

# **Sustainable Floodplain-Management Plans**

Terry Lustig and Michelle Maher,

Environmental Management Pty. Ltd., 15 Cottenham Ave., Kensington, Australia, 2033.  
email: [terry@environmentalmangement.com.au](mailto:terry@environmentalmangement.com.au)

## ***Introduction***

Floodplain-management plans have frequently not been successful. A large part of the problem stems from the tendency for a community's preparedness for the next flood to decline over time after the previous event; the tendency for newcomers to deny the problem; and the likelihood that the effectiveness of the floodplain-management system will deteriorate quite rapidly because of the rapid turnover of key staff in the various agencies making up the floodplain-management system.

There are powerful psychological barriers which make it difficult to enforce proper maintenance of floodplain-management systems. These stem from the fact that we need to feel in control of our lives, whereas warnings will often be taken as threats to our sense of control.

For a floodplain-management system to be sustainable therefore, it should be designed not only to convey the message to the members of the flood-prone community that they are in control, but also so that the system is actually under their control.

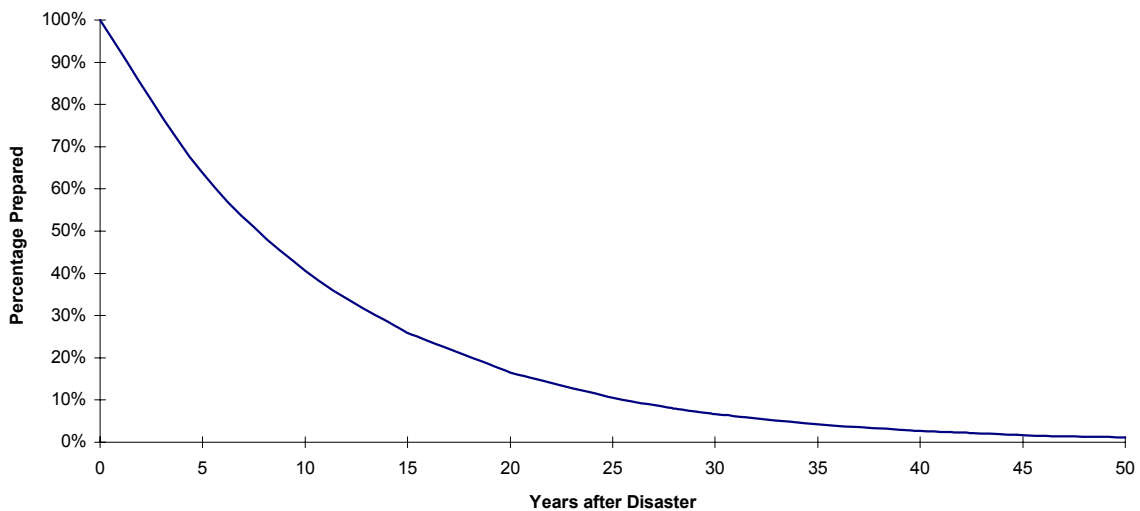
## ***The Problem Of Declining Communal Preparedness***

The overall capability of flood-prone communities to cope with a flood will be apt to decrease with the time since the previous event. While people who have once experienced a flood are usually better prepared for the next one (Lustig and Haeusler, 1989), those who replace them as they die or move out, will not have the experience. They will tend to discount people's accounts of the severity of former events and not fully appreciate how bad it can be (Schiff, 1977), and so will normally be unprepared for the next flood event. Consequently, the preparedness of a community will tend to decrease over time as illustrated in Figure 1.

This figure is typical of Australian communities where a household changes residence every 8 years or so, on average. (See for example, SKM (1995) or Lustig (1994).)

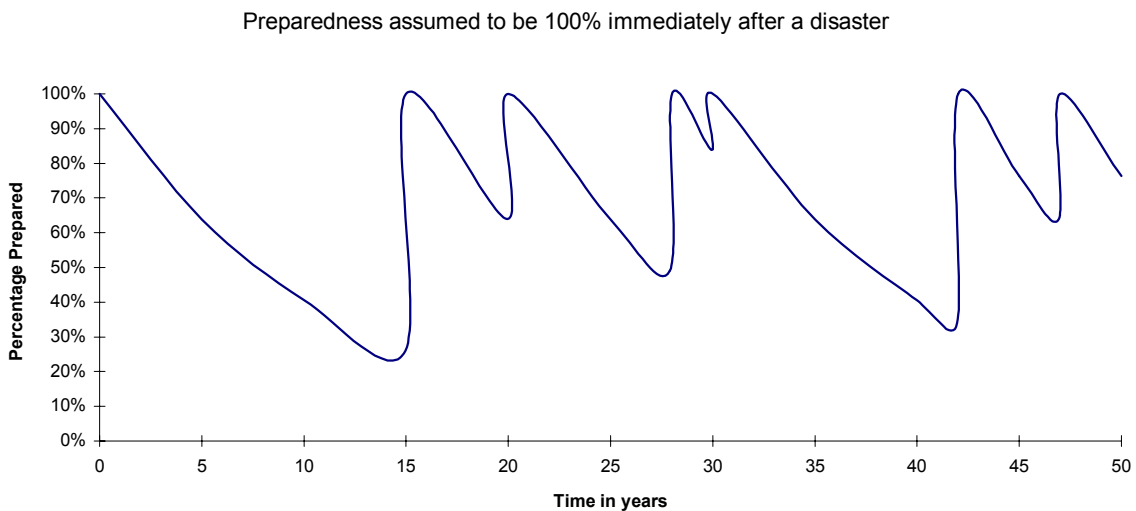
As it is, this curve is conservative, as it assumes that people who are flooded will prepare for the next one. As will be explained below, people may deliberately refrain from doing so.

