

# Submission to Queensland Floods Commission of Inquiry

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## Part 1: Queensland's Flood Problem in Context

It is not widely appreciated in the Australian community, but flooding is at the same time the most expensive and the most manageable of all the natural hazards that we face on a relatively frequent basis. The dollar damage done to private and community assets by flooding is greater nationally than is the case with tropical cyclones, bush fires or severe storms (Bureau of Transport Economics, 2001, p35), and probably droughts, but the threat is more easily mitigated in the case of flooding than is true with any of these other types of natural disaster. Yet as a community we have not exploited this manageability effectively. **This is especially so in the case of Queensland where, to a greater extent than in the other Australian states, the flood problem has been allowed to grow largely untrammelled over the decades.**

It is imperative that more be done in this state to address the problems caused by the flood hazard. The opportunities are many, and tried and effective blueprints exist to reduce the impacts of flooding.

This is not to say that flooding is poorly managed in all respects in Queensland. In general, real-time responses to floods are quite effective, and there is frequent evidence of people's lives being saved by emergency rescue personnel as was the case in the Lockyer Valley on 10 January, 2011. But the management of land use on floodplains is poor in this state, and relative to New South Wales (the only other Australian state with as severe a flood problem) little has been done to develop flood mitigation schemes. Thus few Queensland towns have levee protection or have developed other forms of 'structural' flood mitigation. Moreover buy-backs of flood-liable properties have been few and cases of existing dwellings being raised *in situ* above the levels which floods commonly reach are quite rare.

Worse yet, there is clear evidence that the flood problem is becoming steadily worse as a result of the intensification of development, both residential and commercial, on floodplains. Community exposure to flooding is thus increasing, as was graphically shown in Brisbane in January when, in a flood that peaked at the key Brisbane gauge a metre below the widely-remembered flood of 1974, many more dwellings took in water than was the case on that occasion. Similar 'trajectories' of increasing vulnerability apply to urban communities throughout the state. This reflects badly on land management by councils over the decades and on the leadership of the state government. Policies have been pursued which have exposed more and more people and more and more assets, private and public, to risk. Moreover this continues to be the case.

Land development in Queensland's towns and cities is perversely eccentric. It has had the effect of working against the general public interest by increasing community vulnerability rather than resilience and sustainability. The management

of the use of floodplain land appears to have been conducted to benefit sectional interests rather than broader public ones, and with the short term rather than the long term in mind. 'Development' has clearly had precedence over public safety and sustainability considerations as a driver of the management of floodplains in Queensland, even as safety has become more central to decision making in other jurisdictions.

Excellent flood prediction capabilities have been developed by the Australian Government Bureau of Meteorology, especially in relation to riverine flooding, but in Queensland as in the other states these are rarely well communicated to the populations at risk of flooding. Little effort has been made to explain flood warning products to people who live or have commercial interests on floodplains, and with a few exceptions there has been little emphasis on educating people about how they can best manage flooding in their own interests. As a result, much is lost that is of pecuniary value or is precious to individuals during periods of flooding, and the wealth and emotional well-being of those who are affected is reduced.

The state government and councils of local government, it can be said, have failed in their duty of care to those who are at risk of flooding. Effective flood management is invariably multi-faceted, but in this state most facets of the task have been ignored or allowed to remain under-developed while at the same time the problem has been permitted – even encouraged – to become worse. In particular Queensland has placed its faith in real-time responses managed by the emergency services, and in the generosity of the federal government with respect to relief and recovery funding. Little attention has been paid to the principles of sustainable development of floodplains, the institution of appropriate flood mitigation measures to protect existing development, efforts to improve flood warning services or the better education of people as far as the management of the impacts of flooding are concerned.

Opportunities exist in all these areas to improve the situation across the state and to build communities which can more easily withstand the negative effects of flooding. Since the nineteenth century each generation of Queenslanders has inherited a problem of community flood vulnerability and, piecemeal but inexorably, each generation has allowed that problem to become more severe. It should be the aim of the current generation, led by their councils and their state government, to reverse this historic trajectory which has led to the problem of flooding becoming worse than in any other state or territory in Australia.

