EMERGENCY MANAGEMENT PLANS AND DEFICIENT DAMS (INTERNATIONAL BEST PRACTICE OR A HOME-GROWN APPROACH?)

INTRODUCTION

One inescapable implication of ownership of a large dam is the obligation imposed towards downstream communities by the possibility of the failure of the dam. This paper provides an emergency manager's perspective on how dam owners in Australia, with particular emphasis on New South Wales, have approached this obligation by applying 'international best practice'. By taking a number of specific examples it argues the need for 'international best practise' to be interpreted with the help of emergency managers to best fit the Australian and perhaps the New Zealand situation. The paper does not address the engineering aspects of design, construction, maintenance, inspection and operation of the structure. Rather, it concentrates on the arrangements required below the spillway to mitigate the effects of dam failure on individuals and communities.

WHEN DO WE PLAN?

It has been stated to the author on a number of occasions that a warning and evacuation plan should be developed for all high and significant hazard dams. This seems to be a standards-based approach if ever there was one. When the author asked why, he was told that it was 'international best

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practice' and examples were quoted of a number of countries where this certainly seemed to be the case. The author then pondered why it might have been best practice because it seemed to conflict with best practice from an emergency manager's perspective.

The first step in developing a counter disaster plan or emergency management plan is to conduct a hazard analysis. This is a process designed to provide 'planners with an accurate picture of the range of disaster events faced by the community at risk, and the possible effects of the impact of those events upon the community'.[1] Each hazard is considered in relation to its predictability, frequency, controllability, duration, scope and intensity of impact. Hazards are then subjected to a risk assessment using standardised models to decide whether or not action to reduce the probability or protect people from the consequences is desirable. This then forms the basis for further planning action. A phrase often used by emergency managers is that it defines the 'credible' threats which need to be planned for. A corollary of this approach is that there is no need to plan for the failure of a dam just because it exists.

A difficulty with talking of credible threats of course, is that credibility is largely a matter of perception and not necessarily based on an understanding of fact or mathematical probabilities. Whereas nuclear power plants, for example, are often regarded as posing a credible threat to a community, dams by comparison are more likely to be regarded as stable structures unlikely to fail.

If there is no credible threat to a dam, why plan for its failure as it is sometimes suggested that international best practice indicates is actually done? The author understands that planning for failure has been done for all high and significant hazard dams in Switzerland. Perhaps this example provides the answer. The planning was carried out because of the 'credible' civil defence threat

arising from the Cold War and Switzerland's geographical location. Perhaps this threat applies, or at least did apply until recently, in much of Europe and North America where dams could easily have been strategic targets for warlike operations. The Norwegian example also points to this having been the case.[2] Perhaps the planning was not done just because the dams existed, but because there was actually a credible threat after all. The point the author wishes to make here is that perhaps the reasons underlying international best practice should be examined rather than the practice itself to consider its applicability in an antipodean context. In New South Wales we accept the need to plan for 'deficient' high and significant hazard dams - not for all of them. As an extension of this approach we have also developed a system of allocating scarce planning resources where they are most needed rather than attempting to plan in each case largely for the sake of planning. This is done largely on the basis of the type and degree of deficiency. The process of recognising and classifying a deficiency is outside the scope of this paper.

WHAT IS AN EMERGENCY ACTION PLAN?

This term was commonly used by dam owners in New South Wales until a few years ago and is still used in at least one other State. However, it is not a term used by emergency managers in Australia and is therefore a potential source of confusion and conflict. The author's understanding is that it probably originated in the United States of America and that it is a development of the Emergency Operations Plans approach fostered by the Federal Emergency Management Agency in that country.

The Australian approach is to develop all hazard counter disaster plans usually based at the lowest level on local Government Areas. Usually called 'Disaster Plans' or 'Emergency Management Plans' they recognise certain principles such as the Unity of Objective, Efficiency and Flexibility. At the

same time these plans recognise the virtue of vagueness by not adopting a mechanistic program which discounts the human element and stifles individual initiative. The approach also recognises that a special threat may require a specific response which is outside the scope of the main plan and that it may be necessary to draw up a special plan to deal with it. In New South Wales the State Emergency Service has adopted this approach and develops special plans to cope with the effects of flooding, which in many cases is potentially caused or made worse by dam failure. Generally they are called Flood Plans and in a limited number of cases they are called Flood Emergency Plans.

