

ANALYSING THE SOCIAL IMPACTS OF FLOOD RISK MANAGEMENT OPTIONS

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Abstract

As part of the preparation of a floodplain management study, 'Managing the Floodplain: A Guide to Best Practice in Flood Risk Management in Australia' (Australian Institute for Disaster Resilience 2017, page 77) states that management options "should be tested against the current management practice and existing community exposure, which requires an understanding of the social, economic and environmental benefits and costs of options..."

However, the Guide only provides four examples of the social impacts of flood risk management options that could be analysed (page 62). A basic understanding of the disaster social sciences, including psychology and sociology research, shows that there are many more social benefits and costs that should be assessed in a floodplain management study.

The research shows that there can be different social impacts for each of the flood modification, property modification and response modification options, and that there are varying costs and benefits for each before, during and after a flood. For example, prior to a flood the construction of a levee may transfer residual risk elsewhere in the community, may cause the 'levee paradox' to occur, affect visual amenity, affect social vulnerabilities and dislocate social capital.

This paper identifies potential data sources that can be used to gain a better understanding for this social analysis. These sources include demographic data, insights from community engagement and high level social network analysis.

The paper concludes with a matrix that provides floodplain managers with a checklist of social aspects to consider in the assessment of flood risk management options.

Introduction

Disaster research shows that the idiom 'it was a disaster waiting to happen' rings true. For many years, it has been accepted that disasters are caused by underlying societal issues such as vulnerabilities and inequalities, and not by an 'Act of God' hazard. As Tierney (2014) states, "the origins of disaster lie not in nature, and not in technology, but rather in the ordinary everyday workings of society itself".

After the destructive 1755 Lisbon earthquakes, in a letter young French philosopher Jean-Jacques Rousseau challenged the great French philosopher Voltaire's view that the event was seen as how God showed His power, glory and might. Rousseau noted that nature did not construct thousands of buildings and houses of six to seven stories that collapsed in the earthquakes. Some academics claim that Rousseau's letter to

Voltaire symbolised the beginning of the shift in thinking leading to the socially-constructed interpretation of disaster events.

In 1976, O’Keefe, Westgate and Wisner used empirical global economic loss data to show that social-economic and not natural factors should be responsible for both the loss of many lives and the loss/damages of the assets in the developing world. Since then, numerous researchers have demonstrated this interpretation. The United Nations International Strategy for Disaster Reduction (2018) has adopted the critical approach to disasters by suggesting that “there is no such thing as a ‘natural’ disaster, only natural hazards”.

Given that disasters are socially constructed, it would be reasonable to assume that social issues should be a major consideration in disaster risk management.

‘Managing the floodplain: a guide to best practice in flood risk management in Australia’ (the Guide) (Australian Institute for Disaster Resilience, 2017) provides a framework to understand and manage flood risk and its consequences to the Australian communities.

As part of the preparation of a floodplain management study, the Guide (page 77) states that management options “should be tested against the current management practice and existing community exposure, which requires an understanding of the social, economic and environmental benefits and costs of options...”

However, the Guide only provides four examples of the social impacts of flood risk management options that could be analysed (page 62). An understanding of the disaster social sciences, including psychological and sociological research, shows that there are many more social benefits and costs that should be assessed in a floodplain management study.

This paper describes a process for floodplain managers to assess the social impacts of flood risk management options from the findings of the psychological and sociological research.

Understanding the community

Before conducting a social assessment as part of a floodplain management study, floodplain managers should build a community profile to understand the demographics and social dynamics of the at-risk community in the study area.

A community profile for a floodplain management study can be developed efficiently using four techniques:

1. Population surveys
2. Questionnaires
3. Social network analysis
4. Local knowledge

Population surveys Australian census data provides an insight into flood-prone communities. Census indicators that can help in a social assessment of flood risk management options include:

- Population. The size and density of the at-risk population is an indicator of flood exposure and will influence the type of flood risk management options. For

example, the population size will determine if a total flood warning system is warranted and, if so, what will be its configuration.