*Figure 1. Typical decline in preparedness of a community since the last event*



It also follows that if there are frequent floods, the preparedness of the community will remain high (Figure 2).

*Figure 2 Community maintains preparedness in the face of regular disasters.*



### **The Problem of Declining Organisational Coordination**

Floodplain-management systems are invariably made up of a number of government and non-government organizations. All too often, they find it difficult to coordinate their activities so that they function smoothly, both when there is an emergency and over the rest of the floodplain-management cycle.

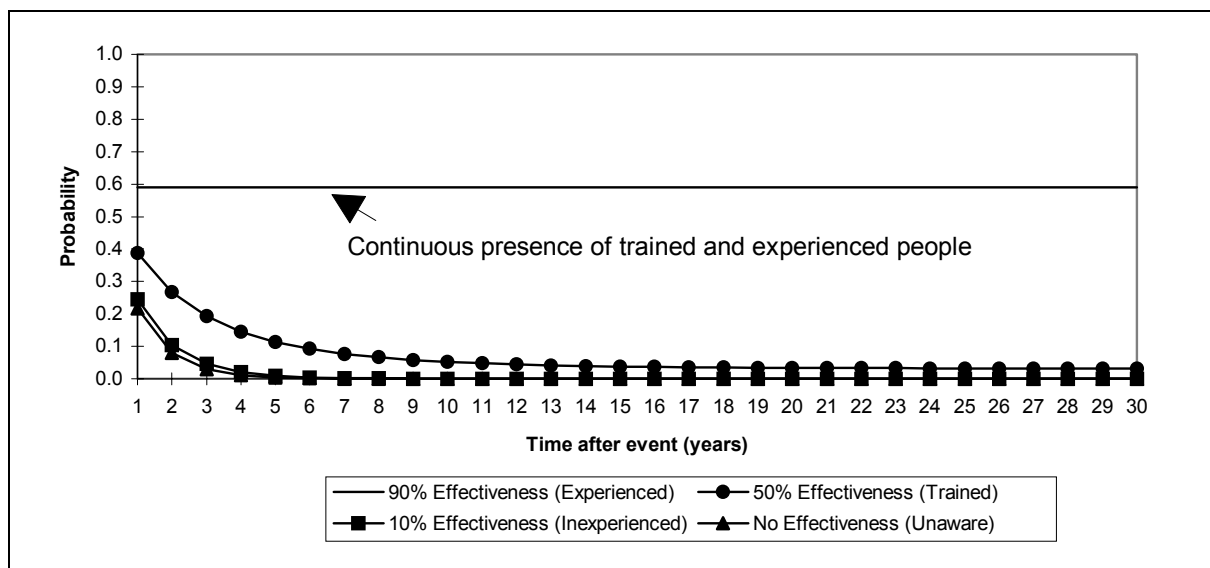
Part of the problem is that these organizations may be busy with other priorities during times when there is no emergency, and may not pay enough attention to preparing for the next event.

As well, the people within an organization change positions or leave, so that gradually those with experience of the last disastrous event are no longer available to pass on their knowledge. The longer the period since the last event, the less will be the appreciation by the emergency workers of the pitfalls in carrying out their duties and liaising with other organizations.

Unless there is very thorough training, the inexperienced replacements are unlikely to appreciate fully how they should work in with others of the floodplain-management system. As a result, two inexperienced members of two cooperating organisations may have different understandings of who should do what, so that some tasks may be left undone before, during and after the next flood.

Figure 3 indicates that with an average 5-year turnover of staff and perhaps five organisations in a flood-warning system, the chances of it working without too many mistakes could become very small within a few years (SKM, 1995). The assumptions made in deriving this figure were that an experienced member of staff would have a 90% chance of not making a serious error, and inexperienced member of staff would have only a 10% chance, while a trained but inexperienced person would have a 50% chance.

**Figure 3. Decrease of organisational readiness with 5 organisations comprising a floodplain-management system**



There is an inherent difficulty of coordination between government agencies even at the best of times. By their very nature, bureaucracies have to take care not to offend their counterparts. Yet quite clearly, coordination during an emergency is highly likely to encounter situations when there is little time for delicacy and subtlety.

We should bear in mind too, that the tendency to assign responsibility for an accident increases as the consequences become more serious (Walster, 1966). This tendency could make it harder to discern the true nature of the problem in a briefing session of coordinating agencies after a flood.

Even during quieter periods of the floodplain-management cycle, we can find all too many examples of declining coordination.

For example, a flood-mitigation engineer may carefully design a retarding basin to reduce the flooding downstream, then a road engineer may carefully build a road above the flood level, restricting the flow of water into the retarding basin.

Again, a road engineer may design a culvert to pass a certain flow of water, and then a water-supply engineer lays a pipe across the entrance to the culvert. During the next flood, the pipe collects debris, reducing the capacity of the culvert.

We would suggest that while strong efforts should be made to improve communication and coordination, we would do well to recognise, in designing a sustainable floodplain-management system, that firstly it is in the nature of flood management for coordination to break down; and secondly that interagency rivalry is generally endemic throughout the world.