There is a problem of uncritically accepting the Emergency Action Plan approach. A dam owner which accepts responsibility to develop such a plan may do so with the best of intentions. However, the resulting plan (including warning and evacuation arrangements) may not meet the requirements of the emergency management agency with the legislated responsibility to put such arrangements in place. Although the responsibility to develop the plan may be implied by 'duty of care' and other considerations, dam owners need to avoid the possibility of conflict by being aware of the responsibilities explicitly vested in others by legislation. The division of responsibilities which applies in one country may not be applicable in another with different constitutional and legal arrangements. Because of the Australian constitutional arrangements where responsibility for protecting the community against the effects of disasters rests with the States and Territories and not the Commonwealth, best practice in one State may not even apply in others except in the common application of concepts and principles rather than details.

The author accepts that dam owners have a responsibility to downstream communities but suggests that the responsibility is not discharged by the development of an Emergency Action Plan driven by the owner. There is an example from another State where a dam owner appears to have discharged

this responsibility by developing such a plan. It is considered adequate by the owner to provide timely warning to the downstream population who may be affected by flooding from the dam and/or failure of the dam. It does include arrangements for notifying some of the appropriate emergency management authorities. However, it goes no further than that. For example, it does not record how those authorities get the warning to the affected communities - in other words, it is incomplete on its own and the question must be asked whether or not it does discharge the owner's responsibility even though the owner appears to have complied with international best practice. Best practice does require a partnership - it is the precise nature of that partnership which requires definition when applying overseas experience within Australia.

WHAT IS THE DAM OWNER'S LEGAL LIABILITY?

The question arises then in relation to the required partnership between dam owner and emergency management authority - 'What is the legal liability of the dam owner in the event of failure?' The question is relevant, of course, where a dam owner accepts that another agency develops arrangements for warning and evacuating a community threatened by dam failure. The author is only able to put forward a layman's perspective which is as follows. If a dam fails the dam owner will be held to be culpable regardless of what the results of that failure are. This, of course, is based on an understanding that being culpable means being held to blame. From an emergency manager's perspective, the primary purpose of developing disaster plans, emergency management plans or special flood plans is to reduce or eliminate loss of life. An effective response operation will also result in two secondary effects. The first is a reduction in property loss or damage by having a prepared community which takes actions to mitigate damages. The second is a reduction in the dam owner's consequent level of liability given that this means an obligation especially for payment or

pecuniary obligations. Perhaps it is instructive to look at international best practice here and consider New York State where the situation is described as follows:

> 'Federal, state and local governments, and dam owners each have responsibilities in protecting public health and safety. Responsibility for public safety rests with the state. Dam safety programs help in fulfilling these responsibilities but do not relieve owners of legal liability.'[3]

WHAT IS A FLOOD WARNING?

Prior to becoming involved in emergency management in New South Wales, the author had worked at the Natural Disasters Organisation, the Commonwealth emergency management agency which is now known as Emergency Management Australia. He was therefore aware of the system of developing and disseminating 'flood warnings' in Australia. On arrival in New South Wales he also became aware of electronic alerting systems installed below some dams considered to be at risk of failure through overtopping.

However, these systems were not called dam failure warning systems but flood warning systems. Two points arise out of this. The first is that some communities suffered under the perception that the systems were meant to warn them of all impending floods. This was not the case of course and may have contributed to a further perception that these systems were not therefore effective. There were other reasons why the systems were not effective, including mechanical failure. However, the fact that they did not do what was expected of them may well have contributed to a perception that they didn't work. The second relates to the possibility of confusion between dam owners and

emergency managers. Perhaps international best practice was applied without understanding what it meant. The U.S. Bureau of Reclamation defines a flood warning as being 'a systematic effort to notify citizens to evacuate a specific area or take other protective action. This is contrasted with an alert, in which a more general population is alerted to the potential for flooding in a general area, with no instructions given to evacuate'.[4] These definitions are used differently from the way they are used in Australia.

Australians do not use 'alert' in the same way and do not issue 'flood alerts'. The term 'alerting systems' is used and usually refers to the hardware and other mechanisms to alert emergency management authorities to the need to do something. Flood warning is a general term relating to warnings to the community of all types and levels of flooding even down to minor flooding which may only cause inconvenience such as the closing of minor roads and submergence of low level bridges.