- Gender. Females are generally more impacted by disasters and are responsible for caring for children, the elderly and the disabled. The percentage of females is thus a factor in social vulnerability.
- Age. People over 65 years of age may require assistance from other people at the time of evacuation or disaster. Children will require assistance from other people at the time of evacuation or disaster and in post-disaster recovery. Flood risk management options should consider these vulnerable age cohorts.
- Income. Flood risk management options (e.g. house-raising) may require personal funding and thus income impacts should be assessed.
- Number and proportion of the population with a disability. People with disabilities are one of the most vulnerable groups, and they and their families should be actively involved in disaster prevention efforts, especially in developing evacuation procedures to guarantee their survival.
- Education. Education levels can provide an insight into literacy levels. Literacy plays a role in understanding the importance of disaster preparedness and mitigation. During a disaster, literate people are also more likely to be proactive, and follow rules and evacuation procedures.
- Country of origin. A diverse population of newly-arrived migrants may not have developed social capital (networks, bonds and trust) with communities and thus may be vulnerable in flood emergency response and recovery.
- Language. Particularly in diverse ethnic communities, there may be several first languages spoken. This may influence flood risk management options such as community flood education and flood warning systems.
- Type of residence. Australian census data provides a breakdown of property types. Those experiencing above-floor flooding in 'bungalows' will particularly require attention from flood risk management options.
- Number of persons per dwelling. This will have an impact on emergency management planning and flood warning systems particularly in relation to evacuation planning and response.
- Transience. The transience of people is another important demographic indicator. If people live in an area for only a short period of time they may not be exposed to local community flood mitigation activities and have no experience of local hazard events. Indicators such as 'length of time at residence' and 'home renter' provide an idea of the transience of a population.
- Volunteering. Volunteering is a form of linking social capital which has been shown to have value in building social resilience. The strength of social capital can be influenced by flood risk management options.
- Communications. The availability of communication infrastructure can influence some flood risk management options such as community flood education and flood warning systems used for an at-risk community. The Australian census measures the number of properties with internet connections.

It may be difficult to attune census data to a specific at-risk community. In rural towns and villages the best that can be done is coverage across the smallest areas available in the census. However, many Australian regional centres and cities are covered by the Social Atlas which provides online census data for small areas of the centre or city that can approximate the area of the at-risk community. For example, Figure 1 shows census data sections of Geelong which includes flood-prone areas adjacent to the Barwon River.

Coupling this mapping with flood risk maps can be a powerful tool in the social assessment of flood mitigation options and the identification of flood risk 'hot spots' where the flood hazard data (e.g. depth, velocity of above-floor flooding) intersects with

exposure (e.g. population density, number of persons per dwelling) and vulnerability (older people, young people, people disabilities, newly arrived migrants).

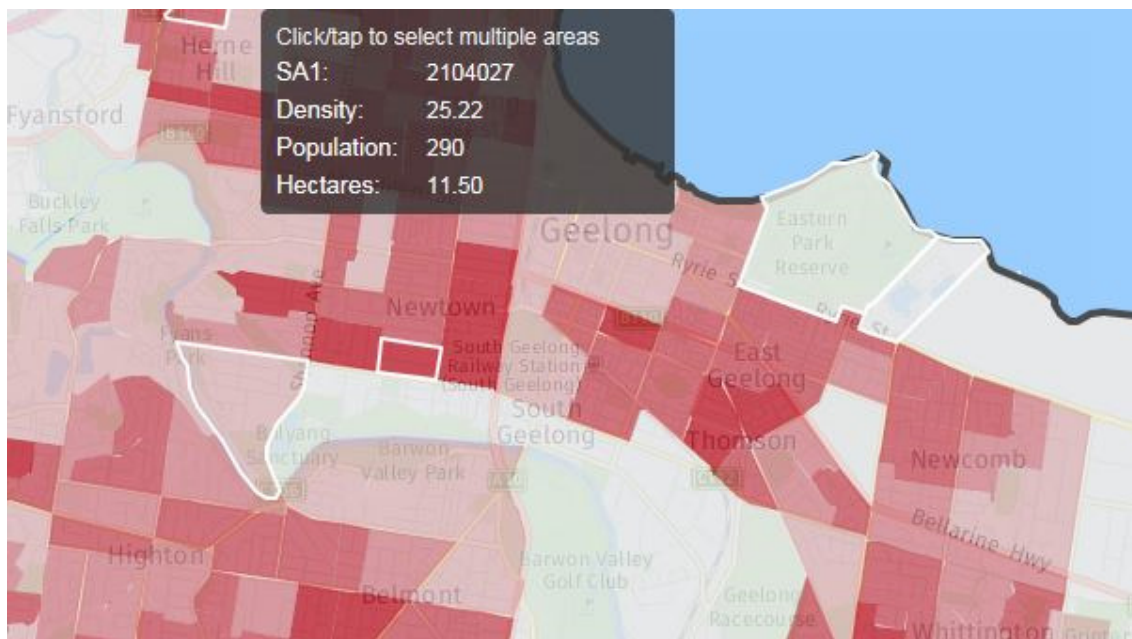


Figure 1: Social Atlas census mapping for Geelong

Questionnaires A community profile can be further developed through other (non-census) methods of social research. There are two categories of social research methods:

1. Quantitative. These methods approach social phenomena through quantifiable evidence, and often rely on statistical analysis e.g. surveys, questionnaires, social network analysis (described below)
2. Qualitative. These methods emphasise understanding of social phenomena through direct observation, communication with participants, or analysis of texts, and may stress contextual subjective accuracy over generality e.g. focus groups, interviews, case studies.