## ***The problem of successful flood mitigation***

It is this reduction in preparedness of both communities and organisations which presents a continual problem in flood mitigation. The more successful we are in mitigating floods, the less experience people will gain, and the less prepared the community and responsible floodplain-management agencies will be.

In addition, as the community becomes less prepared for a flood, an increasing proportion of households will be unaware of the dangers of settling in hazardous areas. Consequently, some will do so, so that more and more of the community will become more prone to floods as well as less prepared for them. May (1997) has noted that in the 1970s, annual population growth in floodplains was double that of the rest of the USA. The deliberate development by government of the north-west sector of Sydney, in arguably Australia's most hazardous floodplain, is a local example.

It is also possible that a decrease in flood events will lead to increased household confidence, with the result that more may be spent on properties in the flood-prone area. The result is that the next event will bring about greater damage because there are now more people and more expensive property.

Also, the less prepared the community, the less political pressure there will be to direct resources towards floodplain management. This includes not only resources directed to emergency services, but also to those authorities concerned with forecasting, flood mitigation, catchment management, landuse planning and environmental conservation.

Powerful psychological barriers which affect preparedness, and therefore make it difficult to enforce proper maintenance of floodplain-management systems, will now be discussed. An understanding of these barriers is crucial for determining the most appropriate institutional arrangements for ensuring a sustainable floodplain-management plan.

## ***The Problem of Denial***

People tend to discredit and devalue the advice of authorities and others who have experience with floods in their area. Why do they do this?

A start to understanding why can be made by considering the distinction between voluntary and involuntary activities (Table 1). A voluntary activity is one which we freely choose to do, and an involuntary activity is one which to a great extent we are made to do. We can readily see that the voluntary activities in the Table are more risky than the involuntary ones. Yet most people would rather be involved in the voluntary activities than the involuntary ones (Slovic et al, 1984). This would seem to be because involuntary activities are those over which people have no control: they feel happier undertaking the more hazardous activities as long as they feel in control.

**Table 1: Voluntary and Involuntary Risky Activities**

<b>Voluntary activities</b>	<b>Involuntary activities</b>
<ul style="list-style-type: none"> <li>• fishing off rocky headlands</li> <li>• rock climbing</li> <li>• riding a bicycle in heavy traffic</li> <li>• hang-gliding</li> <li>• crossing a busy street against a red light</li> <li>• eating the wrong foods</li> <li>• smoking</li> </ul>	<ul style="list-style-type: none"> <li>• riding in an aeroplane of a company with a poor safety record</li> <li>• living in a house with a chemical factory with modern safety facilities being built nearby</li> <li>• living in a house with a dam being built just upstream</li> </ul>

Why is control so important? It is important for mental health that we feel in control of our lives (Langer, 1978). A feeling of helplessness can be debilitating, and in chronic cases can lead to death (Langer, 1975,

1983). Studies on animals (Lefcourt, 1973) and humans (Langer, 1983; Glass 1969), show that mental and physical stress can be more readily coped with if the subjects have a sense of control. This does not mean that they *are* in control, merely that they *perceive* they are in control.

Let us imagine that people who have just bought a house are told it is in a hazardous location. This threatens their sense of control, since they cannot eliminate the hazard. The only way they might feel they can retain a sense of control is to deny the problem. [To think how we might behave in this kind of situation, we could imagine ourselves in analogous circumstances. Let us envisage that we have almost completed a large project. Then someone comes along and points out a fatal flaw which would compel us to revise all the work. What is our reaction?]

This denial is an extremely powerful influence. Even after a flood, people who had not expected it will be telling themselves that it couldn't happen again. It is also a well-known source of frustration for floodplain managers who go out of their way to provide the community with information about a hazard and see it largely ignored.

There is a further difficulty. Even if an area is subjected to a flood, not all the people will be affected who in fact could be flooded. For example during a moderate flood, those houses prone to flooding only in a large flood would be spared, and many of these householders would be convinced that they would always be above flood level. This is because, in order to rationalise that they are in control, people tend to attribute favourable outcomes from risky circumstances to skill, and unfavourable outcomes to bad luck. Therefore, many of those who are flood prone, yet have been above a previous flood, may convince themselves that they are clever enough to have acquired a house above "the flood level".

People tend to recall small, frequent events more easily than rare, large ones (Saarinen, 1990). Typically, people may say that "floods come up to here", and not appreciate how much floods can vary. As well, some of those who were flooded would have rationalised that another flood could not recur in their lifetime.

It should also be recognised that people act not so much to minimise losses, but to minimise distress. (Green, 1990). This means that they will only start to reduce losses if they *perceive* that this is the most effective strategy for minimising distress and restoring control. It has been suggested that this is why people cope with unavoidable threats by ignoring them and devote themselves to matters they perceive they can control (Handmer and Penning-Rowsell, 1990).

As an example of this, it has been documented how different occupants of apartment blocks in New York approached their concerns with burglary in unexpected ways (Miransky and Langer, 1978). Those who thought their area was safe used all their locks *more* than those who thought their area unsafe. Further, more than two-thirds of respondents thought that it was the responsibility of *others* to prevent burglary in their own dwellings. The authors suggested that this was because people may be wanting to distance themselves from negative events, and that taking steps to reduce burglary may make the event seem more likely. It was concluded that simply telling people it is their responsibility to reduce the chances of burglary would probably not work, neither would dire warnings.