Current best practice, as described in 'Flood Warning: An Australian Guide', is that value is added to the flood warnings prepared by the Bureau of Meteorology before they are disseminated to the community. This is done by describing what the effects of the predicted class or height of flooding might be and what action the community might take. The vast majority of flood warnings make no reference to 'evacuations'. The point to be made here is that a dam owner who uses the term flood warning in the same way as the BUREC does will probably be talking at cross purposes with an Australian emergency manager. That emergency manager may develop a flood warning system which is not what the dam owner believes it to be.

While considering flood warnings it is instructive to turn to the definition of 'flood warning system'

contained in the ANCOLD guidelines on Risk Assessment. It is as follows:

> 'A system defining the level of flooding at which a warning will be initiated, the physical means by which it will be relayed and the persons to whom it will be given. The system includes all necessary hardware such as water level activators, and radio transmitting and receiving equipment.'[5]

An emergency manager reading this definition would probably conclude that this refers only to an alerting system. According to 'Flood Warning : An Australian Guide' a total flood warning system is much more than an alerting mechanism - it 'integrates flood prediction, the assessment of likely flood effects, the dissemination of warning information, the response of agencies and the public in the threatened community, and review and improvement'.[6]

The question should be posed then, 'Why do we have two Australian references indicating such a divergence of views?' The answer may lie in the source of information used in the ANCOLD Guideline. The list of references contains 197 entries of which only 32 are immediately recognisable as Australian. Most of the remainder are American from the United States. More importantly from an emergency manager's perspective though is the lack of references on counter disaster or emergency management. Given the importance of 'flood warning systems' and 'emergency preparedness plans' to the risk assessment process this is surprising to say the least. It indicates that, in this area at least, local emergency management expertise was not called upon.

WHAT IS AN EFFECTIVE FLOOD PREPAREDNESS PLAN?

These same Guidelines list the factors on which the incremental loss of life due to dam failure depends. One of these factors is 'the effectiveness of flood preparedness plans'. Ignoring the tautological nature of the title 'flood preparedness plan' the author wishes to explore the concept of linking effectiveness and flood plans.

DeKay - McClelland suggests that 'based on actual cases, that if the warning time is 3 hours or more, the population is not at risk given an effective warning system'.[7] This appears to be a valid conclusion to be reached from an examination of empirical data. However, two points must be made.

The first is that the judgement contained in the statement is a retrospective one. It does not indicate that similar judgements can be made in advance. Yet the ANCOLD Guidelines imply that this can be done and dam owners and others in the dam safety business have indicated to the author that such a judgement can be made in advance. Furthermore they have indicated that such a judgement can be used in the risk assessment approach to decision making, particularly when considering a flood upgrade to a deficient dam. The second point is that DeKay-McClelland refer to the effectiveness of the 'warning system' and not to the effectiveness of the plan itself. Both points present difficulties for emergency managers. To explain why requires some indulgence in semantics related to 'effective' - which means 'productive of or capable of producing a result'.

Let's assume for the moment that the result being sought is the complete evacuation to safety of a Population at Risk (PAR). If a dam fails and this result is achieved, somebody can look back and say 'yes, what we did was effective'. If some of the PAR were not evacuated, that same persons could look back and conclude 'what we did was only partially effective' and could place a figure on the

degree of effectiveness - perhaps using the percentage of the PAR who were safety evacuated as the measure. A point to be made here though is that the assessment of effectiveness is a retrospective one. Most emergency managers will argue that this is the only way in which the effectiveness of a response operation can be assessed. The phrase used above is 'what was done' and not 'what was planned to be done'. The importance of this is that in emergency management the plan and the actual response are not necessarily synonymous.

This leads to consideration of the second aspect of the definition that 'effective means capable of producing a result'. An experienced emergency manager will argue that a plan, on its own, is not capable of producing the result being sought - that is the complete evacuation to safety of the PAR. Planning is only one of the means of improving the effectiveness of a response operation, with a range of other variables coming into play at the time, some of which are beyond the control of the person or persons running the response operation. Other variables can include the level of public awareness, the standard of training of individuals and agencies, the operability of items of mechanical and/or electronic equipment, the meteorological conditions, the decision making capability of key individuals and so on. It is possible that, given so many variables, adherence to the plan could result in a non-effective response operation. Alternatively, an effective response operation could ensue even if the plan is not followed. The link between the existence of an appropriate plan and an effective result may be tenuous to say the least. It is incorrect to assume that a flood plan can be examined and an assessment made on how effective it will be in ensuring that a PAR will be evacuated to safety.

