



New Zealand Climate Change Research Institute

Te Pūtahi Hurihanga Taiao

Vulnerability and adaptation to increased flood risk with climate change—Hutt Valley household survey

Dorothee Quade

Judy Lawrence

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The New Zealand Climate Change Research Institute

Victoria University of Wellington

The New Zealand Climate Change Research Institute
 School of Geography, Environment and Earth Sciences
 Victoria University of Wellington
 PO Box 600
 Wellington
 New Zealand

Contact: Liz Thomas
 Phone: (04) 463 5507
 Email: liz.thomas@vuw.ac.nz

Dorothee Quade, New Zealand Climate Change Research Institute, VUW
 Judy Lawrence, New Zealand Climate Change Research Institute, VUW; PSConsulting Ltd

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List of acronyms

AEP	Annual exceedance probability
ARI	Average return interval
FMP	Floodplain-management plan
GWRC	Greater Wellington Regional Council
HCC	Hutt City Council
VUW	Victoria University of Wellington

Executive summary

Research purpose

This report sets out the findings of the Hutt Valley case study on flooding, which is one of three case studies that form Objective 2 of the collaborative, interdisciplinary research project on Community Vulnerability, Resilience and Adaptation to the impacts of climate change. The project is led by Victoria University and funded by Foundation for Research, Science and Technology (FRST)¹.

The case study area is situated in the Wellington Region in the lower North Island of New Zealand. The research focuses on the Hutt Valley south of the Taita Gorge, where the last damaging flood event occurred in 2004.

The research comprises three interlinked studies.

- Study 1: Modelling biophysical changes and impacts
- Study 2: Investigating socio-economic sensitivities and impacts of flooding
- Study 3: Investigating the social and institutional factors that influence adaptation

This report forms part of Study 2 and is based on a survey of households in the Hutt Valley conducted in July 2010.

Research questions

This report explores three research questions.

1. Are residents still negatively affected by flood events? If so, what are their socio-economic characteristics? (Section 2)
2. Do residents' past flooding experiences and socio-economic characteristics affect their preferences for, and perceptions of:
 - a. measures for managing flood risk (Section 3)
 - b. present and future responsibility, liability, and protection for flooding affected by climate change? (Section 4)
3. How do different ways of communicating flood risk affect residents' understanding of flood risk and preferences for measures to manage flood risk? (Section 5)

Research method

A postal questionnaire was delivered to 959 households in the Hutt Valley, yielding a 19.8 percent return rate (190 households). Of the responding households, 28.9 percent (55) had experienced flooding in the Hutt Valley or elsewhere while 68.9 percent (131 households) had not. The results are broadly indicative as there were several factors that influenced data integrity including, sample size / response-rate issues, the fact that only one third of respondents had experienced flooding, and some survey-design issues.

¹ FRST was merged in February 2011 with the Ministry of Research, Science and Technology (MoRST) to form the Ministry of Science and Innovation (MSI), which is responsible for the policy and investment functions of both these agencies.

Research findings

Respondents were very concerned about flood risk and management

Overall, responses suggested that responding households were very concerned about flood risk and how it was being handled. Delay and inaction were clearly not seen as options. Managing flood risk on an ongoing basis and continuous community engagement with the issue were assigned high levels of importance.

No significant differences were found between flood-affected and unaffected respondents regarding acceptable levels of flood risk and preferred planning time horizons in flood-risk management.

Respondents preferred proactive measures to mitigate flood risk

Both groups identified a largely similar order of priority for specific measures to manage flood risk with proactive responses being the favoured options. Improvements to the stormwater network were viewed as the highest priority, followed by restrictions on new buildings and renovations in high-risk areas, various structural measures, emergency response, and modifying or shifting existing buildings. Inaction on flood risk and its increase due to climate change was not an approach that the community would support. Flood-affected respondents had significantly stronger preferences for restricting new buildings or renovations in high-risk areas, modifying or shifting existing buildings away from high-risk areas, deepening river channels, and improving the stormwater network than unaffected respondents.