Another study came to a similar conclusion. MacGregor (1991) found that people tend to worry more about matters which they feel they have some control over, than those which they perceive as uncontrollable. Thus, simply giving people more information about an event which seems uncontrollable to them may have little effect on how well they can cope with it.

Also, there is very little support from the hazard literature for there being any relationship between awareness and behaviour. People may be aware of a hazard, but they can tend to underestimate the probability of an unfavourable outcome (Saarinen, 1990). It should be noted that this tendency can be found just as easily among floodplain-management experts as among lay people (Quinnell, 1981). (For example, the proportion of flooding experts who live in flood-prone areas is an interesting number.)

It is therefore probable, taking into account these issues, that the preparedness of a community will decline even more rapidly than shown in Figure 1.

In summary, in order to feel that they are in control, people will often deny, or displace, a problem. For example, if told they live in a flood-prone area, they may either deny that possibility or see the responsibility of floodplain management as not concerning them. But what are people to do, after they have denied their flooding problem, if they are flooded and go from a situation where they see themselves as in control to one where they are not in control? An important strategy is obviously to reinstate the sense of control that they have lost.

## **Sense of Control**

There are many ways that individuals and the wider community can re-establish a sense of control. For instance, often in a community, people will help each other during and just after the flood, and this will help them gain a tangible sense of achievement. This can be sufficient for people to regain some sense of control, as the activity of solving problems offers the prospect of eventual control (Solomon and others, 1989).

People also begin to enter what is referred to as the “teachable moment” (Filderman, 1990) where people reach maximum rate of learning under conditions of optimal arousal. This means that there is a short time after the event when people can be most receptive to new ideas (Wilson, 1990). Prince-Embury, (1992) has also suggested that there are psychological benefits from this information and education gained after a flood, as some people can seek control by acquiring information. An increased sense of loss of control and psychological symptoms have been attributed to a lack of adequate information.

All too often unfortunately, flood victims become frustrated as they realise how much they have lost and how difficult it will be to recover. They can suffer shock when they realise that the control they thought they had was not there after all. It is therefore vital that the people have access to flood counselling, support and recognition within days to help them develop or even maintain a sense of achievement in overcoming their troubles. The earlier such a service is available the better. Solomon and others (1989) have found that those who cope best, tend to be people who don't blame themselves, but do accept responsibility to deal with the consequences of a flood. Victims who blame themselves, are less likely to seek help from relief organisations and are likely to have mental health problems. The danger is that once people have learned helplessness, it is difficult to re-establish a sense of control (Lefcourt, 1973). Early intervention can help to remove the sense of guilt that so many flood victims suffer.

Ladrado-Ignacio and Perlas (1994) have suggested that a prerequisite for recovery from a flood is gaining a sense of control. For this reason, the assistance should be based on a strategy of mutual help rather than simply one of charity. For example, if it is feasible, it can be helpful to sell materials and equipment for recovery at a low price rather than give them. Selling the goods should help to give the recipients ownership and to encourage their sense of control over their destinies.

If flood-recovery centres are set up, they should run for at least a year. This is because some people need time to come to terms with what happened before they seek emotional assistance.

Thus, to mitigate social effects in a sustainable manner, there should be prior planning to:-

- ensure people can participate fully in their own recovery;
- provide early information on the flood and ways of reducing the impact next time;
- provide early counselling and recognition of the flood;
- ensure that assistance is provided in a manner which fosters the victims' sense of control.

Steps to regain a sense of control should not be limited to the community. The conduct of the flood-fighting agencies is usually reviewed after a flood. If, as is almost inevitable, there has been a breakdown in any part of the plan, it is important to avoid the temptation to assign blame.

Rather, the breakdown should be recognised as being largely caused by systemic deficiencies which, as we have tried to illustrate, are very difficult to avoid. In this way, the agencies could gain an increased sense of control in working to learn from the lessons of past.

