Comments on Natural Disaster Insurance Review: Inquiry into Flood Insurance and Related Matters

The following comments are provided by Mark Babister and James Ball as part of their discussion with the Inquiry. These comments have been prepared at the request of Engineers Australia but are the opinions of the authors and not necessarily Engineers Australia. Mark Babister is the managing director of WMAwater and immediate past chair of the National Committee on Water Engineering. James Ball is an Associate Professor at the School of Civil and Environmental Engineering University of Technology, Sydney and Editor the upcoming edition of Australian Rainfall and Runoff the national guideline on flood estimation. Both Mark and James are members of the steering and technical committees overseeing the revision of Australian Rainfall and Runoff.

The comments focus on:

1. issues that need to be carefully considered to ensure that long term reduction in national flood risk occurs as part of an insurance scheme; and

2. issues associated with implementing a national flood mapping process and the pricing of risk.

1. Flood Insurance

a. Need

The provision of cost effective flood insurance will address a major deficiency in floodplain management in Australia. The family home represents the major investment of most families in Australia and flooding can result in circumstances where people not only lose this investment but they are still heavy indebted for the finance. This problem is also skewed to people less able to absorb this economic shock as houses in most flood-prone areas tend to be bought by lower income families and first home buyers. The ugly positive of the current situation is that it provides a very strong and brutal driver for occupation of houses in high risk areas to either be abandoned or redeveloped at a higher level. However anecdotal evidence suggests that the redevelopment of many flood prone properties is not carried out by the flood affected owner but by a subsequent purchaser.

b. Risks

Unless a National flood insurance scheme is coupled with good floodplain management it will encourage the occupation of high risk areas and encourage further investment in the family homes, which in the long term will push up the pool cost of insurance. A similar situation is often found with levees and mitigation dams where once home owners believe their flood risk has been eliminated (even though all structural flood works still have some residual flood risk as eventually a large event will over top them). Home owners invest in redevelopment and extension such that over a decade or two, even after adjusting for inflation the long term economic cost of flooding has not reduced.

Another problem has been encountered in the US flood insurance scheme where the owners of houses in very frequently flooded locations regularly harvest the scheme for rebuilding

and redecorating. In many cases the cumulative payouts exceed the value of the house (US Dept Homeland Security, 2009). This issue was addressed in the *US Flood Insurance Reform Act of 2004* (US Dept Homeland Security, 2009).

Bodycott and Benning (1997) in a discussion of the then NSW floodplain management guideline document noted that expected flood damages were continuing to increase despite extensive expenditure on flood mitigation works necessitating a change from the previous control methodology.

c. Solutions

Linking flood insurance with good floodplain management processes will remove many of the risks associated with a national flood insurance scheme. A good floodplain management process contains a range of elements that include:

- Good floodplain mapping;
- Good quantification of flood risk (includes recognition of the uncertainty inherent in assigning exceedance probabilities to flood levels);
- Good assessment of suitable design flood planning levels and the associated freeboard;
- Detailed survey of the habitable floor level of at risk properties;
- Investigation of mitigation measures and a proper economic assessment using cost benefit analysis;
- Good land use planning and appropriate building controls;
- Continuing community education of flood warning, evacuation and response;
- Implementation of measures to reduce the number of at risk properties by either mitigation measures or other measures such as buy back of high risk properties and house raising schemes; and
- A process to ensure that land use planning outcomes do not encourage new dwellings that are in inappropriate locations.

A complete floodplain management process is important as only having all of these components will ensure flood risk is properly managed. It also helps the community understand that risk can be managed and that while some risk can be eliminated there will also be a degree of residual risk that must be managed. Another important outcome would be making flood risk information publicly available in an easy to use way. This will allow future users or purchasers of land to enter into a purchase or lease in an informed way.

It is also possible to link insurance with some risk reduction measures. Voluntary purchase of high risk properties is often used to remove people and houses from areas of the flood plain where the risk of loss of life is very high. The housing stock is usually removed and the land used for public open space. Such measures could be linked so that where the damages

to the house are extensive insurance is payed out together with the purchase of the land and the house by government under a program to remove such dwellings from the floodplain. Similarly in areas where the risk to life is not so extreme but the building damage is extensive payout could be linked to raising the existing dwelling above the prescribe flood level or rebuilding to that level.

Such a policy would also provide an added incentive to remove at risk houses in existing voluntary purchase zones. The removal of houses in these zones often stalls with investors purchasing properties with a guaranteed government buyback scheme. These dwellings then become low end rental stock whose occupiers can least afford the loss of their possessions.