Many local councils around Australia conduct regular community surveys which are published on their websites. These may provide further insight into the social makeup and dynamics of the at-risk community.

Questionnaires are simple types of surveys that are cheap, do not require as much effort from the questioner as verbal or telephone surveys, and often have standardised answers that make it simple to compile data. According to Bird (2009), “within natural hazards research, the questionnaire is a popular and fundamental tool for acquiring information on knowledge and perception”.

Questionnaires are commonly used in the Australian flood risk management process for a range of purposes including developing a specific understanding of the population in the study area, their flood experiences, perception of risk and willingness to respond to warnings (e.g. to evacuate). Questionnaires can also be used to gauge preferences for flood risk management options. This is usually done using a standard Likert scale for the options with associated open questions relating to reasons for the preferences.

Social network analysis Disaster research fully acknowledges that communities regularly work together to survive and recover from catastrophic impacts. Social

network analysis has been used since the mid-1930s to advance research in the social and behavioural sciences.

Social capital is created through the presence of social networks, as well as the trust and norms inherent within them that create a sense of goodwill and facilitate cooperation. Social capital has been found to be critical in the response, recovery and resilience of disaster-impacted communities around the world (Aldrich, 2012). Social network analysis, can provide some insights into the sub-types of social capital (McCann et al, 2016).

Flood risk management options can enhance, disrupt or dislocate social networks. For example, community flood education and engagement can enhance social networks in at-risk communities by bringing people together for a common cause i.e. to help each other in flood preparedness, response and recovery. On the other hand, social networks could be disrupted by moving people via planning instruments and voluntary house acquisitions.

Rudimentary social network analyses can be conducted as part of the flood risk management process, preferably with the participation of the local community. Interviews or focus groups with local people can identify relationships between individuals, households or organisations within the community as well as with external connections. Using that data, a simple sociogram or social network map can be conducted for the at-risk community (see Figure 2). The sociogram can then be used to help understand the impacts of flood management options on social capital.

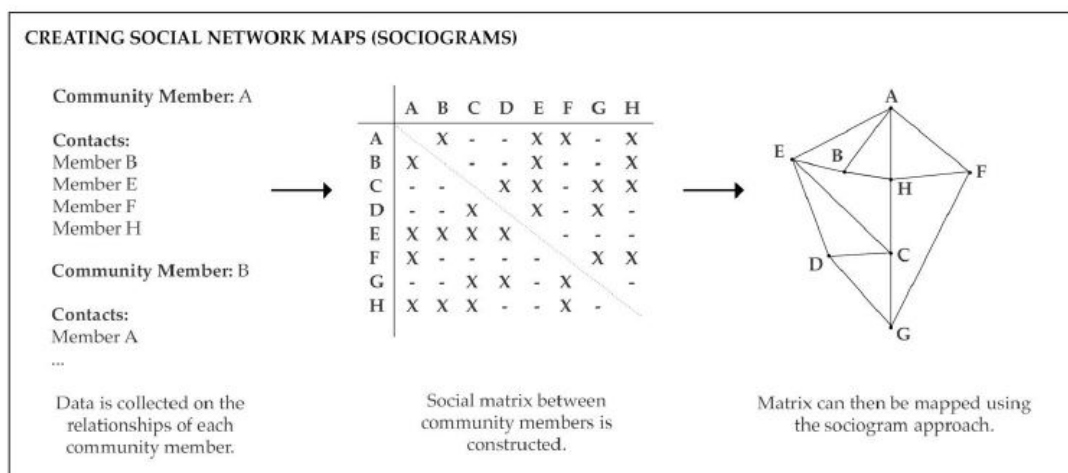


Figure 2: How to construct a social network map (source: Wilkin et al, 2019)

Local knowledge It is common practice for the floodplain management study process to draw upon the local knowledge of the at-risk population. Local knowledge is tapped into primarily through community engagement conducted in the development of the floodplain management study. Local flood committees that provide advice are a formal way of accessing local knowledge.

Local knowledge can provide an insight into previous floods, the value of existing flood risk management measures and future development.