Respondents preferred flood risks to be dealt with collectively than individually

With regard to management responsibility of flood risk, both flood-affected respondents and those not affected ranked the suggested institutions in the same order with regional and city councils assigned the highest responsibility, followed by central government, individual households, and community groups. This indicates a preference for flood risk to be dealt with at the collective rather than the individual level. The flood-affected group expressed statistically significantly higher preferences for regional and city councils to have responsibility than the not affected group for both present and future flood-risk management. The flood-affected also showed stronger preferences for central government and community groups to take on greater future responsibility than present levels.

However, respondents also indicated that it was a personal responsibility to avoid the flood hazard in the first place by not building in high-risk areas. Part of the responsibility was assigned to council: Respondents wanted developments on flood-prone areas to be restricted or at least higher minimum floor levels required for new houses.

Previous flood experience had varied effects on respondents' perceptions and behaviour

The results of this case study provided only partial support for the proposition that flood experience contributes to people's preferences for, and perceptions of, measures for managing flood risk and the current and future roles and responsibilities for managing flooding affected by climate change. In some instances statistical significance was reached but the amount of variance explained was only small or medium, and / or the assumptions of the test were violated. Quantitative analysis revealed that the flood-affected group sought more information on the flood risk to their community and on what to do to prepare for a possible flood² as well as communicating more with local councils about how to reduce flood risk in their area³. Flood-affected respondents were more likely to have raised the floor levels of their houses⁴, kept ditches and drains around the properties clean, talked to their local councils about measures for managing flood risk⁵, and made plans about what to do in the event of a flood than unaffected respondents.

Qualitative data showed that, in some instances, flood experience had profound impacts on subsequent behaviour, with residents having gone to considerable length to prepare their properties for future floods (purchased sandbags, put in more drains, reduced impervious surfaces, planted trees and shrubs to increase water uptake and stabilise soil).

² Note that two cells (33.3 percent) did not fulfil the minimum expected cell count of the chi-square test. Thus, the p-value (0.024) may be unreliable. (At least 80 percent of cells should fulfil the assumption for the p-value to be reliable.)

³ Note that three cells (50 percent) did not fulfil the minimum expected cell count of the chi-square test. Thus, the p-value (0.0005) may be unreliable.

⁴ Note that two cells (50 percent) did not fulfil the minimum expected cell count of the chi-square test. Thus, the p-value (0.04) may be unreliable.

⁵ Note that 1 cell (25 percent) did not fulfil the minimum expected cell count of the chi-square test. Thus, the p-value (0.049) may be unreliable.

1 Introduction

1.1 Research purpose

This report sets out the findings of the Hutt Valley case study on flooding, which is one of three case studies that form Objective 2 of the collaborative, interdisciplinary research project on Community Vulnerability, Resilience, and Adaptation to the impacts of climate change. The project is led by Victoria University and funded by Foundation for Research, Science and Technology (FRST)⁶.

The case study area is situated in the Wellington Region in the lower North Island of New Zealand. The research focuses on the Hutt Valley south of the Taita Gorge, where the last damaging flood event occurred in 2004.

The research comprises three interlinked studies.

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This report forms part of Study 2 and is based on a survey of households in the Hutt Valley conducted in July 2010.

1.2 Research questions

This report explores three research questions.

1. Are residents still negatively affected by flood events? If so, what are their socio-economic characteristics? (Section 2)
2. Do residents' past flooding experiences and socio-economic characteristics affect their preferences for, and perceptions of:
 - a. measures for managing flood risk (Section 3)
 - b. present and future responsibility, liability, and protection for flooding affected by climate change? (Section 4)
3. How do different ways of communicating flood risk affect residents' understanding of flood risk and preferences for measures to manage flood risk? (Section 4)

⁶ FRST was merged in February 2011 with the Ministry of Research, Science and Technology (MoRST) to form the Ministry of Science and Innovation (MSI), which is responsible for the policy and investment functions of both those agencies.

