about when it is safe to evacuate so that they do not walk, ride or driver through floodwaters. Other education is required to support the position paper including related to the need to structurally assess buildings if 'entrapment' becomes the only option. The transference of the national position paper into behaviours required in each local flash flooding setting offers another education challenge

CONCLUSION AND TAKE HOME MESSAGES

Recent research shows that:

- Education, especially when coupled with other flood mitigation methods, can have considerable impact in minimising flood damages.
- There should be optimisation between central, expert advice and community participation for the design, implementation and evaluation of flood education programs.
- Flood education should be delivered on an ongoing basis, ideally through local community flood education plans or similar.

Recent research also identifies the following future challenges:

- Targeting specific community learning needs in flood education programs e.g. recognition of the 132 500 number, improving flood risk awareness in transient populations.
- Using learning particularly related to improving appropriate behaviours, competencies and systems to further build resilience in communities and agencies.
- Improving the evaluation of flood education plans and programs to provide evidence-based understanding of their impact and provide guidance for continual improvement.
- Better integrating education into floodplain management and emergency management plans and processes.
- Reviewing the national position on flash flooding to develop appropriate flood education messages and learning programs.

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