DO WE UNDERSTAND WHAT IS AN ACCEPTABLE FLOOD RISK? THE PEOPLE OF AUSTRALIA HAVE THEIR SAY

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Abstract

The current flood planning levels used to determine minimum floor levels represent an unacceptable risk to residents, according to the results of a national flood risk survey.

Molino Stewart created the online survey following the devastating floods at the start of 2011 to gauge people's perceptions of acceptable flood risk. Over 400 responses were received and included respondents from every state and territory across Australia.

The responses overwhelmingly show that there is a mismatch between current planning and many people's expectations.

Background

In recent decades there has been a tendency to use the 1% AEP flood to set minimum residential floor levels in NSW and elsewhere in Australia. Larger floods can and do occur, such as those which recently devastated Queensland and Victoria. The impact of such flooding can range from wet carpets through the complete loss of house contents, to structural damage to buildings. Despite this, the probability of these varying degrees of flood damage is generally not taken into account in setting planning and development controls and, in NSW, it could be argued there is a directive in place to specifically prohibit councils from doing so. The 2007 Section 117 Direction and EP&A Regulation on flood prone land requires that, unless there are exceptional circumstances, councils must adopt the 100-year flood plus freeboard as the Flood Planning Level (FPL) for residential development (NSW Government Department of Planning, 2007). Furthermore, the perceptions of residents who will experience the impacts of flooding are rarely explicitly explored when setting FPLs.

In light of these considerations, Molino Stewart conducted a survey of residents to determine what they consider to be acceptable flood risks. The survey was conducted online, following the devastating floods at the start of 2011. Quite simply it asked people to indicate how often they would accept having flooding in their yard, across their floor, up to their ceiling or destroying their house.

Methodology

The survey was launched online at the Flood Insurance Workshop at the FMA Conference in Tamworth on 22 February 2011. This was accompanied by an Australia wide media release to publicise the survey. It resulted in a number of regional commercial and ABC radio stations in Queensland and NSW interviewing Steven Molino about the survey which gave it wider publicity.

The survey showed participants a series of photographs including above ground flooding, above floor flooding, ceiling level flooding and a home destroyed by flooding and asked them to select from a list, an acceptable chance of each happening to their

own property. Choices ranged from once-a-year to never.

The survey also asked for postcode and suburb, whether the person had experienced flooding at their current property or another property and whether they expected their existing property could flood.

The questions required around two minutes to complete (Appendix A)

Limitations

There were several limitations to the survey which are discussed here.

It should be acknowledged that the population sampled in this study was small (413) compared to the estimated 150,000 properties in Australia that have a 1 in 100 chance per year of flooding at ground level (Risk Frontiers, 2011). However, since 90% of respondents were from NSW, the comparative gap is less if only those respondents are considered.

There was no way of knowing the exact location of the 'home' property and therefore its actual flood risk. It is possible that some, or even many, of the surveys were completed by those whose property has no flood risks. This issue was somewhat overcome as respondents were asked whether they had experienced a flood at their property or a previous property and whether they think their current property could flood. This allowed the breaking down of responses according to flood experience or perceived risk and an examination of the impact that this would have on risk perception and acceptance.

The survey respondents were self-nominating which may have introduced a bias in the results as they were not a random sample of the population.

The type of home built on the property was a further unknown which could have influenced some responses. Houses in some of the survey areas (e.g. Lismore) would be built on stilts which would mean that the images would be less representative of their flooding conditions. Nevertheless, the images were chosen to represent the impacts which flooding would have on assets and in that respect the house type should not greatly influence the response.

Not all respondents answered every question.

While the above limitations are acknowledged, and it would be inappropriate to suggest that the results are statistically representative of the Australia population as a whole, they clearly show some results which are instructive regarding attitudes to flood risk.

Results

There were a total of 413 responses but not all respondents answered every question. Table 1 provides a summary of the number of responses to each question. The following is a discussion of the results for each question as well as some simple analysis of results for segments of the respondents.

Table 1: The number of responses obtained for each question

Question	*Question Subject*	*Number of Responses*
0	Postcode	413
1	Suburb	407
2	Flood Experience	396
3	Flood Risk Expectation	389
4	Above Ground Flooding	377
5	Above Floor Flooding	375
6	Ceiling Level Flooding	371
7	Building Damaging Flooding	384

Question 1

As shown in Figure 1, the majority of the surveys were completed by respondents from New South Wales (90%). Outside of NSW, the most surveys were completed by residents of Queensland (2.9%), followed closely by Victoria (2.4%).

Of the 370 responses from New South Wales, 41% of these were from the Central Coast (mostly Gosford and Wyong LGAs) and 35% were from various regions in Sydney.

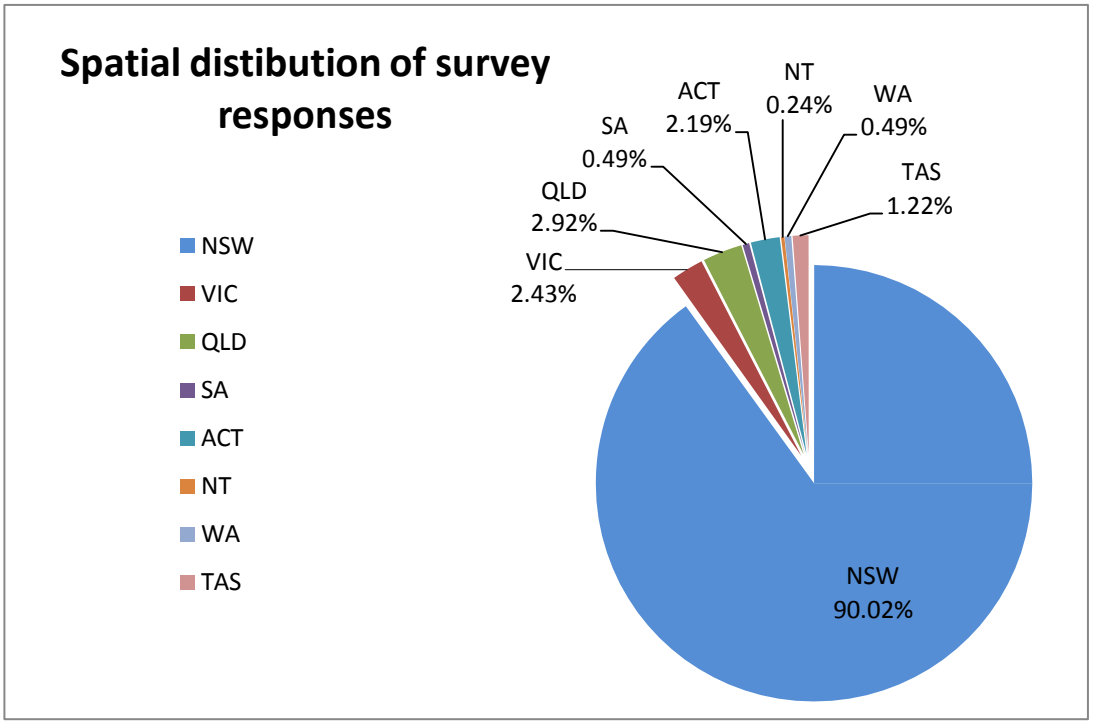

Figure 1: Distribution of survey responses across Australia

Question 2

When the results obtained for Question 2 were analysed, it was found that the majority of the people responding to the survey (76%) had no previous experienced of flooding in their homes (Figure 2). Thirteen percent of people reported that they had previously experienced flooding at their current property and an additional 11% had experienced it at a previous property.