Another problem with the current flood insurance model is that insurance is often paid out on a like for like basis removing the option of replacing damaged materials and fixtures with flood compatible materials or raising expensive electrical items. A simple example would be when replacing a water damaged air conditioning compressor and placing the new unit higher on the wall on the house.

2. Quantification of flood risk

Australian home owners take a very strong personal interest in flood maps or tagging of their properties as flood prone and are very quick to challenge any tagging as it is perceived to have serious detrimental effect on property value. While it is outside this document's scope to discuss the effect of tagging properties on property values, experience has shown that major community problems arise if mapping or tagging of properties can be shown to be not based on rigorous and sound technical work. A similar reaction is expected if houses are incorrectly tagged or mapped as flood liable for insurance purposes.

To get a reliable estimate of flood risk for a property 3 data sets are necessary:

- Reliable ground digital terrain model,
- Quality flood mapping based on sound modelling, and
- Accurate spatial coordinates of each dwelling including the elevation of the primary/habitable floor level.

a. Digital terrain models

The last ten years have seen very significant advances in the remote sensing methods for collecting terrain information. Airborne Laser Scanning (also called LIDAR) has become the default method for collecting terrain information for flood modelling and a range of other purposes. The information collected by this method is generally accurate to +- 150mm which is sufficiently accurate for flood modelling. The coordinated national method for the sharing and use of this information amongst all levels of government and between government departments is working extremely well.

b. Flood modelling and mapping

The flood modelling behind flood maps is the most complex part of the quantification of flood risk. Australian Rainfall and Runoff (ARR, Pilgrim 1987) is the national guideline document that underlies all work in this area. This document was currently being updated and is scheduled for progressive chapter release over 18 months beginning early 2012. This time frame is dependent upon funding being found for the 2nd half of the updating. In order to finish the updating a further $5 million in funding will be required. The current version was last published in 1987 other than one of the 14 chapters that were updated in 1998. For this reason the current version does not properly address many advances in methods and techniques and the ability to apply current computer power to methods in ways that were unthought-of in 1987. The current update has been funded by the DCCEE with BOM funding the rainfall component and in-kind industry support matching all funds.

The most significant feature of ARR is that it is not a rigid standard but a guideline document as it is well recognised that because of the high variability of rainfall and stream flow and the range of different flood problems and mechanisms a single uniform approach cannot be recommended. The strength of the document also comes from the fact it is developed through broad interaction between research and practitioners. The non-geographically specific parts of the document also form the basis of many of the national methods used in Oceania and parts of south East Asia.

As part of the flood modelling process hydrodynamic (hydraulic) models are required to generate the flood surfaces. A national guideline on this aspect has been prepared as part of the ARR project and is currently undergoing independent review.

There are various rapid flood risk assessment techniques available that give a broad understanding of flood risk. These methods trade off reliability for speed and cost. Currently these techniques struggle even when just used for assessing portfolio risk and are completely unsuitable for assessing individual properties.

c. Geo coding flood prone properties

To accurately assess flood risk of an individual dwelling it is necessary to know its exact location and the floor level. It is very important to know the elevation of the main floor level to determine individual flood risk of individual houses as most flood damage is generally low until the primary floor level is inundated. Prior to this damages are generally a result of yards, garages and sheds being inundated. This type of information is vital for the economic assessment of different mitigation options.

While the latitude and longitude of a house can be reasonably accurately determined existing spatial data in combination with geo referenced air photos there is no accurate remote sensing technique to determine floor level. Without this information flood risk can only be determined for the land and not the dwellings. Floor level information of flood affected houses is regularly collected as part of flood studies and floodplain management studies. It is collected without entering the dwelling using two station GPS survey equipment. The measurement is usually based on the level of the front door step but can also be done from the street. Generally when flood level information is collected information about the dwelling and land use is collected to assist in assessing management measures. This

usually includes basic information about the construction materials and number of levels. Much of Australia's old flood prone building stock is timber framed on piers and in many cases can be raised to reduce the flood risk. Two story dwellings give the owner the opportunity to move contents upstairs to reduce damages however in many flood prone areas the downstairs area has been illegally enclosed to produce extra living space and has a very high flood risk.

While this type of information is often collected on a study by study basis it is unclear what would be the best way collect this information and make it available nationally. The data could be collected by the lower tiers of government who commission the collection, hydrologists who carryout out flood studies or the surveyors physically collecting the data. Sometimes in flat areas floor levels are estimated by measuring their height above ground level but this cruder technique is used less often.