Reducing the impacts of flooding will be no small task, but it should not be impossible nor prohibitively expensive. The difficulties will be those of political will rather than any absence of means by which the flood problem can be more effectively managed. As can be seen from an examination of what has been done to manage others of the threats of nature, it is possible to contain the impacts and to reduce rates of death, injury, damage, distress and dislocation.

The case of tropical cyclones is instructive. In Australia the threat of tropical cyclones has been increasingly well managed by the adoption of measures such as modifying building codes to ensure that structures can withstand high winds and by investing in better forecasting and tracking of cyclones. It is worthy of note that in

recent severe tropical cyclones Larry (2006) and Yasi (2011) the numbers of deaths caused and the degree of damage wrought was much less than that caused by Cyclone Tracy in Darwin in 1974. The damage to newer buildings especially was effectively contained in the more recent events. But in the case of flooding the complete opposite is the case, as was recently pointed out in an article in the *Sydney Morning Herald* (Molino, 2011a). Molino noted that while we are increasingly building dwellings that can withstand very strong winds, we are utilising building materials in floodplain construction (chipboard in kitchens, plasterboard in walls, composite timber beams and plywood bracing for frames) that cannot withstand immersion. Thus the owners of new dwellings are being faced with costly repairs or, indeed, the need to demolish their homes (because the materials used in building them have lost structural strength after inundation) and to start again.

And unlike the owners of cyclone-damaged properties, those who have built on floodplains are doubly penalised when it becomes apparent in many cases that they are not insured against the damage done by floods. The much commented-upon problem of the lack of availability and affordability of flood insurance adds further to the real cost of flooding in Australia and the pain which is borne at the level of individual flood-affected households. Some people, not covered by flood insurance, never recover financially from the effects of a severe flood.

The fact that flood damage can to a considerable extent be mitigated is demonstrated by the experience of New South Wales over the past half-century. That state, devastated by severe floods on virtually all of its rivers between 1954 and 1956, developed an increasingly strong and multi-dimensional policy response to flooding over the remainder of the twentieth century. As an example, in the decade from 1983-93, New South Wales spent some \$42 million on flood mitigation projects and developed what became an internationally renowned floodplain management policy that sought to protect existing urban development from flooding and at the same time to prevent the escalation of the problem. In essence, existing urban development was given a measure of protection and it was made more difficult to develop flood-labile land for urban (and especially residential) purposes. Over the same period Queensland, which had virtually the same exposure to the flood risk as New South Wales as measured by the costs of flooding in the two states, lacked any formal floodplain management policy and spent only \$8 million on flood mitigation. The New South Wales expenditure of federal funds on flood relief and recovery over the same period of time was \$133 million as against \$229 million in Queensland (Smith, 1999; see also Molino, 2011b). Little has changed in the ensuing years, except that the New South Wales commitment of funds to flood mitigation initiatives has fallen away somewhat. At least in New South Wales it can be said that much of the task has been completed, but such a statement could not be made in Queensland.

The message is clear. Spending a little on mitigation can save a lot on recovery. Prevention (or at least reduction) is, as in many other fields, better than cure.

Queensland's traditional approach to floodplain management and the use of commonwealth recovery funding should be regarded as unconscionable, reckless and mendicant. New South Wales, by contrast, was cited by an internationally renowned floodplain management expert some years ago as being "close to

international best practice” in the field (Smith, 1999, p1), the state having approached the flood problem with “a degree of consistency and vigour unmatched by the other states of Australia” (Smith, 1998, p235). New South Wales has in effect slowed the rate of growth in the costs attributable to flooding, whereas the costs in Queensland are tending to increase with growing rapidity. The comparison is an odious one, but it is one which should be noted and acted upon by the Queensland state government. For more detailed information on the methods that have been used to manage the flood problem in New South Wales and the funding which has been invested over the past half century, see Keys (2008).

As noted above, many things can be done to address the flood problem in Queensland. This submission deals in detail with only a small number of the measures which could be adopted, but in addition it proposes in skeletal form a more wide-ranging 12-point plan for flood management in Australia which was recently published online (Keys, 2011). That plan is reproduced here in slightly modified form as Part 3.