It is a matter for dam owners to select appropriate factors to consider when deciding whether or not to upgrade dams. The existence of an alerting system could be used, as could the existence of a set

of warning and evacuation arrangements. However, a predictive assessment of the effectiveness of a plan should not be used because it is based on an assumption which will not stand up to scrutiny. What's more, its use would almost certainly be contrary to competent emergency management advice.

This problem has been addressed recently through discussion with the ANCOLD Working Party which is currently reviewing the Flood Guidelines. The end result should satisfy both dam owners and emergency managers while still allowing for the risk assessment process to be used in decision making related to the upgrading of flood deficient dams.

WHAT ABOUT FLOOD INSURANCE?

Another question which arises from the translation of international best practice to Australia and possibly New Zealand relates to the BUREC approach of seeking a community's acceptance of warning and evacuation plan in lieu of structural upgrading. The question is 'what part does the availability of flood insurance play in the decision of a community to accept a certain level of flood risk?' Given that flood insurance is not available in New South Wales a follow-up question is 'would a community in that State be prepared to accept the same level of risk?'

WHAT DOES ALL THIS MEAN?

The questions posed in this paper and the comments in reply are designed to illustrate some problems involved in uncritically accepting international best practice. They are not meant to argue for rejection of that practice. Accept international best practice by all means. But before doing so,

seek emergency management input in relation to matters 'below the spillway'. This input should assist in developing an understanding of the counter disaster or emergency management concepts and principles being applied, help in translating words and phrases to those used locally, and help in transposing practices between different sets of constitutional and legislative frameworks.

Readers may ask, 'is this all really necessary?' The author's experience over the last five years indicates that there can be no doubt about the necessity for developing a home-grown product. He has come to this conclusion after many discussions with dam owners and others. Many of these discussions were animated to say the least and in many instances arose more from differing perceptions and interpretations rather than disagreement on underlying principles. However, there have been cases where there was disagreement on the basis of principals and their application. Given that the courts use precise language in applying the law, the advantage of dam owners and emergency managers having a precise understanding of each others language should be obvious.

Prompted by the New South Wales Dam Safety Committee, an attempt was made to come to grips with this problem early in 1993 with a workshop at the Australian Emergency Management Institute, Mount Macedon. Despite some good results to come out of this activity, a home-grown set of best practices in this field was not developed. There were a number of reasons for this failure, one of which was timing. By this is meant that early in 1993 the emergency management community in Australia was still developing its thinking in this area and was probably not ready to develop best practice. It is probably fair to say however, that the community is now looking to define best practice in a number of aspects of flood management within the Australian context and is embarking on a series of activities over the next couple of years to do so. Given that the dam owning and dam safety community is also in the process of replacing a standards based approach with a risk

assessment based approach to decision making, perhaps the timing is opportune on both sides.

CONCLUSION

The best way to develop a home-grown approach to best practice is probably the subject of a workshop in itself. However, an option favoured by the Author is the establishment of an ANCOLD Working Party tasked with examining international best practice in the field of arrangements below the spillway. Its task would be to report to ANCOLD on how international best practice may need to be interpreted, reworded or translated to best fit the Australian context. The main advantage of this option over a workshop or series of similar activities is that it provides continuity. Practices being considered by the dam owning community can be examined as they come to notice and the more constant contact should result in better integration of the activities of the dam owners, dam safety authorities and emergency management agencies. The required level of integration can only occur within a fully developed home-grown version of international best practice.

END NOTES

1. Australian Counter Disaster College, Counter Disaster Planning Course Notes.

2. Martinsen J.G. 'Dam Failure Warning Systems' in Hydropower and Dams, May 1995.

3. Department of Environmental Conservation, Flood Control in New York State, 1985.

4. Bureau of Reclamation. BUREC Dam Safety Policy, 1989.

5. ANCOLD, ANCOLD Guidelines on Risk Assessment, January 1994.

6. Emergency Management Australia. Flood Warning: An Australian Guide. 1995.

7. ANCOLD, ANCOLD Flood Guidelines currently under review.