## Improving the Management System

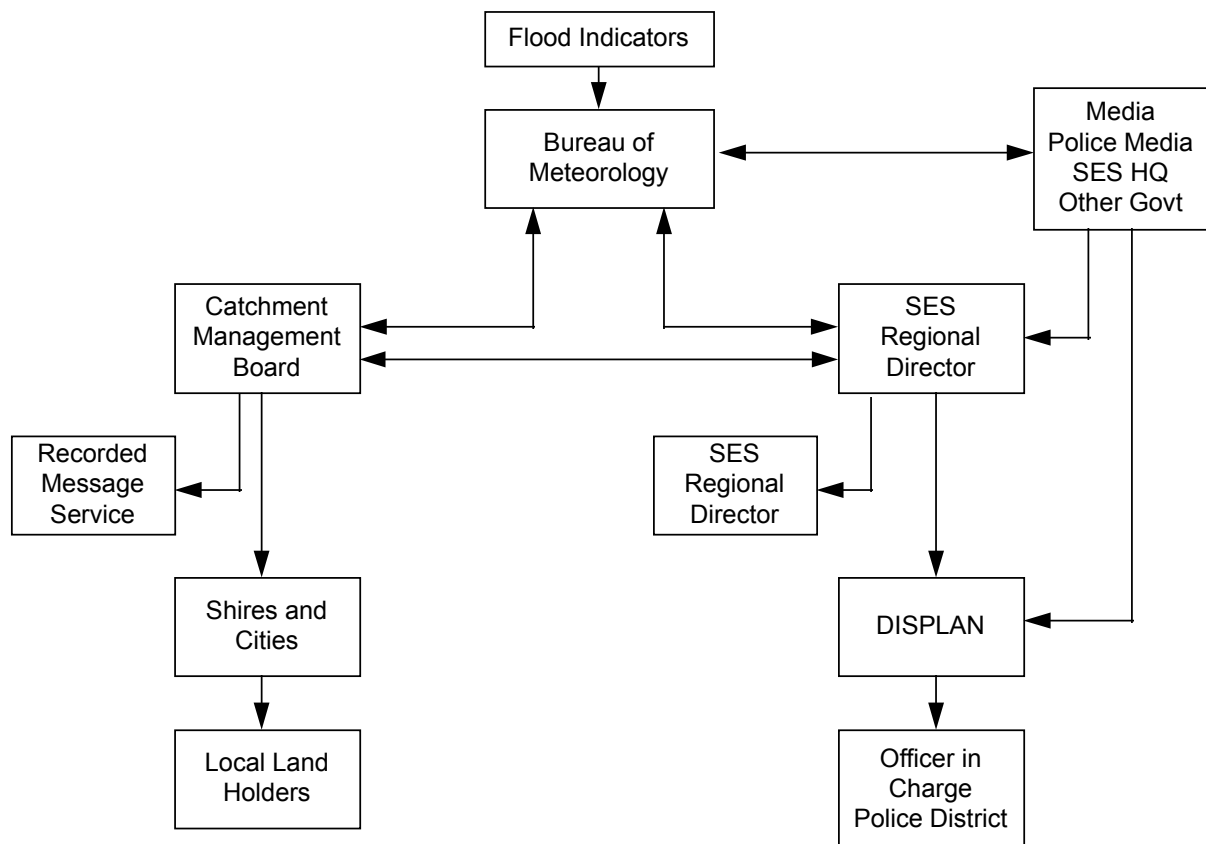
Maskrey (1989) has shown in developing countries how a feeling of control is necessary for effective communal action in mitigating floods. If this principle is not adopted, the system is unlikely to be effectively sustained until the next flood. It is only with the people feeling they have a stake in the mitigation system that they will remain actively involved. Further, unless the people are participating, the political and hence financial support for maintaining the floodplain-management system will tend to drop away.

Thus, the floodplain-management system should be designed to convey a strong message to the occupants of the vulnerable area that the system belongs to them and that they are its most effective component. But is this done?

Only rarely. There appears to be a general underlying hierarchical view in many agencies involved in flood management as to what constitutes a floodplain-management system. It would seem that many see the management system as comprising only the public agencies, with the public itself consisting of passive recipients of the management services. This view is found to co-exist with the belief that it is the effectiveness of the agencies which is the primary determinant of the effectiveness of the system as a whole. Under this paradigm, the role of the rest of the community is primarily to *respond* to the warnings. Unfortunately, even in the latest Australian guide for flood warnings, this is the terminology used (EMA, 1995).

For example, flood-warning systems are typically depicted much as in Figure 4, with the advice or service going *down* to the people. This contrasts with what many would argue should be the role of such a system, namely to provide a service *up* to its client, the community. Also, such depictions rarely acknowledge the fact that it is often the people who provide valuable information and services to the floodplain-management agencies.

**Figure 4. Typical hierarchical flood warning system**



## ***Putting the community in control***

Figure 4 has been adapted from what had previously been developed by the flood-warning agencies in a particular floodplain in Australia. The valley had both rural and urban areas and was reasonably closely settled.

As this arrangement was examined, several features emerged.

- No one seemed to be in charge during the previous flood.
- The “Local Land Holders” in Figure 4 were at the end of a long chain of communication. As it was, one council officer declined to send them any warnings, since “they should know by now anyway”.
- There was little acknowledgement of the role which could be played by the people themselves. In fact, community activists were sometimes being viewed as a threat rather than a resource.

It is rarely recognised that the people in the floodplain are its most effective component. That this is so can be readily shown with two examples:

- An SES (State Emergency Service) volunteer takes an average of 10 minutes to evacuate one household. That is, one SES person can evacuate 6 households an hour. Quite plainly, there won't be enough SES people to evacuate a large area in time, and most households would have to help themselves or each other.
- Sinclair Knight Merz (SKM, 1995) in a small survey of victims of the 1993 floods in North-East Victoria found that most people received warnings from their families and friends, rather than from official warnings.