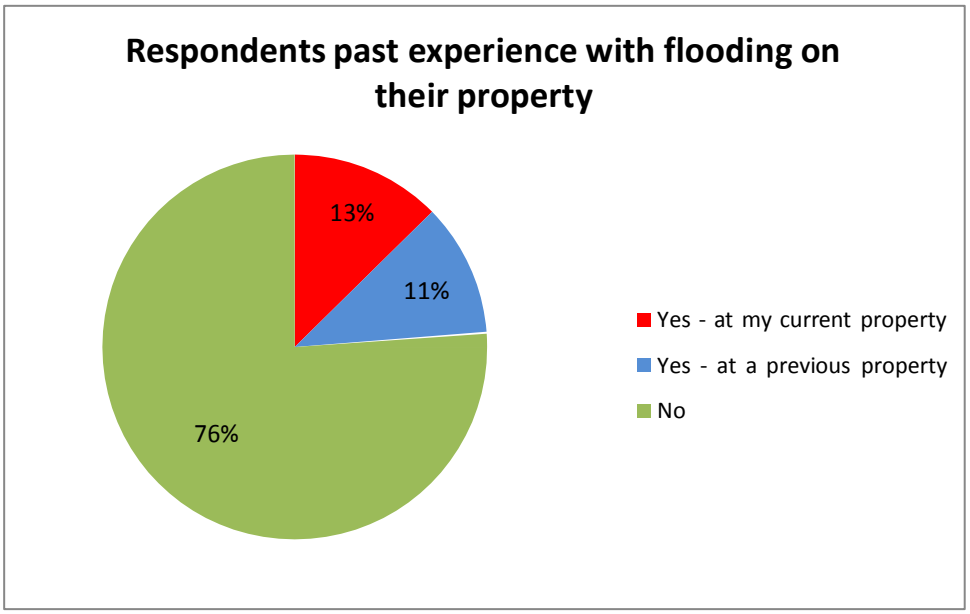

Figure 2: Respondents experience with flooding on their property

Question 3

The majority of the responses (68%) obtained for Question 3 of the study indicated that respondents did not believe that their property could flood in the future (Figure 3).

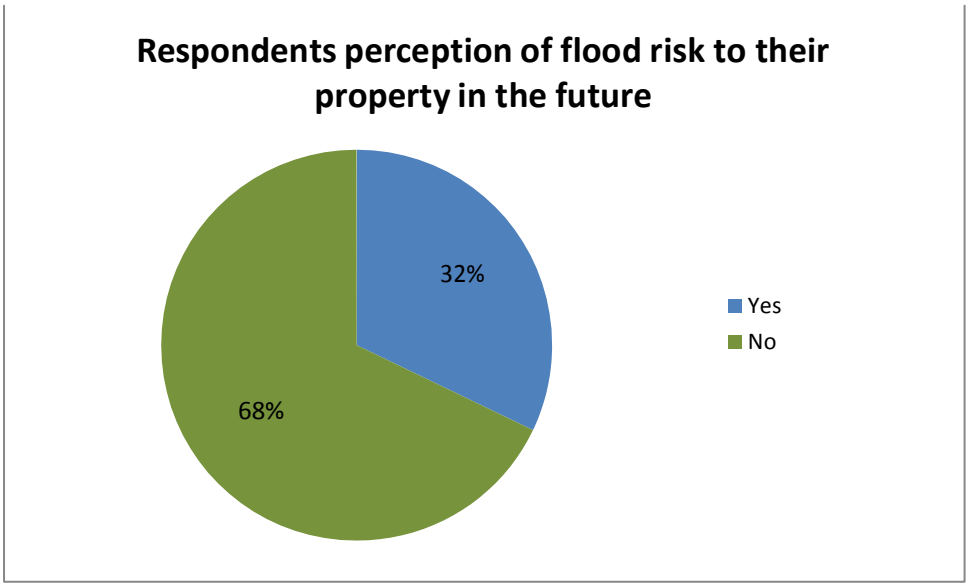

Figure 3: Perception of flood risk to their property in the future

The responses to this question were divided into groups according to their flooding experience.

Figure 4 shows that 85% of the respondents who have previously been flooded at their current property expect that their property might flood in the future. This distribution of responses is markedly different to those obtained from other respondents. For those who have experienced flooding at a previous residence (Figure 5) and those who have never experienced flooding (Figure 6), there were 26% and 25% respectively who expected to flood in the future.

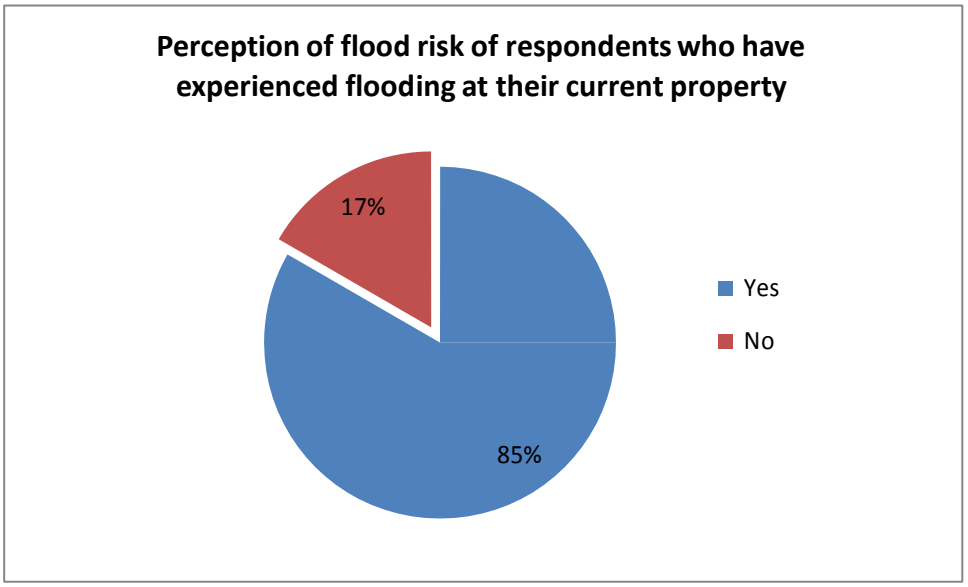

Figure 4: Perception of flood risk to their property in the future for those who have experienced flooding in their current property

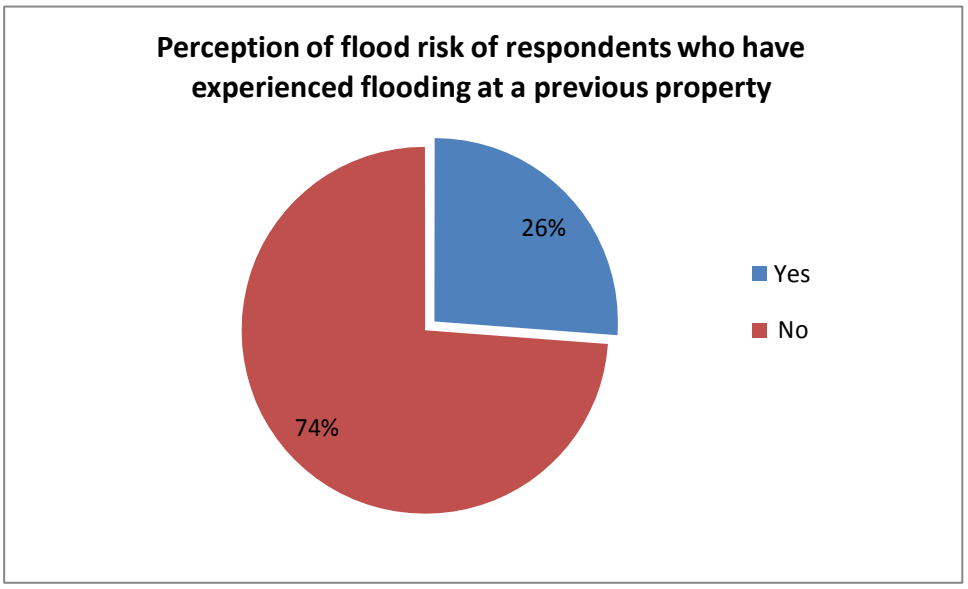

Figure 5: Perception of flood risk to their property in the future for those who have experienced flooding in their previous property