It would be a relatively simple process to produce a standard for the collection and measurement of this data. The more complex question is how individual land holders would get their information updated if they replace or raise their house. Such an update would need to be on the basis of information provided by a registered surveyor.

In the absence of floor level information for the purposes of risk assessment the insurance industry have used average floor levels for a particular style of house or a probability distribution of floor levels above ground level. This style of approach would not reward owners who have improved their flood risk.

d. Availability of expertise for flood modelling and mapping

Flood studies

There is extensive expertise in Australia in flood studies that produce flood models and mapping. Most of that expertise is in the consulting sector but some also exits in state government and the larger local councils. It is important that any process takes into account local practice that has been developed to address specific issues. To work in this area a good understanding of hydrology and hydraulics is needed. There is also a considerable amount of specialist research carried out in this area by the academic sector in Australia and practitioners and researches have a good history of working together in Australia.

Floodplain management

The expertise in this area is spread between local government, state government and consulting areas but tends to be concentrated in states with a strong floodplain management programs. NSW has the most developed program where flood risk is not just quantified but actively managed and long term programs are put in place to reduce flood risk.

Management of Studies

Most of the expertise in managing these studies lies in state government and large councils.

Local government also has a very important role to play in any process as they are responsible for most land use planning and are in a position to provided local input. Experience has also shown that flood studies need to have strong local input and actively

collect flood data from long term residents. This increases the reliability of results and community acceptance and is generally facilitated by local government. Any process used to implement a national flood mapping program needs to draw upon the extensive experience that already exists in these areas. This will require a consultative process that takes into account the needs of different uses. Flood modelling and mapping is a complex process that resists standardisation of the process but is amenable to the standardisation of the output. While floodplain management processes exist in some states and are well documented such as the NSW Floodplain Development Manual (NSW Gov, 2005), work is currently under way on a national floodplain manual that brings together different state processes and will act as a template for those states that have less developed process. This work needs to be supported and could be completed and nationally workshopped at a much faster rate with a relatively small injection of funds.

REFERENCES

J. Bodycott, N Benning, (1997), Floodplain management policy and practice in NSW — an update, Proc. 24th Hydrology and Water Resources Symposium, Auckland, New Zealand, IEAust, pp 59–63.

Pilgrim DH (Ed) (1987), Australian Rainfall and Runoff — A guide to flood estimation, IEAust.

Richard L. Skinner, Inspector General, (2009) FEMA's Implementation of the *Flood Insurance Reform Act of 2004*, US Department of Homeland Security.

NSW Government (2005) NSW Floodplain Development Manual — The management of flood liable land, NSW Government.

DP Loucks, JR Stedinger, DW Davis, EZ Sakhiv, (2008), Private and public responses to flood risks, International Journal of Water Resources Development, Vol. 24, No. 4, pp 541-553.

S Maijerink, W Dicke, (2008), Shifts in the Public-Private Divide in Flood Management, International Journal of Water Resources Development, Vol. 24, No. 4, pp 499-512.

CL Johnson, SJ Priest, (2008), Flood risk management in England: A changing landscape of risk responsibility? International Journal of Water Resources Development, Vol. 24, No. 4, pp 513-525.

J Handmer, (2008), Risk creation, bearing and sharing on Australian floodplains, International Journal of Water Resources Development, Vol. 24, No. 4, pp 527-540.

H Apel, B Merz, AH Thieken, (2008), Quantification of uncertainties in flood risk assessments, Journal of River Basin Management, Vol. 6, No. 2, pp 149-162.

PHAJM van Gelder, (2008), A framework for uncertainty analysis in flood risk management decisions, Journal of River Basin Management, Vol. 6, No. 2, pp 85-98.

J Hall, D Solomatine, (2008), Uncertainty in flood risk management, Journal of River Basin Management, Vol. 6, No. 2.

Vanessa Cançado, Lucas Brasil, Nilo Nascimento, André Guerra, (2008), Flood risk assessment in an urban area: Measuring hazard and vulnerability Proc. 11ICUD, Edinburgh, Scotland.

HS Wheater, RE Chandler, C Onof, VS Isham, E Bellone, C Yan, D Lekkas, G Lourmas, ML Seond, (2005), Spatial-temporal modelling for flood risk estimation, Stochastic Environmental Research and Risk Assessment, Vol. 19, No. 6, pp 403-416.

AD Koussis, K Lagouvardos, K Mazi, V Kotroni, D Sitzmann, J Lang, H Zaiss, A Buzzi, P Malguzzi, (2003), Flood forecasts for urban basin with integrated hydro-meteorological model, ASCE, Journal of Hydrologic Engineering, Vol. 8, No. 1, pp 1-11.