Most of the focus in this submission, though, is on the largely unrealised potential for improving flood warning practices and the contribution which should be sought by the better education of those who have interests on floodplains. Appropriately flood-educated people, it is argued, will be better able and more motivated to act on flood warnings than those who do not comprehend the nature of coming floods and fail to realise the value and importance of timely, committed and well thought out responses on their own parts when floodwaters are approaching. ‘The creation’ of such people has not been achieved anywhere in Australia to the extent that is possible, though attempts have been made in some jurisdictions.

## **Part 2: Flood Warning and Flood Education**

In this writer’s opinion, warning of impending flooding is almost never performed well in Australia. Nor are most people ready or prepared for floods, which in most areas occur only infrequently and thus create few opportunities for ‘practice’ in protecting items of property or preparing for and undertaking evacuation. The inevitable consequence is that many items of pecuniary and sentimental value are lost when floods, particularly severe ones, occur. It has been estimated that up to 80% of potential within-buildings flood damage in urban areas could be saved if people were better warned, knew what to do when a flood was bearing down upon them and were persuaded to act accordingly (Gissing, 2003). Sadly there is strong evidence that nothing remotely achieving this level of damage reduction is being achieved. It certainly was not in Queensland during the many floods of the summer of 2010-11.

Yet from a technical standpoint we have high quality riverine flood forecasting in the state in relation to predictions of the heights that will be reached at specified gauges on rivers and the times those heights will be reached. Moreover flood warning is known to be a potentially very effective and relatively inexpensive way of reducing losses and indeed of keeping people safe (Handmer and Smith, 1995; Gissing et al, 2010). The problem lies in the way the forecasting, done in most areas by the Australian Government Bureau of Meteorology, is utilised by the

emergency services (Keys and Cawood, 2009), including in Queensland the councils of local government which have responsibility for disseminating warnings to communities which are expected to experience flooding.

Only relatively rarely are the Bureau's flood-height predictions broadcast over local radio stations with appropriate 'value-adding' by way of information on what the impacts of flooding at the forecast river level will be, which areas and people will be affected and what those people should do by way of property protection and other activity (including, in some instances, evacuating to safety). Rather, the Bureau's predictions tend to be disseminated **as if they are themselves warnings** and without due care being taken to ensure they are understood and motivate the taking of appropriate actions. Moreover the predictions by themselves are expressed in the technical language of river heights at gauge locations and much of their content is poorly understood in the community. Much needs to be done by the emergency service to 'unlock' the meaning of the predictions and to add information that is needed in areas about to experience flooding.

In Queensland during the summer of 2010-11, flood warnings came in for little media scrutiny. The attention was on more dramatic matters such as rescue and on the visual spectacle provided by deep and fast-flowing floodwaters in places like Toowoomba and the Lockyer Valley or the extent of inundation in built-up areas. As the floods receded it moved to images of damage and debris. Yet, as the flood levels dropped, it was clear on nightly television news bulletins from the piles of household effects piled high in the streets in places like Bundaberg, Rockhampton and Brisbane that many people had not taken steps to raise items in their houses, much less to remove them from floodplains for temporary storage at the homes of friends or relatives on higher ground. In the cases of these three cities there were hours or days of warning that significant floods were approaching. The scenes of debris in the streets, and the voices of those who were interviewed by radio and television journalists, made it all too clear that far too many people had taken action to protect their belongings only very late – probably when they saw the floodwaters rising near their houses.

Almost certainly this was partly because the flood warning services that were provided did not spell out clearly what people were in for or persuade them to take appropriate action. What happened also suggests that the flood warnings, not being well understood, are not widely trusted.

There is clear evidence that the warning services are not operating as they should. State agencies and councils have not developed the appropriate internal mindsets to ensure the task is performed well; in effect they are expecting the Bureau's products to do the warning job virtually by themselves. Yet three generations of the Australian best-practice manual on flood warnings, the first published more than fifteen years ago (Emergency Management Australia, 1995), have insisted that these products are not warnings in themselves (despite their titles) but merely essential inputs to warning processes. To ensure that genuine warning messages are provided, information and advice must be added to the predictions and thought must be given to ensuring that the additions are done in ways that will motivate people to take appropriate property-protecting action (see, for the current manual, Commonwealth of Australia, 2009). There was little if any of this in what was

broadcast over ABC Radio 612 Brisbane in the days leading up to the inundation of residential areas near the Brisbane River.