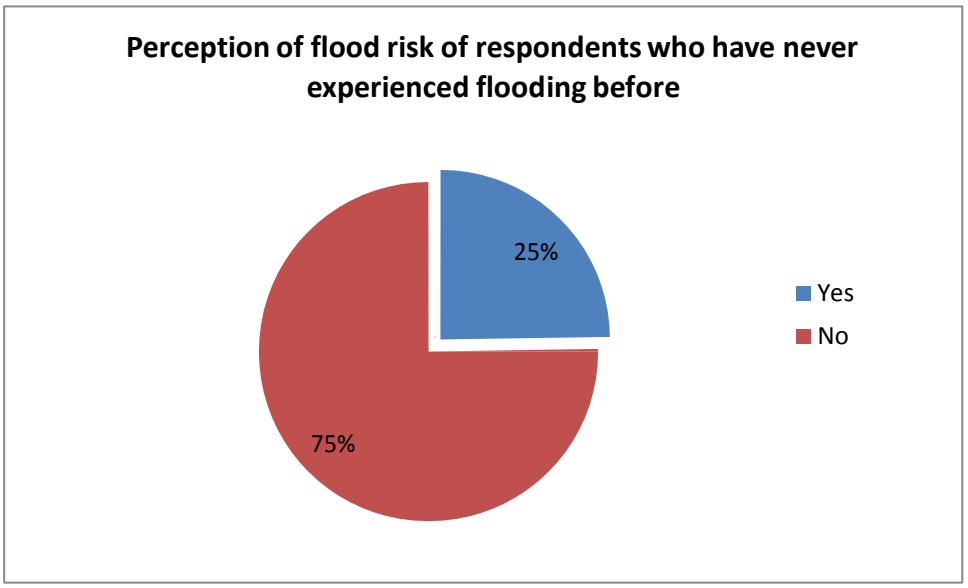

Figure 6: Perception of flood risk to their property in the future for those who have never experienced flooding

Question 4

When the respondents were questioned regarding the acceptable occurrence of flood levels which would enter either their front or back yard, 10% of responses indicated that it would be acceptible for this level of flooding to occur every few years (Figure 7). Twenty-nine percent suggested that it would be acceptible if it occurred a few times over the respondent's lifetime and 14% once in their lifetime. This suggests that about half the population would be accepting of their yard flooding at least once in their lifetime.

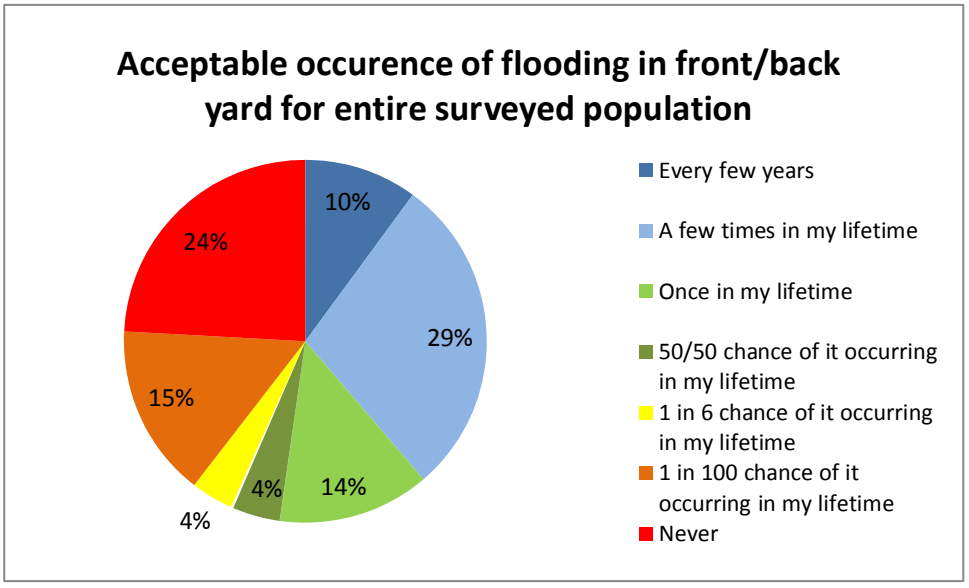

Figure 7: Acceptable occurrence of above ground flooding for whole population.

Four percent believed that it was acceptable when associated with a 50/50 chance of occurrence in their life time a similar number suggested a 1 in 6 chance in their lifetime would be acceptable. Another 14% said a 1 in 100 chance in their lifetime would be

acceptable. Given that a 1 in 100 chance per year flood has about a 50/50 chance of

occuring in the average person's life time and a 1 in 500 event about a 1 in 6 chance of occurrence, the sum of these statistics suggests that about a quarter of the population would only accept flooding of their yard by a low probability flood.

Almost one quarter of responses (24%) indicated that above ground flooding would never be acceptable.

The responses to this question were divided into groups according to the respondent's flood experience. Figure 8 provides a breakdown for those who had been flooded at their current property, Figure 9 those who had flooded at a previous property and Figure 10 those who had never experienced flooding.

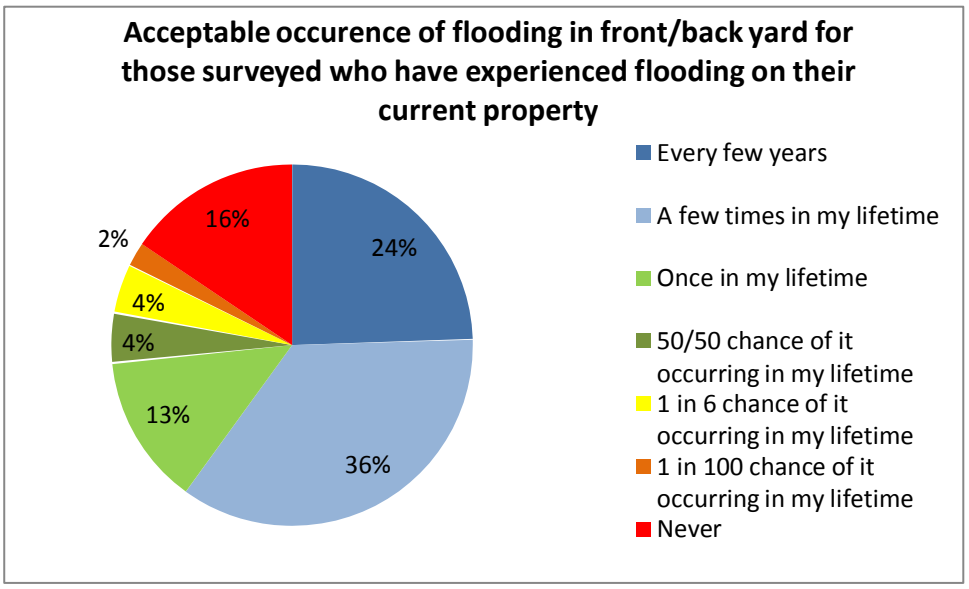

Figure 8: Acceptable occurrence of above ground flooding for those who have experienced flooding in their current property.