Although local knowledge can provide important input to the tailoring of flood risk management options to at-risk communities, it can be limited by the so-called 'prison of experience' (Kates, 1962) where people expect the future to be like the past.

Cost-benefit analysis

It is common practice in the development of a floodplain management study to conduct a cost-benefit analysis to help weigh up the respective value of flood risk management options identified for a study area.

Cost-benefit analysis (CBA) is an economic technique used to organise, appraise and present the costs and benefits, and inherent tradeoffs of public investment projects and policies taken by governments and public authorities in order to increase public welfare (Mechler, 2008).

The CBA for flood risk management usually values benefits as the reduction of expected annual damages. The costs relate to investment capital costs (initial construction cost plus ongoing maintenance cost over the life of the project).

The difficulty with this practice is that it normally disregards the social attributes of a community in which risk is constructed. For example, it does not “relate potential flood losses to the level of household income or wealth, which are important determinants of social vulnerability and relevant for discussions on equity” (Kind et al, 2017).

“CBAs for disaster risk reduction tend not to quantify social and environmental impacts, while some of these benefits are qualitative and therefore are not quantifiable with CBA — or even comparable in terms of costs and benefits” (Shreve and Kelman, 2014).

Qualitative assessment

Due to the CBA limitations, the social analysis of flood risk management options should be conducted in a qualitative manner using the community profile as a basis for understanding and decision-making.

Qualitative assessment of flood mitigation options is common in the disaster literature. Flood defences have generally been shown to have great social value particularly in reducing exposure. Globally, Lim et al (2018) found that in the historical period (1986–2005), flood defences reduced the population exposure by 9% per year. “In general, the population benefits increase steeply for flood defence level ranges from the return period of 5 to 20 years, with the benefits then tailing off for the return periods of 20 to 500 years”.

However, levees (and other flood defences such as detention basins) have been heavily scrutinised, not only in regards to their propensity to be overtopped or fail in a flood, but to increase flood risk. The levee ‘effect’ or ‘paradox’ shows that increasing levels of flood protection can also be associated with unexpected increases in flood exposure and vulnerability.

More intense urbanisation of flood-prone areas behind the levee means more people and assets will eventually be exposed to less frequent, but potentially catastrophic flooding (Merz et al., 2015). Increasing the levels of flood protection can also generate a sense of complacency among the protected people, which can reduce preparedness, thereby increasing vulnerability (Tobin, 1995).

The Guide only provides four examples of the social impacts of flood risk management options that could be analysed using a floodplain management option assessment matrix (page 62). These examples are:

- Increase community growth
- Disruption/ relocation due to measure
- Improve property values
- Minimise social disruption during flooding

As shown in the community profile discussion above and in the disaster literature, there are several other issues that should be qualitatively assessed in terms of the benefits and costs of the options. Most of these issues are derived from the societal components of risk: exposure and vulnerability. These issues are listed in Table 1 and related to the main flood risk management from Page 46 of the Guide. This table can then be included in the floodplain management option assessment matrix on page 62 of the Guide.

Table 1 is only a general guide that covers some of the main social issues. Through the community profiling other issues may arise that can be assessed related to a particular community.

Conclusion

The social analysis of the flood risk management options is an important activity as disaster research shows that floods are socially-constructed. These options can provide great benefits to communities by the reducing residual risk that communities and emergencies have to deal with. On the other hand, the options can have social costs that dislocate social fabric and increase financial burdens to residents and businesses.

An insight into the social assessment can be gleaned through a community profiling process to better understand the society within the floodplain management study area. Although the CBA is a useful tool to quantitatively assess structural flood mitigation options, it is limited in its ability to accommodate social issues. Thus, a qualitative social assessment of the options is recommended that draws on the insight provided by the community profile.

Table 1: Matrix relating flood risk management options to social issues

Option	Exposure	Vulnerability	Equity	Visual amenity	Social capital	Property values	Insurance premiums	Community development
Zoning/development control	✓	✓	✓		✓	✓	✓	✓
Voluntary purchase	✓	✓	✓	✓	✓			✓
Voluntary house raising	✓		✓	✓		✓	✓	
Flood proofing of buildings				✓		✓	✓	
Community flood education		✓			✓			✓
Flood warning		✓			✓			✓
Emergency planning		✓			✓			✓
Levees	✓	✓	✓	✓	✓	✓	✓	
Detention basins	✓	✓	✓	✓		✓	✓	
Flood mitigation dams	✓	✓		✓		✓	✓	✓
Channel improvements			✓	✓				

✓ = assessment required

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