Of particular importance here is the collection, collation and utilisation (in flood warning messages) of flood intelligence which can be used to indicate what is likely to happen in floods of specified predicted heights. Progress in the development of flood intelligence has been disappointingly slow in most parts of Australia, partly because the agencies which ought to be developing and using it have not given it a sufficiently high priority. New South Wales and Victoria are to some extent exceptions here.

Another area of disappointment in most parts of Australia is the dissemination of flood warning information. In the Victorian floods of late 2010, unusually strong and innovative attempts were made to expand the range of 'devices' by which warning information was brought to the communities in which flooding was about to occur. Thus social media (in this case Facebook) was used to get the message out, along with public meetings in the areas which were likely to experience severe floods, 'virtual' public meetings (extended discussions over ABC local radio stations in which likely questions from community members were anticipated), variable message signs on major highways, doorknocks to advise people of the developing situation and to provide advice, recorded voice and text messages sent to landline and mobile telephones and, of course, messages being compiled for reading over the airwaves. Because of the wide range of dissemination techniques employed it is likely that the 'reach' of the warning messages was much greater than is the norm during floods in Australia.

Not all of what was done in the Victorian case was highly effective, partly because of the lack of sufficient flood intelligence. Moreover the messages sent to radio stations tended merely to repeat the Bureau's flood forecasts without in most cases adding consequence information and providing advice. Nevertheless it is probable that the overall flood warning effort during the early stages of the Victorian floods was more effective than previous efforts in Australia to warn people as floods developed (Keys, 2010). There was also much that Queensland could learn from.

Much can be done to rectify the situation that has been noted in Queensland as far as warning efficacy is concerned. Warning needs to be recognised for what it can be, namely a highly effective means of helping people manage the effects of flooding, and it needs to be resourced with appropriate data and means of dissemination of messages. It would be helpful were the responsibility for flood warning to be removed from councils of local government (where the appropriate skills are not well developed and where there are many other tasks to distract staff during floods) and placed with Emergency Management Queensland which will, because of its state-wide responsibilities when floods occur, be better placed to gain experience in the warning task and thereby to develop the appropriate expertise to ensure it is done well in the future. This agency would be doing the job frequently and would thus have many more opportunities to build skills and expertise than local councils.

EMQ staff, and for that matter volunteers in the State Emergency Service, could usefully practise, in advance of floods, the preparation of flood warning messages

based on the known impacts of the recent floods and on whatever other flood intelligence already exists. Writing flood warning messages well before they are actually needed has already been done with some effect in New South Wales: it allows messages to be created and polished outside the operational period in which time pressures make it difficult to maximise message quality and persuasiveness. As far as is known this approach has not yet been attempted in Queensland. This matter, along with others relating to the 'how' of message construction, is covered in detail and with exemplification in the national flood warning manual (Commonwealth of Australia, 2009).

Flood warnings will work best, of course, if people are ready for them, understand how to use them and are convinced to act upon them. There is a major educational task to be developed here: it involves, in essence, the 'creation' of flood-ready populations in flood-labile areas. The task will need to be conducted outside flood time and in recognition of the fact that long periods can pass between the occurrence of floods in particular locations, especially severe floods which are less frequent than smaller ones.

It will also need to incorporate many different educational techniques. These should include the provision of locally-customised flood brochures, the holding of local community meetings (in which flood warnings are explained along with the kinds of action which will be appropriate for people to take in floods of different severities), and the provision of flood signage and markers in known flood-labile areas (including areas which are known to experience flash floods) to indicate how high floods have reached in past events. Beyond these methods, consideration should be given to advising individual owners of dwellings and commercial premises of the flood heights, at a nearby gauge to which the Bureau of Meteorology issues flood predictions, which will affect their properties: this could be done by indicating, on a small piece of dymostrip placed in the electricity meter box of each property, the approximate height on the gauge at which over-floor inundation can be expected. Doing this, with explanation, would demystify flood warnings and unlock the meaning of flood warning messages.

In effect, education needs to remind people of the potential of flooding and to empower them to act appropriately when floods begin to develop. Much of the necessary information is already available in many parts of Queensland but it has yet to be assembled or used in this manner.