1.3 Methodology

A postal survey (see Appendix 1) was sent to 996 households in the Hutt Valley, 325 of which were surveyed by Geological and Nuclear Sciences Ltd (GNS)⁷ following the last big flood event in 2004, and 671 were selected randomly from the census meshblock map. Assuming 959 of the 996 questionnaires were delivered (37 were returned undeliverable by the postal service), the survey yielded a 19.8 percent return rate (190 households).

Of the responding households, 28.9 percent (55) had experienced flooding in the Hutt Valley or elsewhere while 68.9 percent had not (131 households) and four responses were missing (2.1 percent). Of those who had been affected by flooding, nine households had floodwaters inside their houses (4.7 percent of total sample, N=190), the remainder had their property, garage, out-buildings, or access flooded.

1.4 Limitations

The results are broadly indicative as there were several factors that influenced data integrity. While the sample has a higher proportion of flooded households than was the case for a survey of households conducted by GNS after the 2004 floods, a larger proportion of flooded households in the sample would have made the differences between the two groups more robust and able to be generalised more readily. Less than a third of the sample was affected by flooding. Hence comparative analyses between flood-affected and unaffected respondents may be limited in explaining the interplay between socio-economic attributes and vulnerability to flooding. Phenomena observed in the sample may be due to sampling error, and self-selection may have biased the composition of the sample (e.g. with regard to age or income, which are both at the high-end of the range compared to the census population⁸).

Some socio-economic data was gathered in categories rather than in continuous form (e.g. age, income). This limits the range of statistical techniques available for data analysis. For example, mean, median, and mode may be less meaningful and informative where they can only indicate an age or income bracket rather than pinpointing a specific value.

For some questions with a relatively large number of missing responses, comments by respondents suggested that this was due to an apparent mismatch between the wording of the question and the answer options. The response rate may have been higher if the options had been worded differently.

⁷ A New Zealand Crown Research Institute.

⁸ The survey did however not aim to be representative of the general population with regard to demographic variables. Rather the sampling strategy reflects the aim to assess ongoing impacts on households that had been affected by flooding in 2004.

2 Socio-economic characteristics and negative effects from flooding

The first goal of the research was to establish whether residents were still negatively affected from past flood events, and if so, what their socio-economic characteristics were. The following questions address this.

2.1 Socio-economic characteristics of flood-affected respondents

2.1.1 Are some socio-economic groups more likely to be affected than others?

Of the responding households, 28.9 percent (55) had experienced flooding in the Hutt Valley or elsewhere and 68.9 percent had not (131 households), 2.1 percent (four households) did not respond to this question.

One respondent (0.5 percent) reported that they were still suffering from a past flooding experience and recorded an ongoing psychology injury (undiagnosed depression).

Statistically significant differences were found for ethnicity (Māori and Pacific Islanders were proportionally more affected than the rest of the sample⁹) and In addition, it was found that some household types were more affected than others¹⁰. Most strongly represented within the flood-affected group were couples without children (42.6 percent of all flood-affected households while they made up only 32.6 percent of the sample).

⁹ A chi-square test for independence with Yates Continuity Correction revealed a statistically significant association between Māori ethnicity and flooding experience, $\chi^2 (1, n=178) = 6.127, p=0.013, \phi=0.206$, which is a small to medium effect size. Of those who have experienced flooding, 18.9 percent are Māori while of those who have not experienced flooding, only 5.6 percent are Māori. Of all respondents of Māori ethnicity surveyed, 58.8 percent have experienced flooding, while only 26.7 percent of all non-Māori ethnicity surveyed have experienced flooding. All cells fulfil the minimum expected cell count.