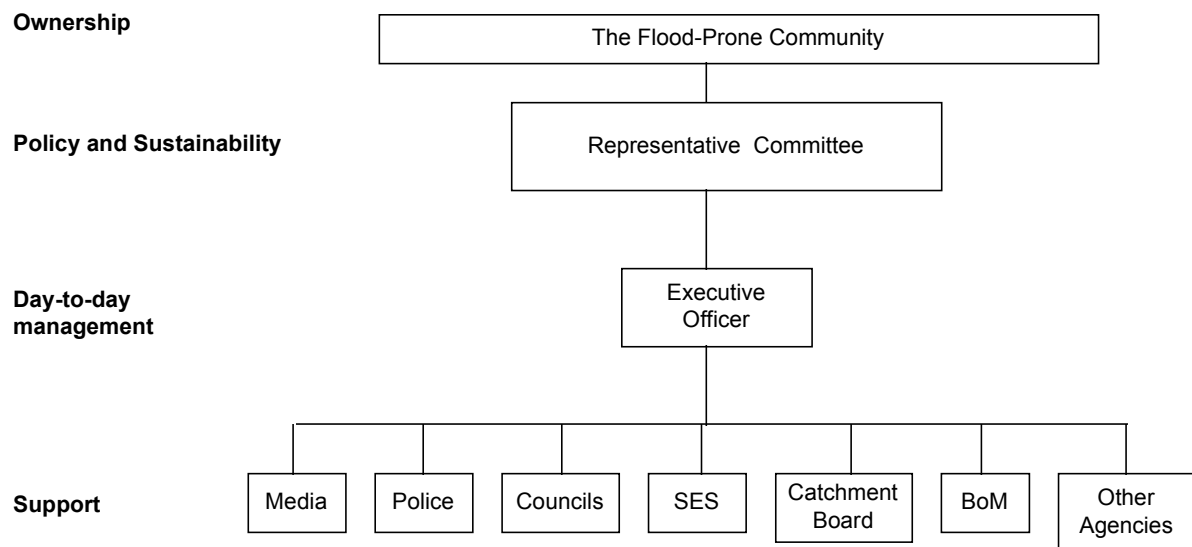
These examples illustrate that it is the people themselves - untrained and unfunded - who are arguably the most effective component of any floodplain-management system. It would be reasonable to assume from this that in order to make the system work better, it would be the most cost-effective to enhance the capabilities of the community.

Soste and Glass (1996a) have begun to develop techniques to tackle this issue in a few catchments in Eastern Victoria. One of the tasks they set themselves was getting the community to take control of developing their own procedures for coping with floods. While they were reasonably successful on the whole, the effort by the authors was prodigious. Such an effort would not be likely to attract sufficient funding as a general rule. Further, for the reasons outlined above, the flood-awareness booklet they produced may not continue to be used over the long term without significant effort to sustain it.

What we need therefore, is to set up institutional arrangements which ensure that the community remains in control. In a second paper, Soste and Glass (1996b) came to a similar view.

In order to promote the idea that the floodplain-management system belongs to the community, there should be a Floodplain-Management Committee, consisting of representatives of the flood-prone community. Preferably, the members of this Committee should have a personal stake in sustaining the flood-mitigation system. It should be noted that while Flood Committees do exist in NSW, and take an interest in and often play a vital role in establishing or enhancing the local flood-warning system, they do not have a direct interest in the operation of that system unless there are members who are also in the local SES and/or the local Emergency Management Committee.

All the agencies with responsibilities for setting up, operating and maintaining the floodplain-management system would report to this Committee. The organisational arrangements could perhaps be as shown in Figure 5.

*Figure 5. Suggested model for control of floodplain-management system*

The members of this Committee would not be responsible for the day-to-day operation of the flood-mitigation system, but would have oversight of the performance of the various agencies, which would be reporting to it. We might expect that the Committee would normally delegate the executive task to a local floodplain-management co-ordinator, probably seconded from one of the agencies involved in the system.

The Committee could have the following tasks:

- to report regularly to the flood-prone community on the performance and state of readiness of the flood-warning system;
- to appoint an executive officer and Secretariat for a specific term (up to, say, 3 years);
- to monitor the capability of each agency with responsibility for some component of the floodplain-management system;
- to institute checks on the operational effectiveness of the floodplain-management system as a whole;
- to initiate regular flood-preparedness campaigns (ideas are presented in Appendix 1);
- to run regular checks on the state of community preparedness in the whole flood-prone area, up to the extreme event;
- to maintain a high political profile for the floodplain-management system;
- to act as role models for preparing for the next flood and for responding to warnings when the flood comes (Handmer and Penning-Rowse, 1990; Quinell, 1981);
- to act as personal motivators to prepare for the next flood (Handmer and Penning-Rowse, 1990).

There are several reasons for having no representatives of the floodplain-management agencies on this Committee:

- The members of the Committee must be seen by the community as the stewards of their floodplain-management system.
- The members should be directly accessible by the occupants of the flood-prone area.

- If one agency did not perform to expectations, or was encountering difficulties, the Committee would not be inhibited in making representations at a sufficiently high level to resolve the matter.
- With the membership of the Committee being people with a personal stake in the floodplain-management system, they could help provide the continuity needed for sustaining the floodplain-management system in a state of readiness.

The work of this Committee would be demanding and would require people with staying power. It would be difficult to keep the issue of floodplain management in front of an increasingly unaware and hence increasingly indifferent community. More and more, there will be a temptation for the members of the committee to resign in the face of declining recognition of their efforts by the community. It will be important therefore, not only for the Committee to be watching the performance of the floodplain-management agencies, but also for some agency to be monitoring and encouraging the Committee. As well, consideration might be given to ways of publicly recognising the contributions by the members of the Committee towards sustaining the floodplain-management system.

Some funding of the Secretariat and local components of the floodplain-management system would be needed. It is recommended that consideration be given to the cost being eligible for a government subsidy, with the rest to be paid for by Council. It would be politically and psychologically desirable for a significant part of this to be raised by a special levy on people in the catchment. This would help make clear that the floodplain-management system was going to belong to the community, since they were in fact making an important financial contribution to its continued operation.

This direct levy would also help ensure that the floodplain-management system continued to have local control. For as long as the occupants of the catchment were paying the levy, the Committee would continue to function. Were there to be no such direct charge, the funding of the Committee would be subject to the normal political processes which could lead to funds being gradually diverted elsewhere.