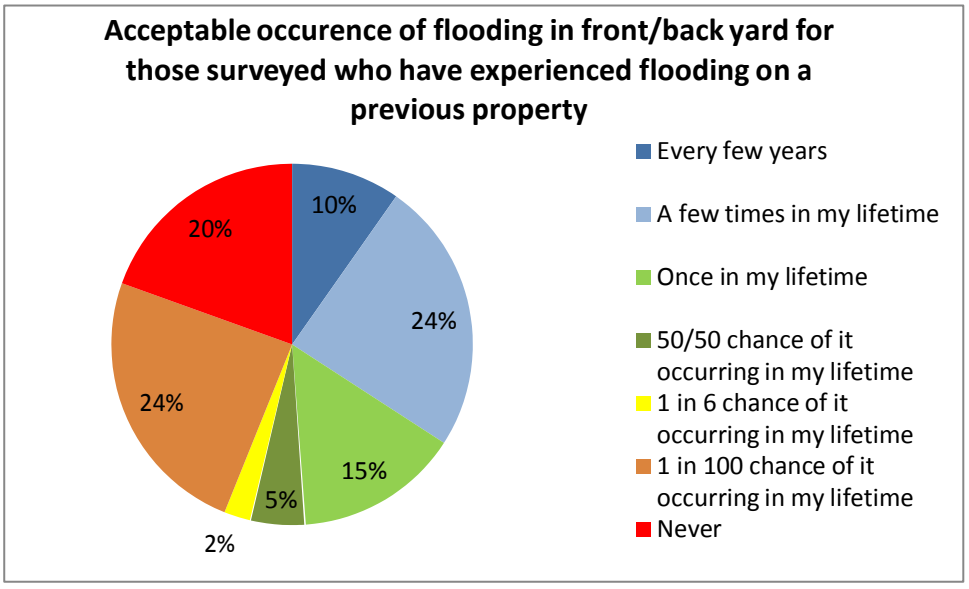

Figure 9: Acceptable occurrence of above ground flooding for those who have experienced flooding in their previous property.

From this analysis it can be seen that there is little difference between the distribution of responses between those who have experienced flooding at a previous property and those who have never experienced flooding before with the results, understandably, not varying much from the total population results.

Comparatively, those who have experienced flooding at their current property in the past are more accepting of flooding with nearly three quarters saying they would accept it at least once in their lifetime. Of note is that 16% of the people who said they had been flooded at this property said that it was never acceptable that their yard floods.

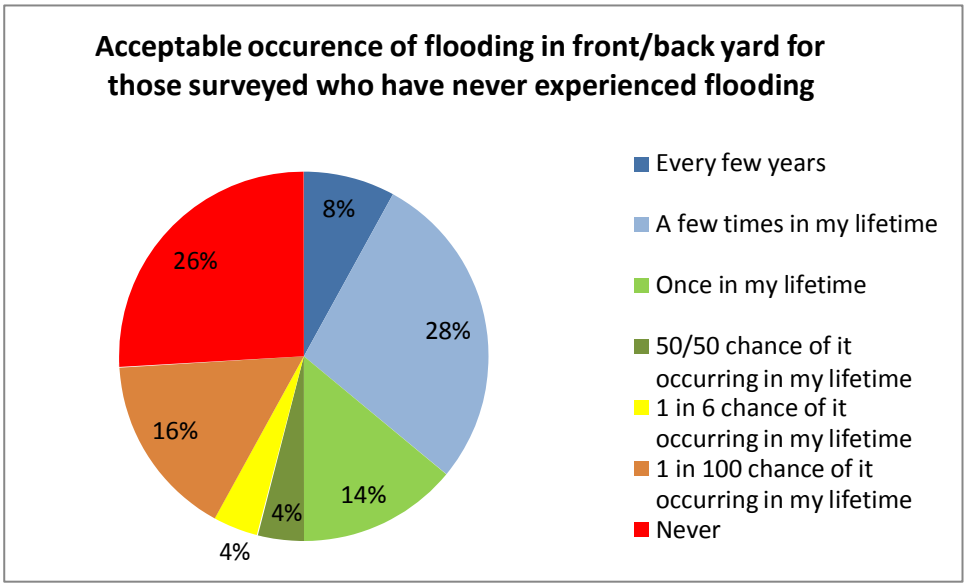

Figure 10: Acceptable occurrence of above ground flooding for those who have never experienced flooding.

Question 5

Question 5 asked respondents what the acceptable occurrence of above floor flooding would be (Figure 11). Over 70% of responses indicated that this level of flooding would never be acceptible. Only 10% indicated that in their lifetime a 1 in 100 chance would be acceptible, 3% responded with a 1 in 6 chance, 3% responded with 50/50 chance and 12% responded with 'once in my lifetime'.

The responses to this question were once again divided into groups according to whehter the respondent had been flooded at their current property (Figure 12), a previous property (Figure 13), or never (Figure 14).

Once again, those who had experienced flooding elsewhere or had never experienced flooding gave similar responses but those who had flooded at their current property were more accepting. Nevertheless, nearly 20% of them would only accept flooding from a 1 in 500 event or bigger and nearly 60% would not accept above floor flooding.

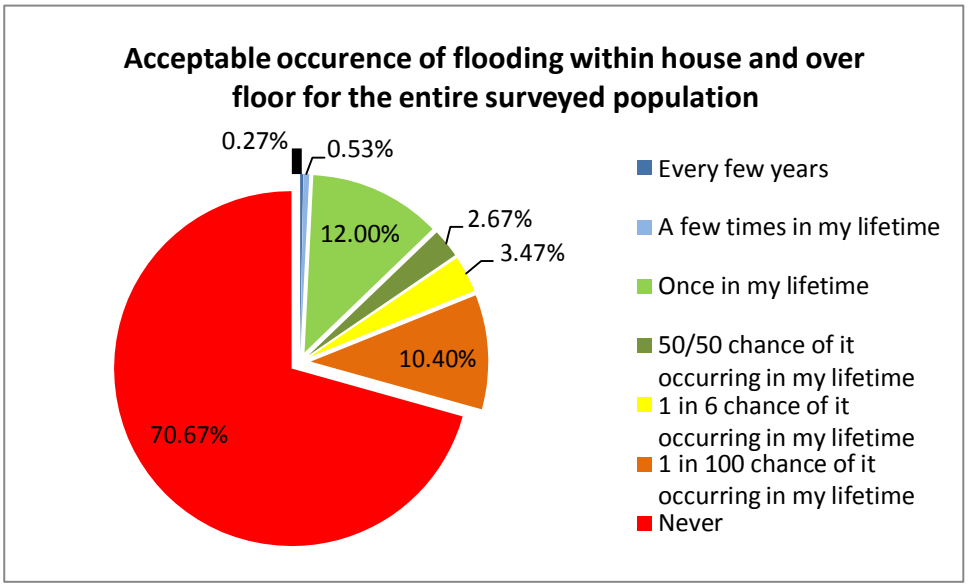

Figure 11: Acceptable occurrence of above floor flooding for all respondents.