A chi-square test for independence with Yates Continuity Correction revealed a statistically significant association between Pacific Island ethnicity and flooding experience, $\chi^2 (1, n=178) = 4.150, p=0.042, \phi=0.184$, which is a small to medium effect size. Of those who have experienced flooding, 9.4 percent are Pacific Islanders while of those who have not experienced flooding only 1.6 percent are Pacific Islanders. Of all Pacific Islanders surveyed, 71.4 percent have experienced flooding, while only 28.1 percent of all non-Pacific Islanders surveyed have experienced flooding. Note that two (50 percent) of cells do not fulfil the minimum expected cell count, which may render the p-value unreliable.

¹⁰ A chi-square test for independence revealed a significant association between household type and flooding experience, $\chi^2 (5, n=180) = 15.681, p=0.008, \text{Cramer's } V=0.295$, which is a medium effect size. Note that six cells (50 percent) do not fulfil the minimum expected cell count, which means that the p-value may be unreliable.

2.1.2 Does the NZDep2006 help identify socio-economic groups that are particularly vulnerable to flooding impacts?

The researchers assessed whether the dimensions of deprivation and corresponding variables of the New Zealand Index of Socioeconomic Deprivation (NZDep2006) (Salmond, Crampton, & Atkinson, 2007, p. 9) can also be used to identify groups particularly vulnerable to flooding impacts. This does not appear to be the case for this survey sample. When identifying differential vulnerabilities as a basis for planning decisions, variables other than, or in addition to, those used in the NZDep2006 will need to be considered.

2.2 Long-term negative effects of flooding on respondents

2.2.1 Was there any permanent damage to property and built environment or to individual possessions?

The house was the part of the property that was most frequently affected by permanent damage¹¹ (nine households or 5 percent). Permanent damage to, or loss of, individual items was also incurred by nine households (5 percent).

2.2.2 What is the biggest past flood event that directly affected properties?

The 2004 and 1976 flood events were the biggest events most frequently mentioned by respondents. Respondents sometimes reported stormwater flooding and water ponding due to heavy rain, as river flooding.

During the February 2004 flood, a maximum flow of 1,067.564 cumecs¹² was recorded at Taita Gorge. This is almost the size of a 5-year flood of 1,089 cumecs (Greater Wellington Regional Council, 2011a). None of the damaging flooding during that event is due to the Hutt River, but mainly due to stormwater and flooding of the Waiwhetu Stream, a tributary to the Hutt River.

In the 1976 flood, the peak flows at Taita Gorge, as calculated by a regression from the Birchville flows, were 614 cumecs and 747 cumecs (Wellington Regional Council, 1991, p. 151). Both of these are below what is currently considered a 2-year flood (777 cumecs) as measured at Taita Gorge (Greater Wellington Regional Council, 2011a). The main damage in the 1976 flood was caused by the Korokoro Stream flooding.

¹¹ 'Permanent' in this context means property still affected by impacts of past floods.

¹² A flow rate of cubic metres per second

2.3 Were there any changes in insurance cover and premiums since the 2004 floods?

Of the respondents, 84.1 to 98.9 percent were not flooded in 2004 or their insurance conditions remained unchanged after the event. Sixty-six percent had increased insurance premiums since the 2004 event due to increased risk of flooding.

2.3.1 Have there been any long-term financial impacts from flooding?

Thirteen respondents (6.9 percent) considered themselves financially worse off, mainly because they had to rebuild or replace items and / or because rates went up after the flood event (to cover increased flood mitigation expenses by councils).

After the 2004 floods, some people moved away from the flood area. At the time of writing, people had started to move back—first to rent and then to purchase property. The above results give a limited picture of the impacts of flooding on households. Some respondents commented that because people had moved away in part because of flooding, there was only a small number of people left who could comment on the questions and the results may well under represent the full effects of the flooding on households. In addition, the inability to link household and individual data on income and ethnicity limits the conclusions that can be made about socio-economic characteristics of the respondents¹³.