An alternative rating area could be the floodplain only. This would have the advantage of involving not only those who are affected by floods, but it would have several disadvantages:-

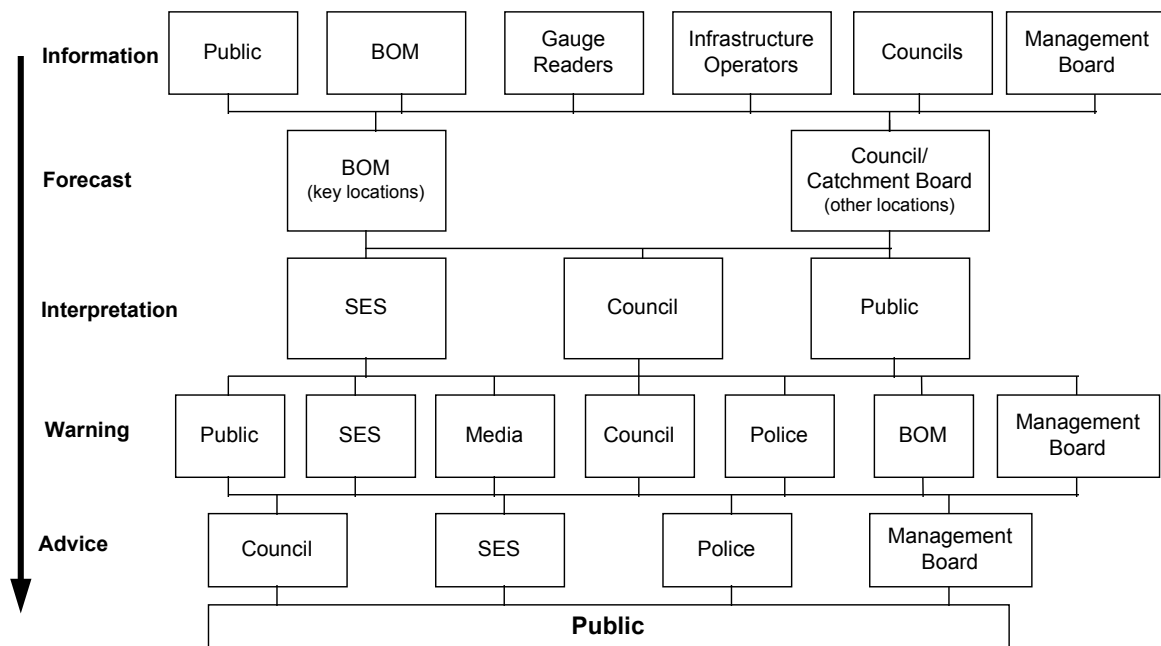
- It would be difficult to convince those occupants who are at or near the level of the Probable Maximum Flood (PMF) that they should become involved.
- Those upstream who could contribute by reducing runoff from their properties would be excluded.
- The levy could be at a simple flat rate, rather than, say in proportion to the degree of hazard, always a contentious issue.

As well, the work of the committee could be more readily sustained, given that issues of catchment management continually arise. This has been the experience, for example, of the Upper Parramatta River Catchment Trust, which has already seen its 10-year term extended. [Check]

### ***The flood-warning system***

Even today, information from official sources would generally appear to play a minor role in flood warnings, and it is frequently the case that when people receive a warning which causes them to take action, it is more often than not from a friend, relative or neighbour (SKM, 1995; Walster, 1966), or from their own observations (Soste and Glass, 1996a).

If we are to take account of the fact that the members of the community, besides being the owners of the flood-warning system, are probably also its most effective component, the flow of information in the warning system could be as depicted in Figure 6.

*Figure 6. Suggested flow of information in a flood-warning system*

It is essential that the warning be transmitted in several ways at once. There are two reasons for this. The first, which is widely accepted, is that redundancy is important in case some communication links become inoperative during the flood-warning process. The second is that people need the opportunity to obtain confirmation of the impending hazard or flood.

The warning message should not consist simply of facts. There is no evidence for the provision of information leading directly to a change in attitude, much less a change in behaviour (Handmer, 1990). In fact, taking into account the effect of denial as argued above, merely making an announcement about an impending flood can be counter-productive.

It is suggested that the message should be designed to be (Marks, 1990):-

- **multi-modal**, using many different forms (e.g. acoustic, visual, graphic) and many modes of communication. This enables people to get confirmation from several sources, and repetition helps to persuade.
- **positive**, stressing the benefits rather than negatively stressing the adverse possibilities. Even the anticipation of success in a risky venture enhances the sense of control (Langer, 1978);
- **specific**;
- **inviting participants' activity** rather than passivity, as by seeking their participation, people are being told that they can be in control (Langer, 1975,1978).
- **inviting sociability** rather than isolation (e.g. check your neighbours are aware).

Often, it could be valuable if the Bureau of Meteorology (BoM) could set up a system of accrediting local organisations for forecasting, as is now sometimes done. (See, for example, Soste and Glass, 1996b.) These local organisations would often have access to a wide formal and informal network for acquiring information on local observations. They would also have a much better idea on which of the formal and informal observers were reliable.

The local forecasters could be responsible for producing forecasts in areas not dealt with by the BoM, and for interpolating between the results of the models of the BoM. This local capability can be very helpful. With

such an arrangement, the local flood-mitigation and emergency agencies should be in a better position to issue warning messages which were meaningful to the community, and this would help foster a greater sense of control within the community.