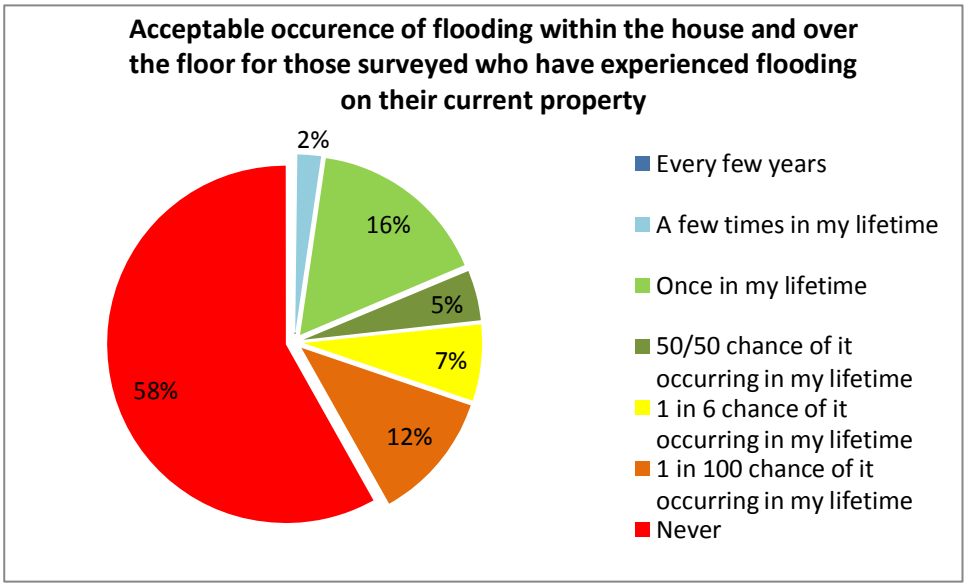

Figure 12: Acceptable occurrence of above floor flooding for those who have experienced flooding in their current property.

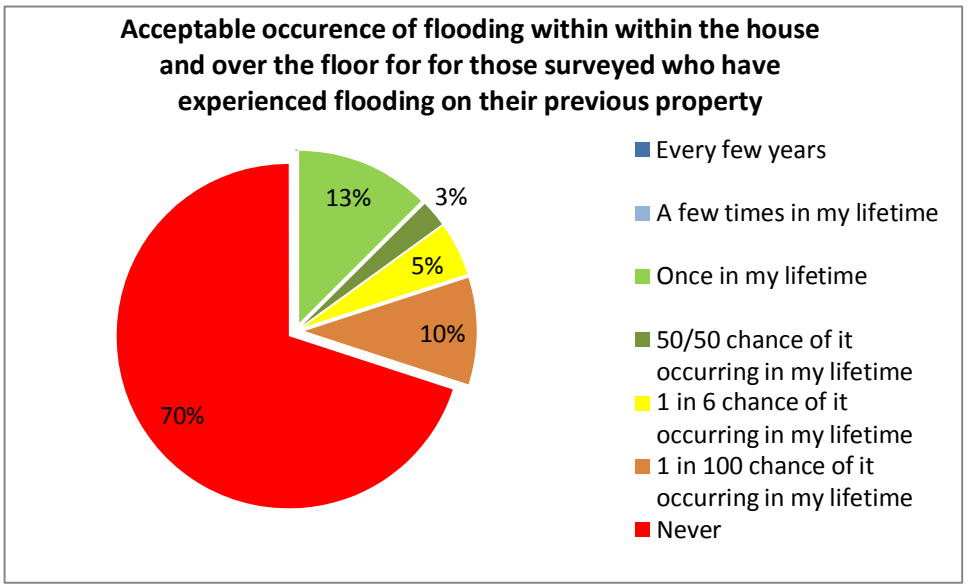

Figure 13: Acceptable occurrence of above floor flooding for those who have experienced flooding in their previous property.

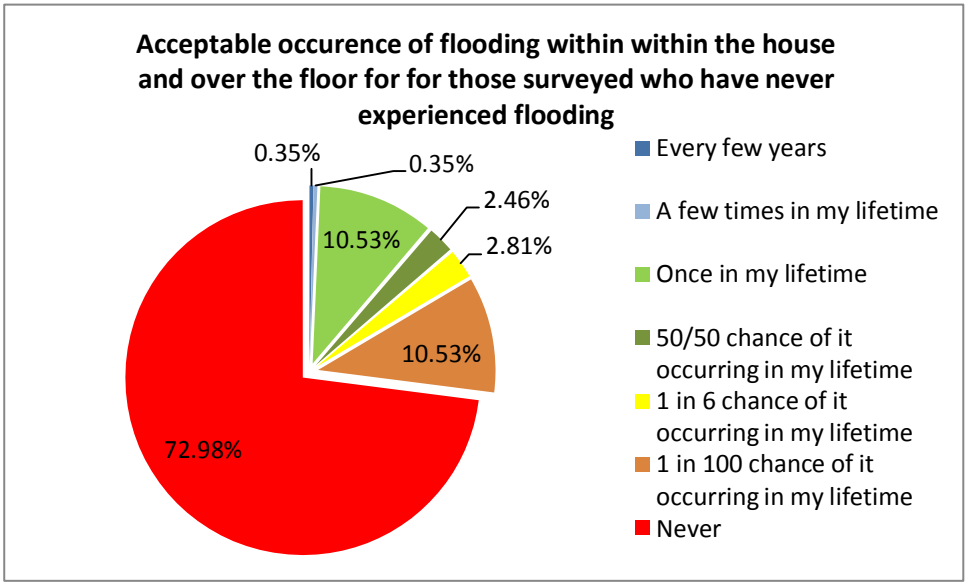

Figure 14: Acceptable occurrence of above floor flooding for those who have never experienced flooding.

Question 6

The sixth question asked respondents what would be an acceptable occurrence of flood levels reaching a depth of 2m indoors (Figure 15). Of the responses, 85% indicated that this level of flooding would never be acceptible.Only 9% indicated that a 1 in 100 chance in their lifetime would be acceptible, 2% responded with a 1 in 6 chance in a lifetime, 1% responded with 50/50 chance in a lifetime, 3% responded with 'once in my lifetime'.

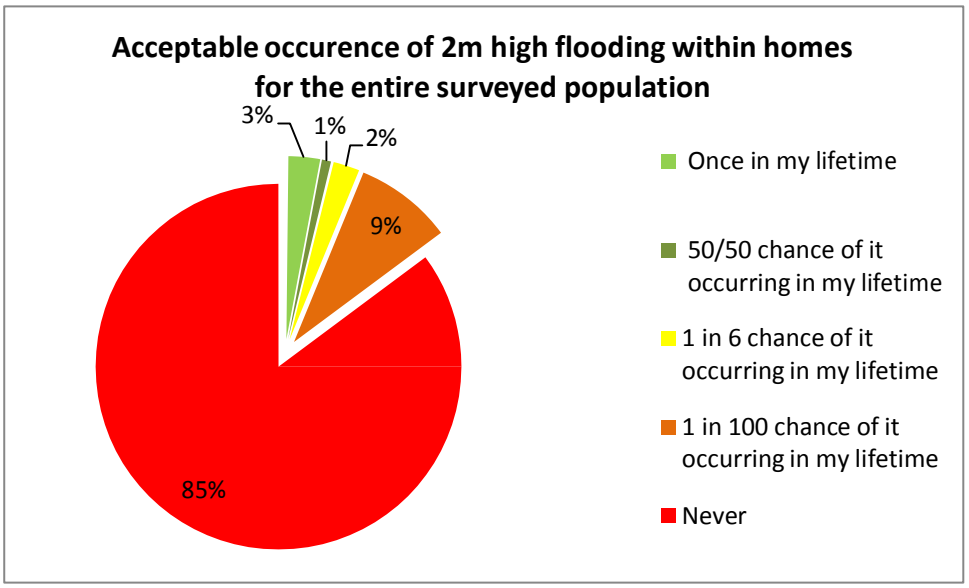

Figure 15: Acceptable occurrence of 2m high indoor flooding for all respondents.

The responses to this question were again divided into groups according to if the respondent had been flooded at their current property (Figure 16) a previous property (Figure 17) or never (Figure 18).