¹³ A relatively small sample size meant that attempts to test various subgroups for specific variables failed as some of those groups were too small to conduct meaningful statistical analyses. For example, the sample contained only one respondent who indicated they suffered from long-term health impacts due to previous flooding, and only very few respondents were living in a single-parent family AND were affected by flooding.

3 Measures for managing flood risk

Part of the second research question was to establish how residents' past flooding experiences and socio-economic attributes affected their preferences for different measures for managing current and future flood risk. The following questions address this.

3.1 What did respondents think were positive effects of past flood events and resulting measures for managing flood risk on their community?

Landscaping, drainage, stormwater infrastructure, community cohesiveness perceived to have increased

Landscaping, to mitigate flood risk, was reported as enhancing amenity values. After the flood events, flood-risk mitigation was put on councils' agendas and became a priority that was undertaken more regularly. This led to improved drainage, upgrading and maintaining stormwater infrastructure, and regular vegetation clearing. Community coherence and preparedness was also reported as having improved as a result of flooding experience. Enhanced flood protection increased the feeling of safety and peace of mind for residents of at-risk areas. One respondent anticipated that improved protection levels would maintain or increase property values.

Emergency-response capabilities improved

In addition to the positive effects highlighted by respondents, since the 2004 floods considerable efforts have been made to upgrade emergency-response capabilities. For example, Readynet, a web-based emergency preparedness network, has been set up to facilitate communication in emergencies. Groups such as businesses, communities, schools, and neighbourhoods can register for free and use Readynet to prepare an emergency response plan for their organisation. In emergencies, the network is used to send text message and / or email alerts, and users can opt to sign up for this function only (Hutt City Council, 2011).

3.2 What did respondents think were negative effects of past flood events and resulting measures for managing flood risk on their community?

Property values, social networks, psychological impacts, recreation areas, amenity values perceived to have decreased

Respondents noted that if a particular area had been flooded once it was subsequently perceived as being at high risk of recurring flood events. This was seen to have had an adverse effect on house and property prices, as it made it harder to sell the property. Respondents perceived an increase in rates to raise funds for measures to mitigate flood risk¹⁴. Flooding caused adverse impacts on social

¹⁴ The 2004 floods did not actually trigger an increase in rates. Rates increases are scheduled to fund the improved structural flood protection measures set out in the Hutt River Floodplain Management Plan over a 40-year period. No specific change was made to the funding as a result of the 2004 floods (Graeme Campbell, pers. comm.).

networks and individual health and well-being. It resulted in disruptions to community life as well as individual psychological impacts (stress and worrying). Lost recreational areas and decreased amenity values of the river were also noted as adverse outcomes of measures to mitigate flood risk.

Most respondents approved of the actions taken to mitigate flood risk after the 2004 floods. Some frustration was aired about an inadequate emergency response, including warning systems, in February 2004, when communications and warning systems broke down, were overloaded, and / or ineffective (Ministry of Civil Defence and Emergency Management, 2004) (for improvements via Readynet see section 3.1).

Delayed floodplain-management plan for the Waiwhetu Stream

Respondents perceived industrial areas and the relatively better-off residential areas to have received preferential treatment in the recovery process. Respondents also thought that there was no coherent planning approach to avoid or reduce future flood risk. Respondents mentioned the delay in preparing a floodplain-management plan (FMP) for the Waiwhetu Stream—6 years after the 2004 floods no such plan was operational. Work on the Waiwhetu Stream FMP was put on hold in 2007 when removing contaminated sediments downstream of Bell Road Bridge was prioritised instead. After completing this work, preparation of the FMP resumed in September 2010 with updated hydraulic and flood hazard modelling and public consultations in November 2010. Writing the FMP is tentatively scheduled to start in October 2011 to be adopted by June 2012 (Greater Wellington Regional Council, 2010, 2011b).