The BoM should reinforce this sense of empowerment when issuing forecasts by conveying the message that the warning system is relying on the people's skills. Firstly, it should make sure that the recipient of any warning message is informed at the beginning that detailed interpretations can be obtained from the local flood-mitigation and emergency agencies, the local government authority, the local police, and perhaps some other local agency. This is so that more than one source of the same information can be accessible to the public. Secondly, it should ask that the people inform others. Thirdly, it should state that any early observations (e.g. flooding in the upper catchment) or later records of the event (e.g. markings of peak water levels) would be welcome (especially in rural areas).

Where circumstances permitted, the warnings might be issued in a graduated fashion (known colloquially in the USA as "Ready-Set-Go"). The "Ready" advice would be only a generalised announcement indicating that a flood-producing event could be expected somewhere within a certain quite large area. Later, when the forecasts could be much more accurate, the "Set" warning could indicate there was a high likelihood of a disastrous event within a reasonably well-defined area. When the prediction could be very accurate, the "Go" warning could state where, when and how high the flood was likely to be.

This stepwise approach to providing a warning should be more likely to result in people responding than happens wherever the "Ready" advice is restricted to the emergency agencies. It has been found that even in games which were purely random, people who had a longer time to become involved tended to have a greater sense of control and seemed to believe they had hence a greater chance of winning. This perception has been observed even with educated people (e.g. university students) who could be certain to appreciate how random the outcomes were (e.g. tossing a coin) when they were looking at the situation objectively. Of course during an emergency when a warning is being given, the proportion of the community which is likely to remain objective would be low.

There is an opposing argument to this strategy, based on the "cry wolf" syndrome. This argument holds that the "Ready" warnings should not be made public, since more often than not the situation does not worsen, and people will tend to ignore them. While we acknowledge that there is this risk, we would suggest that this risk can be reduced with the idea of conveying to people the message that they are in control and that it is their skills which are needed to help reduce losses. Keys (NSW SES, 1997, pers. comm.) suggests that false alarms should be used to advantage by taking the media opportunity to explain why the warning was given, thereby indirectly heightening the community's awareness of the warning system.

We should accept that people prefer to have information about uncertain, unpleasant yet unavoidable outcomes (Lanzetta and Driscoll, 1966). It might be argued too that the problem is not so much the false warnings but the people's prior beliefs. People tend to seek or accept information which is consistent with their beliefs, and will interpret new evidence in a way which fits in with them (Handmer, 1990). If we can begin to alter those beliefs by giving people a stronger stake in the floodplain-management system, we might more readily sustain it.

## **Conclusion**

To sustain the systems for mitigating floods requires their designs to take account of the tendency for people to deny the problem. This tendency stems from the strong need for all of us to feel we are in control of our lives, and this implies that a sustainable floodplain-management system must convey the message that it is the people who own and control it.

The nature of floodplain management is that there are many agencies with some responsibility for its operation. As the time since the last flood increases, the various agencies will tend to become less and less ready to operate as effectively together. To compensate for this, each agency should be responsible to a Committee comprising representatives of the local catchment, with day-to-day management being delegated to an executive officer, possibly seconded from one of the agencies making a contribution to the system.

The funding of the Secretariat and other expenses of the system should rely to a substantial degree on a levying of those benefitting. This would make funding less subject to changing political priorities.

## **Acknowledgement**

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**Dr Terry Lustig**, the Managing Director of Environmental Management Pty Ltd, has three decades of experience as a civil and water engineer, and two decades of experience as an environmental engineer and environmental economist. He is accredited with the NSW Government for undertaking economic studies for government projects and specialises in the economics of floodplain-management strategies and environmental economics.

Dr Lustig is an international leader in the fields of sustainable natural-disaster management, and of economic and social analyses of non-structural strategies; and one of Australia's foremost experts in the field of economic analysis of floodplain-management strategies generally.

He has been consulting overseas for the last eight years to the Asian Development Bank, the United Nations Development Program, the Asian Disaster Preparedness Centre and several other overseas public and private organisations in the field of water-disaster management.

**Michelle Maher** is Office Manager with Environmental Management Pty Ltd. She is a geographer with a Masters of Environmental Planning. She has experience in the assessment of social and environmental issues associated with flood management.

## **Appendix 1 Suggested Strategies for Sustaining Communal Preparedness and Engendering a Sense of Control**

- Permanent marks in public places indicating the severity of the worst historical flood, for example the height reached by the highest previous flood;
- photos in public buildings showing previous floods;
- flood advice kits containing simple strategies for protecting property on receiving the warning and for preparing for the next hazardous event;
- advising on ways of safeguarding very important personal property such as memorabilia;
- kits for schools to teach aspects of the hazard in topics such as science, geography, social studies *etc.*;
- school and village plays;
- articles in the local newspapers;
- videos on previous floods and on flood preparedness which are available for a nominal fee;
- programs on local radio stations;
- use as a topic for talk-back radio;
- information leaflets in relevant public offices;
- data personalised for each household, relating the effects of the hazard on the property;
- as a topic for information drama on radio and television;
- incorporating into radio quizzes.

Strategies for developing a sense of control and motivating people to prepare for the next hazardous event:-

- flood-preparedness advice desks at evacuation centres during and after a flood;
- flood -preparedness advice stands at fairs, festivals and other public occasions;
- competitions between villages as part of hazard drills;
- well-publicised subsidies for flood-proofing strategies.