Once again, the division of the responses in this way shows very little difference between the distribution of responses between those who have experienced flooding at a previous property and those who have never experienced flooding before. In this instance, those who have experienced flooding at their current property in the past are still more accepting of flooding. However; the difference between the responses of this group and the other two is not nearly as significant as it was from the lower depths of flooding with 79% of those who had previously flooded saying that this level of flooding would never be acceptable.

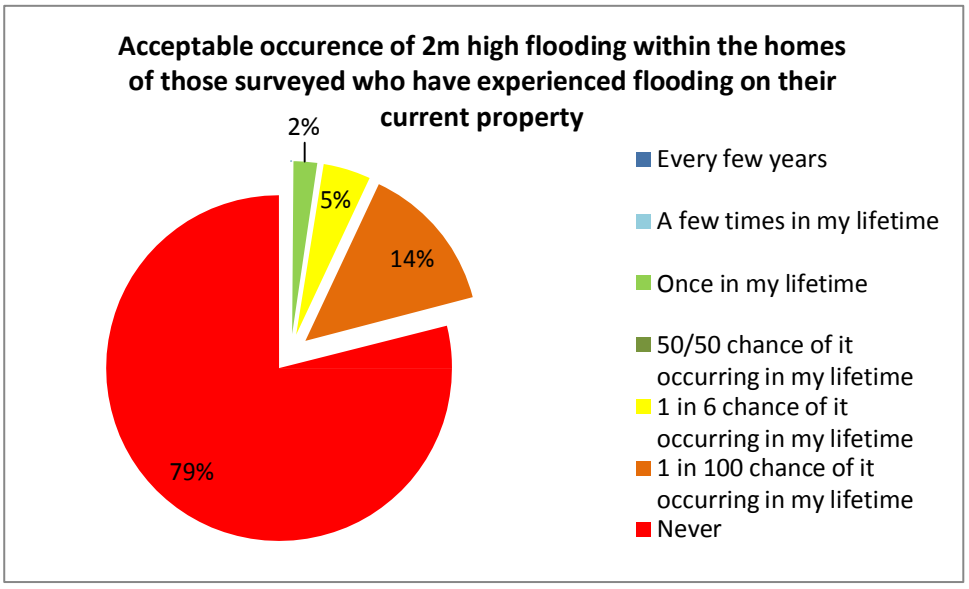

Figure 4: Acceptable occurrence of 2m high indoor within the home of the respondents who have experienced flooding in their current property.

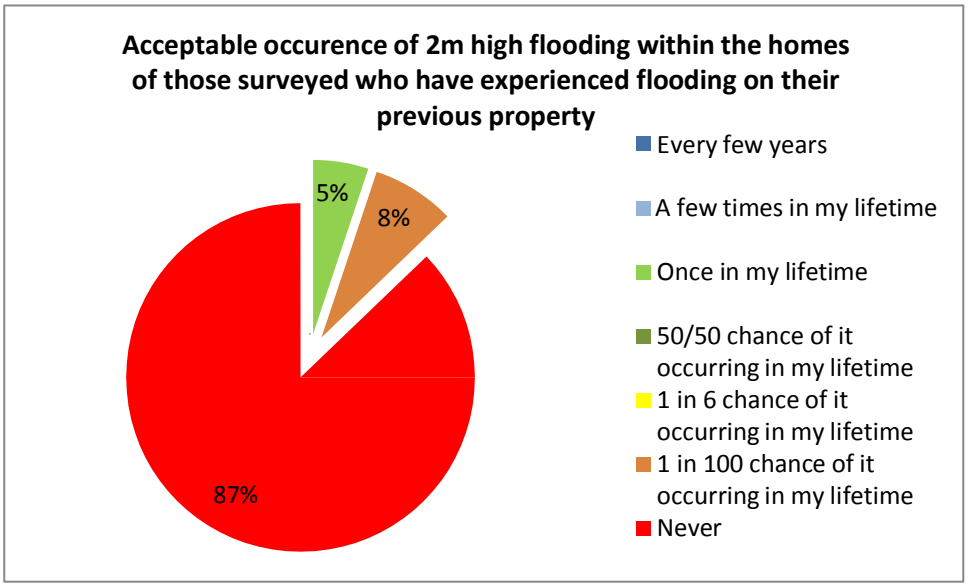

Figure 5: Acceptable occurrence of 2m high indoor within the home of the respondents who have experienced flooding in their previous property.

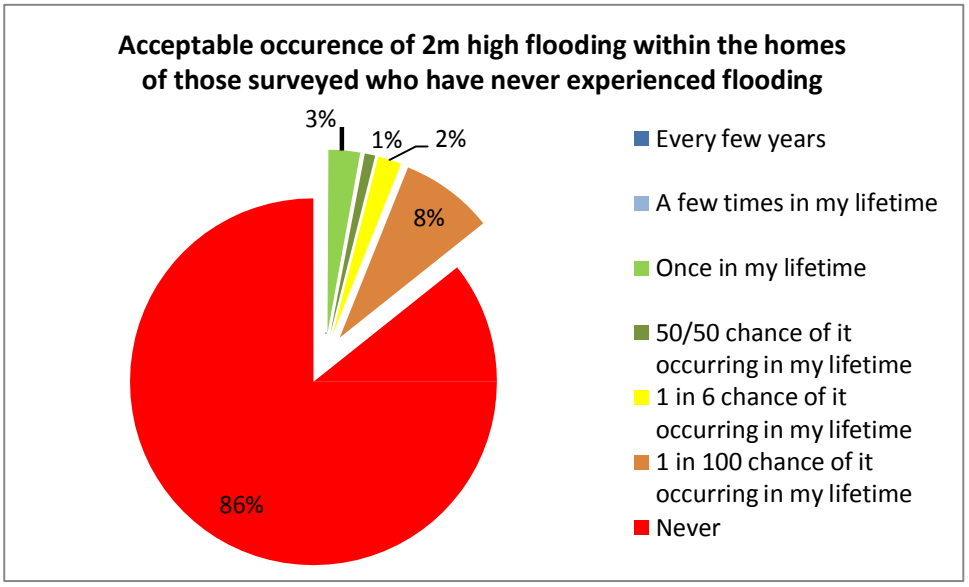

Figure 6: Acceptable occurrence of 2m high flooding within the home of the respondents who have never experienced flooding.

Question 7

When asked what was an acceptable chance of their home being structurally damaged by a flood (Figure 19), almost all respondents indicated that this would never be acceptable (91%). Only 6% suggested that it would be acceptable when associated with a 1 in 100 chance of occurrence in a lifetime, 1% responded with a 1 in 6 chance of occurrence in a lifetime, 0.5% responded that a 50/50 chance in a life time would be acceptable and 1.6% responded that they would accept a risk of this kind of flood occurring once in their lifetime.

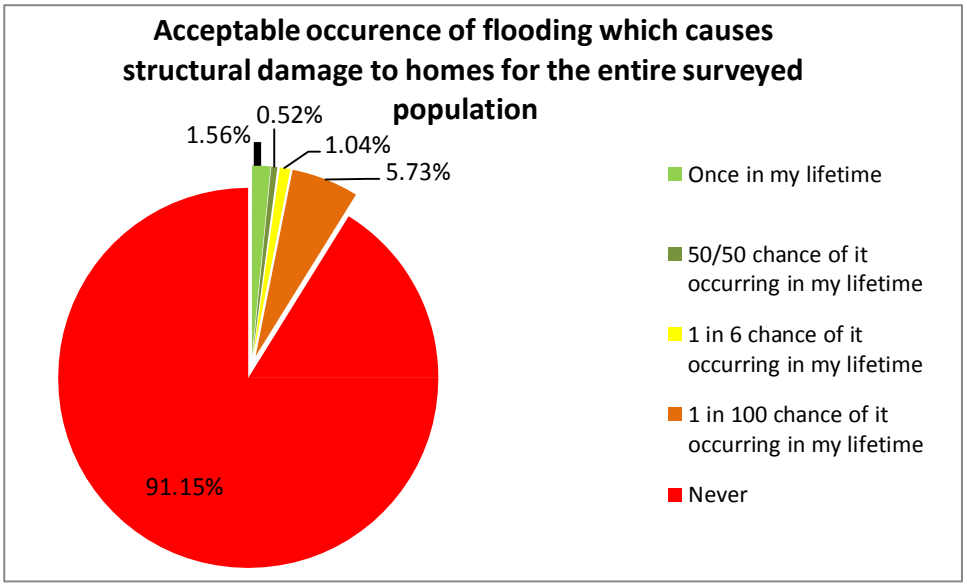

Figure 19: Acceptable occurrence of flooding resulting in structural damage to the home for all respondents.