3.3 How did respondents rank measures for managing flood risk?

3.3.1 Preferences for measures to manage present flood risk

Respondents were asked how present flood risk should be managed and were presented with a range of options to rank from most to least preferred.

Improving stormwater networks was the top priority

Improvements to the stormwater network were assigned utmost priority. In this context, responsibilities for flood-risk management are split between city and regional councils. In the Wellington region, streams and rivers of regional significance are managed by Greater Wellington Regional Council (GWRC) while smaller urban streams and stormwater are managed by Hutt City Council (HCC) (Wellington Regional Council, 2001). When discussing flooding, respondents did not necessarily distinguish between stormwater-based flooding and river-based flooding. Indeed, stormwater-based flooding appears to be a recurring issue of high salience. Respondents noted that large parts of the existing stormwater network were inadequate and not meeting current requirements.

Restricting development in flood-prone areas was the next highest priority

The second most preferred option for managing flood risk was restricting new buildings or renovations in areas at high risk of flooding. While all respondents wanted restrictions on further development of flood-prone areas high on the list of priority actions, the preference level for this measure was significantly higher within the group of flood-affected respondents compared to those unaffected by past flooding. This clearly identifies the role of land-use planning (non-structural

measure) as an essential element of managing flood risk. It is further supported by additional comments that suggest that councils should not permit (or have previously permitted) flood-prone areas to be developed. Respondents perceived a potential conflict of interest, where councils may grant consent for further development that increases the revenue stream from rate payments. A few respondents also sensed additional pressure on politicians by developers and real estate agents, which was perceived as ultimately compromising the flood-hazard resilience of local communities.

Overall, responses suggest that respondents were very concerned about current flood risk and how it was being handled. Delay and inaction were clearly not seen as options. Managing flood risk on an ongoing basis and maintaining continuous engagement with the issue were assigned high levels of importance.

3.3.2 Preferences for measures to manage future flood risk

Respondents prioritised the same measures for managing future risks as they did for present risks

Respondents were also asked how *future* increases in flood risk associated with climate change should be managed and were presented with the same selection of management measures as for current flood risk. Again, the same options ranked highly on the preference list. Improving the stormwater network and restricting new buildings and renovations in high-risk areas were assigned top priority. These were followed by structural measures (raising stopbanks and deepening river channels) and emergency-response measures (giving earlier warnings and improving evacuation plans for floods). Modifying or shifting existing buildings was ranked low on the preference list, followed only by 'no action', which was again rated as unacceptable.

Flood-affected respondents had stronger preferences for non-structural measures than those who were unaffected

Statistically significant differences in preference levels were found for five of the nine listed measures. Flood-affected respondents had stronger preferences for restricting new buildings or renovations in high-risk areas, modifying or shifting existing buildings away from high-risk areas, deepening river channels, and improving the stormwater network than respondents who were unaffected by flooding.

Respondents prioritised measures to manage future risk more than those to manage current risk

Looking at preferences for measures to manage current and future flood risk, revealed that respondents had even stronger preferences for shifting houses, raising stopbanks, restricting new buildings in high-risk areas, and increasing natural buffers in the future. Doing nothing about flood risk was considered even less appropriate in the future than it was considered for the present.

Respondents considered inaction not to be an option, for managing both current and future risks

A more detailed analysis of the subgroups of flood-affected and not affected respondents reveals that both groups would like to see houses moved in the future, and both consider inaction on flood risk even less appropriate for the future than for the present. In addition, those not affected by flooding also showed statistically significantly stronger support for raising stopbanks to deal with future increases in flood risk compared to their levels of support for using it to manage present-day flood risk.

4 Preferences for approaches to managing flood risk: Responsibility, payment, and protection

The previous sections have outlined respondents' preferences for various measures for managing flood risk. Part of the second research question was to establish residents' views on present and future responsibility, payment, and protection for flooding affected by climate change.

Therefore, this section presents *who* respondents think should:

- be responsible for flood risk management
- pay for such measures
- be protected by the measures.