It should be noted here that there will be opposition from vested interests to some elements and means of community flood education. Flood markers, for example, will not be welcomed by developers, real estate interests and some existing homeowners, and it will be argued that they will reduce property values. There is precious little evidence for this, as Yeo (2003) has shown for several countries, including Australia: the truth is that floods, not flood markers, damage property values. Equally it is also true that values recover quite speedily (normally within a few months) after properties have been inundated. Governments and councils need to be firm in their resolve to resist sectional interests in these matters, and to recognise that the greater good is served by people being enabled to cope better with the inevitable floods of the future than with those of the recent and more distant past. Markers and (especially in areas prone to flash floods) signage

indicating what people should do when flooding begins have an important role to play in flood education. It is a role that has been exploited only very half-heartedly in Australia and hardly at all in Queensland.

Flood markers should seek to remind people (and to inform newcomers) of floods that have happened in the past, like those of 1974 and 2011 in Ipswich and Brisbane and in 1993 and 2011 in Rockhampton. Ideally they should not seek to mark the levels which might be reached by design floods such as the so-called 'Q100' event which is a mere estimate and one which is liable to change as climate change occurs and, along the coast, as sea level continues to rise. In any case the use of the Q100 measure in this context would be likely to be derided by many as representing mere 'computer' floods, and in addition this kind of measure is now hopelessly misunderstood in the community and the confusion it has created is probably now almost impossible to overcome.

To be effective, flood markers should not be located in parks (as is the case in Brisbane's Botanic Gardens) or other areas relatively distant from residential and commercial areas, but actually **within** those areas. The evidence that property values will be little if at all affected will need to be publicised, not merely alluded to, to allay community fears. In other words the opposition that such markers are likely to generate will need to be purposefully confronted.

Community education efforts should be led by Emergency Management Queensland, not by local councils. This will help ensure consistency of messages and maximise the opportunity to raise flood awareness in all flood-liable areas within the state. Several of the tools of community flood education are discussed in the national manual on flood preparedness (Commonwealth of Australia, 2009b), but the contributions of Dufty (2008) and the New South Wales State Emergency Service (2006) are also worth examination.

By way of postscript, it should be noted that there was a yawning gap between the effort that was made to warn of the approach of Tropical Cyclone Yasi and of the impending floods in Queensland in January 2011. In Yasi's case a strong attempt was made to point out how severe the impacts would be once the system reached the coast, and to persuade people to make their properties as safe as possible and then to evacuate to safety. While some people stayed to wait out (and even to observe) the cyclone, most appear to have responded as asked. One result was a minimal death rate which should be regarded as one of the great successes of the operation.

The situation was very different in the case of the flooding, though here it must be added that what happened at Toowoomba and in the Lockyer Valley was the result of flash flooding whose severity was difficult to forecast and which gave little or no time to prepare or to escape: probably close to 30 people appear to have died in these areas including those who have not been accounted for. Elsewhere in the state it was difficult to see much in the way of evidence of the effective workings of flood warning systems in terms of property-protecting behaviour and it was all too easy to see cases in which people died as a result of their own actions. Too many people entered floodwaters willingly and deliberately, especially in motor vehicles, and between late November 2010 and early March 2011 it appears that at least



eleven of them died as a result in eleven different incidents in various parts of Queensland.

## **Part 3: Flood Management: a 12-point Plan for Australia**

The anxiety is over, and the question is what we should do now. After five months of repetitive flooding in all states and territories, with probably over 40 deaths nation-wide and unprecedented damage, we should develop a strategy to manage future floods. Here are twelve guiding points.