The responses to this question were once again divided into groups according to whether the respondent had been flooded at their current property (Figure 20), a previous property (Figure 21), or never (Figure 22).

While there was some variation between groups, acceptance was low across the board. For example 86% who had experienced flooding on their current property would never accept this type of damage which 92% of those who have never flooded would never accept it. Of the small proportion in each category who would accept this type of flood damage, most expected it to have less than a 50/50 chance in their lifetime.

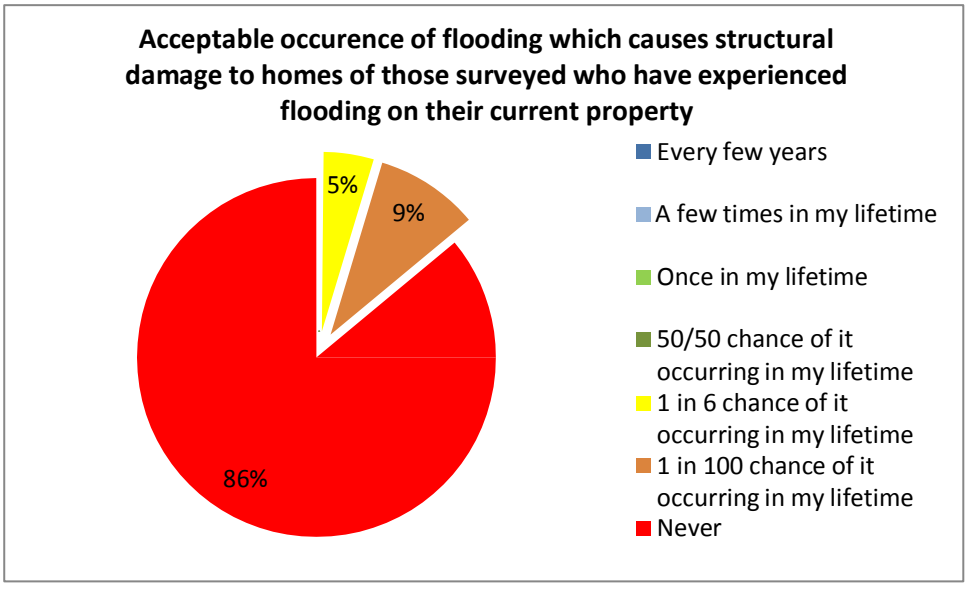

Figure 20: Acceptable occurrence of flooding resulting in structural damage to the home of respondents who have experienced flooding in their current property.

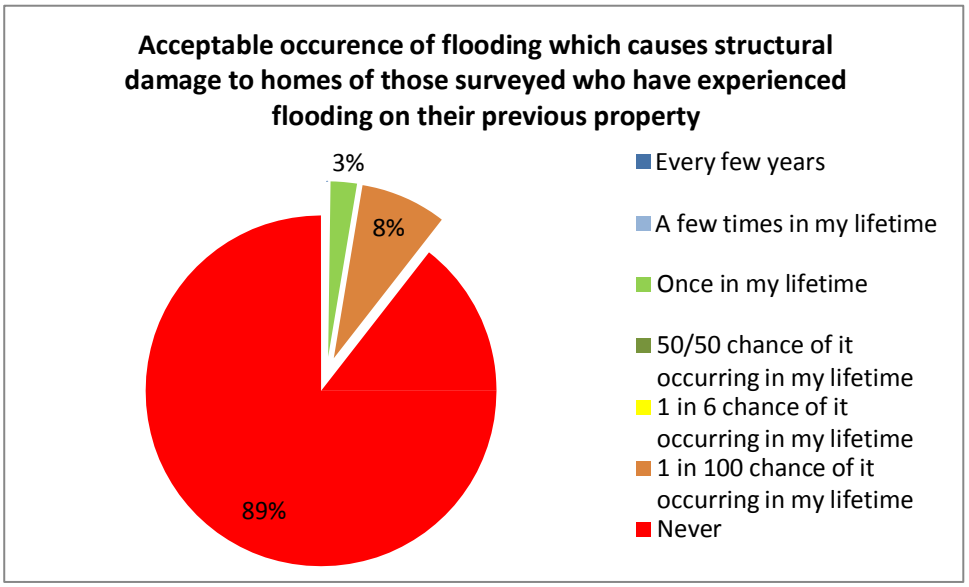

Figure 21: Acceptable occurrence of flooding resulting in structural damage to the home of respondents who have experienced flooding in their previous property.

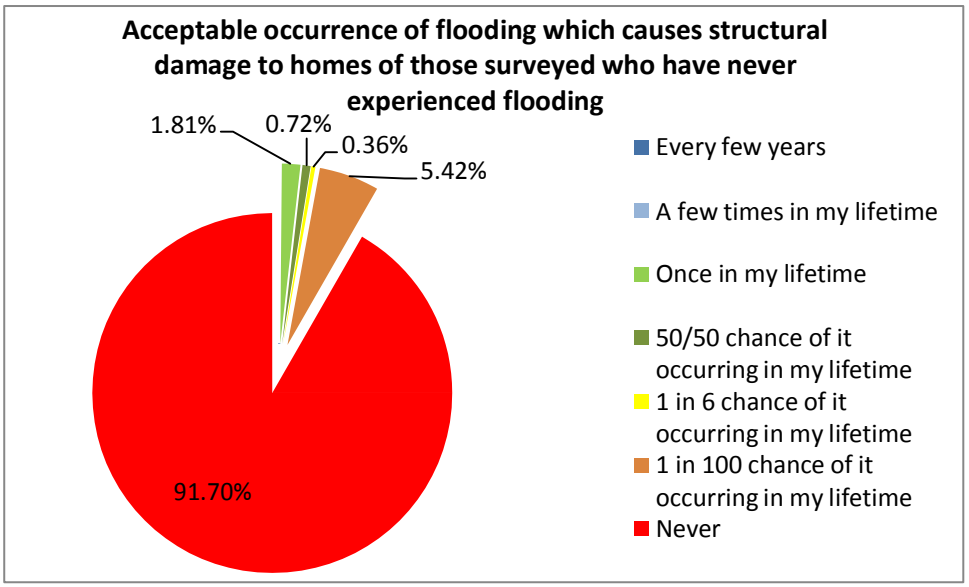

Figure 22: Acceptable occurrence of flooding resulting in structural damage to the home of respondents who have never experienced flooding

Comparison with Other Studies

A Queensland University of Technology (Godber, 2003) survey of Gold Coast residents living on the Nerang Floodplain found that the majority were aware of the potential for flooding in their area but that there were variations in the degree of personal risk or exposure perceived by the respondent; the flood risks which were considered to be 'acceptable' and the way in which land-use standards and flood risk information was interpreted.