- 1. Stop seeing floods as enemies to be overpowered, and adapt to flooding.** Much of the tone of recent discussions in the media suggests that we have not learned the fundamental lesson that floods cannot be defeated or wrestled into submission. The construction of big dams, as some advocate, will be hugely expensive and of questionable value in big floods which will quickly outstrip their mitigation capacities. This is not to say that dams with a flood mitigation component cannot be part of our strategy, but they cannot be a complete solution. No one measure can be. If we wish to enjoy the benefits of floodplains, we must adjust our lives and affairs to accommodate the floods that inundate them from time to time. In short we must learn to live with the flood hazard.
- 2. Recognise that there is no simple panacea.** Multi-pronged, locally-appropriate floodplain management strategies are needed. As far as engineering works are concerned, these might include levees, bypass channels and detention basins. Planning measures could include buy-backs of properties and the raising of houses. In New South Wales all of these things have been tried with success over the past half-century, but some problematic environments have yet to be appropriately managed. Not all measures are suited to every location.
- 3. Ensure our institutions pull in the same direction.** We cannot have councils promoting development in severely flood-labile locations and expect the insurance industry to provide cover there. Nor should taxpayers and public appeals be called on repeatedly to bail people out. And it is not wise to have the New South Wales Land & Environment Court sanction the building of aged care facilities in flood-labile locations, requiring the SES and other emergency services to mount difficult and dangerous rescue missions when floods strike. Such conflicts abound in Australian land management.
- 4. Remove development from the worst areas.** Dwellings and commercial developments that are inundated frequently, or to great depths in big floods, or which impede flood flows, should not be there. They are mistakes to be rectified. Damage is disproportionately concentrated in such locations and insurance cover is usually prohibitively expensive or impossible to obtain there. We need to make an effort to remove some at least of the inappropriate development of the past.
- 5. Avoid the gradual intensification of community vulnerability to floods.** The steady drip, drip, drip of pressure to build on the lower parts of floodplains erodes the resolve of councils, especially during lengthy droughts. People forget

flooding and come to believe the flood problem has been 'fixed', the community drops its guard and community vulnerability is allowed to increase. An existing problem steadily gets worse, though no individual development appears to make a significant difference by itself. In the best of worlds there would be a 'no additional vulnerability' test on council decisions about the use of land.

**6. Map the floodplains and make the information available.** Information on the effects of flooding at different levels of severity (for example, at different heights on local stream gauges) is needed by developers, property owners, purchasers, planners and insurers. It is the centrepiece of effective floodplain management and will provide flood intelligence to inform flood warning processes.

**7. Help people to utilise flood warnings in their own interests.** This is a matter of education which we have rarely brought to bear. Information is provided, but not teaching. People need to know what flood warnings mean to them and how to act – and before they see the floodwater. Much is lost because people seek to raise or otherwise protect belongings too late. We need to link Bureau of Meteorology flood predictions with the probable consequences of developing floods, and to better communicate information and advice to those about to experience flooding. Strangely this issue has had little play of late, but it is crucial to better community flood management.

**8. Create reminders of flooding, especially in flash flood environments.** Toowoomba and the Lockyer Valley were horrendous. In New South Wales, places like Fairfield, Eastwood, Kensington, Randwick and Rose Bay have had severe flash flooding in recent decades, as have Newcastle, Coffs Harbour and Wollongong. Parts of Melbourne and Adelaide have had it too. Signage advising people of the danger and indicating what they should do when there is heavy rain or when flooding begins is necessary. Markers showing the levels reached by very large riverine floods are also needed as reminders of the threat. They do not have the negative impact on property values that is sometimes alleged.

**9. Spend on mitigation to save on relief.** Our disaster relief system is generous by international standards, but it is a very expensive and inefficient band-aid. Reducing the problem in advance will be more effective.

**10. Stop talking down the threat.** Floods cost more in dollar terms than any other natural hazard, but developers, real estate interests and councillors often minimise the threat and create a climate for further inappropriate development, more cost and more distress. Flood education is sometimes opposed, and business interests sometimes object to flood warning because they perceive a short-term negative impact on economic transactions.

**11. Build public safety considerations into land development processes.** The State and Territory Emergency Services (S/TESS), as the designated flood management agencies, should have a say in what development is allowed on floodplains, just as the rural fire services around the nation do in relation to the granting of building permits in fire-prone areas. In addition it would be wise to qualify the 'one-in-100-years' flood (the Q100 event in Queensland) as the standard for guiding land use decision making in relation to residential floor levels: it throws

**12. Where building on floodplains is unavoidable, build in a flood-compatible way.** That means using appropriate building materials and strategies. Slabs on the ground should not be allowed, and we should move away from plasterboard, chipboard, composite timber beams and plywood bracing which cannot handle immersion.

#### **Part 4: Conclusion**

Queensland can do a much better job of managing floods than it currently does. There has been only a relatively small commitment in the past to flood mitigation, much less than has applied in New South Wales, and there appears to have been little innovative work done in the context of flood warning by comparison with what has been attempted in recent months in Victoria notwithstanding the apparent use of Facebook by Queensland Police in January as part of the warning effort. Unless flood management is given a more appropriate priority, the people of Queensland are doomed to suffer to a greater degree than they should from the ravages of flooding.

This will be the more true if we are about to enter into a period of more frequent and more intense flooding than we have seen over recent decades, as is quite likely given that drought-rich periods are well known to have been interspersed with flood-rich ones in eastern Australia's history. The period 1980-2010 saw several severe droughts, the one which began late in the 1990s in some areas being particularly serious, whereas the years from 1950-80 were much more dominated by floods several of which were catastrophic in their impacts.

Successful flood management by its very nature is multi-faceted, and its many elements from structural devices to land use planning to individuals' flood behaviour must be applied with care. Some elements will need to be customised to particular environments (in some locations, for example, levees are inappropriate), but others (like warning systems and the education of residents about flood management) should be present in all flood-labile areas. There is a need for Queensland to reconsider its approach to the flood hazard and to tackle it more whole-heartedly and on a broader basis: the benefit will be that a greater measure of protection against floods will be achieved.

This is an historic opportunity to set in place the tools by which the most costly environmental hazard which the community of Queensland faces can be better managed in the public interest. It is an opportunity which should not be wasted. Given the fact that a relatively small investment in flood mitigation and better land use management can produce a substantial reduction in spending on flood relief and recovery, the effort is likely to be cost-effective from a national point of view.

In responding to the floods of 2010-11 the state should learn the lessons from the approach that was taken after the great flood of 1974 on the Brisbane River and its tributaries. The response on that occasion, by and large, was to concentrate on a single large, visible and publicly 'saleable' mitigative measure, the construction of Wivenhoe Dam, which came to be seen by many as having made Brisbane free of the threat previously posed by the Brisbane River. The folly was twofold: firstly, in putting faith in a single measure which could never have delivered the solution that was touted at the time, and secondly by allowing a gradual, inexorable and eventually large-scale intensification of development in the supposedly protected area downstream of the dam.

This was a textbook demonstration of the so-called 'levee paradox' (Smith, 1998, pp232-34), which works as follows. Communities, tired of flooding, insist on better protection from floods. After achieving it, they allow more development to take place in the protected areas, only to have it demonstrated by nature that the mitigation works (which might be dams, levees or other structural devices) were unable to prevent severe cases of flooding. Thus, by allowing the intensification of development on floodplains, we increase the level of our own vulnerability. The paradox is that the institution of the mitigation measure or measures paves the way for more assets to be damaged or lost. Thus the impact of a genuinely big flood is worsened, not lessened. No practical mitigation measure, incidentally, can make floods harmless.

Queensland should look at ways of retarding the processes by which vulnerability is increased. It should also look at better ways of managing floods as they occur, especially in the context of ensuring that flood warning systems are able to do the job they are designed to do. Part of this will involve preparing people to respond better to warning messages. Governments and councils have never in the past responded effectively to floods in this state, and political courage will be needed if this is to change. But the potential gains to be achieved are considerable.

Queensland has allowed the problem of flooding to accumulate for decades, and it damages communities repeatedly and expensively. Strong policy and community-protecting decisions — statesmanlike decisions, even — are needed from the state government and from councils. A larger, more co-ordinated effort is needed.

The approaches advocated here, including the wide range of flood 'treatments' alluded to in Part 3 of this submission, have been tried before in various parts of Australia. Some measures have proved to be politically difficult to institute, however, and there is a tendency for governments to slip away from the more contentious (and often highly effective and inexpensive) ones after the hue and cry of bad floods has died down. It is hard to be optimistic that things will be any

different this time, which might mean that Queenslanders will be condemned to suffering unnecessarily over and over again in the future when floods strike. This would be unfortunate in social and indeed economic terms as well as eminently avoidable

The most manageable natural hazard that Queenslanders have to deal with is rarely well managed in this state. But it does not have to be this way. Queensland should aim to do better.

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