Residents were shown photographs of three levels of flooding at properties: water in the yard; water at the house entrance; and water through the building. When residents participating in the study were asked if they would be prepared to accept each of the potential flood impacts to their properties:

Just on 60% answered that they would not accept flooding in to their yards, over 80% said that they would not accept floodwaters to their home entrance and almost 100% of people said that they would not accept floodwaters through their property.

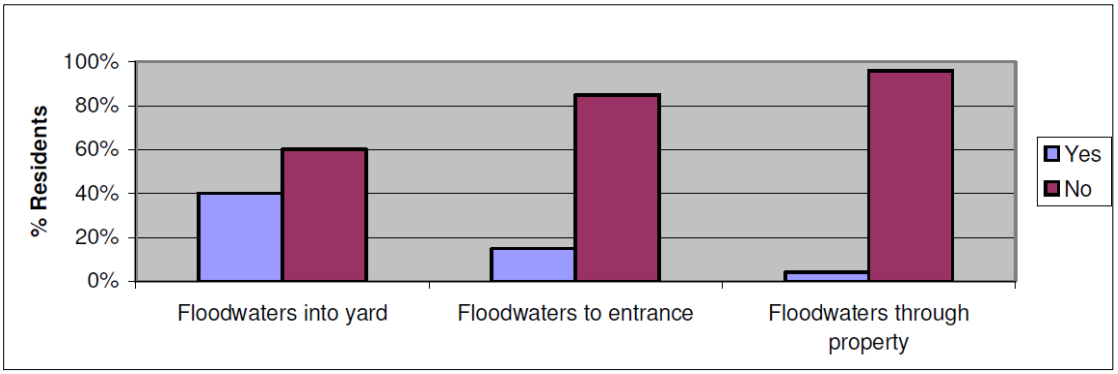

Figure 7: The impacts of flooding that residents are prepared to accept at their location, as determined by Allison Godber

This shows an even more negative response to potential flooding levels than that which was received in the Molino Stewart online survey. However, this may be due to the simple 'yes' or 'no' answer format.

Discussion

The 1 in 100 chance per year flood is generally used to set minimum floor levels and has about a 50/50 chance of occurring in an average person's lifetime. A recent survey by Gosford City Council on behalf of the Floodplain Management Association (FMA 2011) suggests that the majority of NSW Councils (60%) define flood prone land only in relation to the 1 in 100 chance per year flood. Planning controls generally require minimum residential floor levels to be set at the 1 in 100 level or a nominated height above it.

The Molino Stewart survey indicates that even where people have experienced flooding on their property before, nearly a quarter of them do not find a 1 in 100 chance per year of above ground flooding to be acceptable. If they have never experienced flooding nearly half would not find it acceptable. Rarely do planning instruments specify minimum ground levels for residential development.

When it comes to above floor flooding, less than 20% would find a 1 in 100 chance per year of flooding acceptable. While this may reflect a misunderstanding of the frequency of occurrence of the 1 in 100 flood, 70% indicated that it would never be acceptable. Even where people have experienced flooding at their current property, 58% indicated that above floor flooding would never be unacceptable. This may indicate that many believe that buildings constructed to flood planning levels should never experience above floor flooding.

While many councils apply a freeboard above the 1 in 100 flood level when setting planning levels, this is generally there to account for model uncertainties, dynamic fluctuations in water surface during a flood and possibly climate change. It is usually

not intended as a means of reducing the long term probability of above floor flooding to something less than 1 in 100 per year.

While some planning instruments consider floods larger than the 1 in 100 per year event in relation to life safety, few, if any, have development controls to protect buildings and contents from the consequences of larger events. In fact the 2007 S117 Direction specifically proscribes such controls. Yet this survey suggests that if larger floods are going to cause significant loss of building contents or building damage then the community expects a much higher level of protection from flooding.

It is acknowledged that in many places in Australia a house with a floor at the 1 in 100 flood level would never experience 2m depth of indoor flooding even in a PMF. But it is equally true that in many parts of the country floods much more frequent than a PMF would cause such depth of flooding and could even cause structural damage. With more than 80% of respondents suggesting that 2m of indoor flooding would never be acceptable and more than 90% suggesting that building failure is never acceptable, it suggests that the chance of such consequences need to be taken into consideration when setting planning controls on floodplains with large ranges of flood heights.

These results suggest that the current flood planning level for above floor flooding is not acceptable to the majority and the community expects a much higher degree of protection from even more severe flood consequences, something which most flood policies don't address.

Conclusions

The results from this survey suggest that:

- there is a significant gap between regulated "acceptable" flood risks and community perceptions of what is an "acceptable" flood risk.
- the consequences of flooding are a significant determinant of acceptable risk.
- those who have previously experienced flooding at their current property are more likely to accept flooding than others
- the community expects a higher level of protection from severe consequences than current floodplain planning delivers

While the conventional floodplain planning wisdom has been that using the 1 in 100 chance per year flood to set residential floor levels strikes the appropriate balance between practical and economic use of the floodplain and protection of property, the survey results suggest that one or both of the following is needed.

- Improved community education so that people understand the true flood risks
- Revised planning controls to better respond to community expectations, particularly in relation to the consequences of more extreme floods

References

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Godber, A. (2003). Urban Floodplain Land-use - Acceptable Risk? *Emergency Management Australia: Australian Disaster Conference - Planning Safer Sustainable Communities.* 10-12th September, Canberra, Australia.

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Risk Frontiers. (2011). *Response to the National Disaster Insurance Review.* Macquarie University.

Appendix A

Australian Flood Risk Survey

Q0.0 - Please enter your postcode

Postcode
2019

Q1.0 - Please select your locality from the list for the Post Code you entered

Locality | BOTANY .:J

Q2.0 - Have you ever been flooded at home before?

Yes - at my current prope
C Yes - at a previous property
C No

Q3.0 - Do you think you r current property could flood in the future?

C Yes
C No

Q4.0 - looking at the picture to the right.. how often would it be acceptable for your propecrty to flood in this way? i.e. water in your front/back ya rd.

Every few years
A few timesin my lifetime
[: Once in my lifetime
[: SO/SO chance of it occuning in rny lifetime
1 in 6 chance of it occurring in rny lifetime
C 1 in 100 chance of it occurringin my lifetime
Never

Holro,<l Oty Council

Q5.0 - Looking at the picture to the right, how often would it be acceptable for your property to flood in this way? i.e. water entering your house and flooding over the floor

- ☐ Every few years
- ☐ A few times in my lifetime
- ☐ Once in my lifetime
- ☐ 50/50 chance of it occurring in my lifetime
- ☐ 1 in 6 chance of it occurring in my lifetime
- ☐ 1 in 100 chance of it occurring in my lifetime
- ☐ Never

Blacktown City Council

Q6.0 - Looking at the picture to the right, how often would it be acceptable for your property to flood in this way? i.e. about 2m of water above the floor in the main living areas of your house

- ☐ Every few years
- ☐ A few times in my lifetime
- ☐ Once in my lifetime
- ☐ 50/50 chance of it occurring in my lifetime
- ☐ 1 in 6 chance of it occurring in my lifetime
- ☐ 1 in 100 chance of it occurring in my lifetime
- ☐ Never

Flickr/Martin Howard

Q7.0 - Looking at the picture to the right, how often would it be acceptable for your property to flood in this way? i.e. the house is structurally damaged by flooding

- ☐ Every few years
- ☐ A few times in my lifetime
- ☐ Once in my lifetime
- ☐ 50/50 chance of it occurring in my lifetime
- ☐ 1 in 6 chance of it occurring in my lifetime
- ☐ 1 in 100 chance of it occurring in my lifetime
- ☐ Never

Flickr/US Geological Society