4.1 Who should be responsible for managing flood risk? (Responsibility)

Respondents were asked to rank a range of institutions according to the order in which they should be responsible for managing current and future flood risk (survey questions 19 and 25).

Both flood-affected and not affected groups preferred collective responsibility over individual responsibility for current and future flood risk

Both flood-affected and unaffected respondents ranked the institutions in the same order with GWRC and HCC assigned the highest responsibility, followed by central government. Next were individual households and community groups. The ranking is indicative of a pattern from the collective to the individual level. Only after public institutions (various levels of government) were mentioned was the private level (individual households and community groups) considered.

Not assigning responsibility to anyone was regarded as unacceptable and viewing flood events as beyond human control and purely subject to natural forces was not considered realistic or practical.

The flood-affected group preferred councils to take greater responsibility than the not affected group did

The flood-affected group expressed statistically significantly higher preferences for GWRC and HCC to have responsibility compared with the not affected group for both present and future. The flood-affected also showed stronger preferences for central government and community groups to take on future responsibility. All differences were of medium effect size.

4.1.1 Significance tests

Both the non-parametric Mann-Whitney U test and the parametric independent samples t-test revealed the same variables as statistically significant.

Table 1. Mann Whitney U test results comparing flood-affected and unaffected respondents' preferences for current (Q19) and future (Q25) responsibility (only the statistically significant results are shown)

	Mann-Whitney U	Z	Asymp. Sig. (2-tailed)	Flood affected		Not affected		r
				Md	N	Md	N	
Q19 Regional Council	2287.5	-3.866	0.0005	5	55	5	121	-0.3
Q19 Hutt City Council	2388	-3.706	0.0005	5	55	5	125	-0.3
Q25 Central Govt	2307.5	-2.4	0.016	4	53	4	112	-0.2
Q25 Regional Council	2640	-2.442	0.015	5	54	5	120	-0.2
Q25 Hutt City Council	2571.5	-2.509	0.012	5	54	5	119	-0.2
Q25 Community groups	2210	-1.954	0.051	3	49	3	111	-0.2

Table 2. Independent samples t-test results comparing flood-affected and unaffected respondents' preferences for current (Q19) and future (Q25) responsibility (only the statistically significant results are shown)

	Levene's Test for Equality of Variances		t-test for Equality of Means							eta squared
			F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error	
	Lower	Upper								
Q19 Regional Council	15.492	0	3.581	126	0	0.417	0.116	0.186	0.647	0.07
Q19 Hutt City Council	1.937	0.166	2.629	178	0.009	0.351	0.133	0.087	0.614	0.04
Q25 Central Govt	5.802	0.017	2.734	123	0.007	0.497	0.182	0.137	0.857	0.04
Q25 Regional Council	17.387	0	2.633	136	0.009	0.261	0.099	0.065	0.457	0.04
Q25 Hutt City Council	12.111	0.001	2.672	136	0.008	0.294	0.11	0.076	0.511	0.04
Q25 Community groups	0	0.992	2.012	158	0.046	0.398	0.198	0.007	0.789	0.02

The effect size 'eta squared' indicates that 2–7 percent of the variance in the dependent variable (preference for institution) was explained by the independent variable (flooding experience).

4.1.2 Future responsibility

Comparing present and future preferences of the total sample revealed that respondents would like to see central government, GWRC, and community groups taking on increased responsibility in the future (see **Error! Reference source not found.** below). The effect sizes were large for central overnment and community groups and small to medium for GWRC.

Table 3. Paired samples t-test: comparing the total sample for Q19 and Q25

	Paired Differences					t	df	Sig. (2-tailed)	N	eta squared
	Mean	SD	Std. Error	95% Confidence Interval of the Difference						
				Lower	Upper					
Central Govt	-0.333	0.974	0.08	-0.49	-0.176	-4.192	149	0.0005	150	0.11
Regional Council	-0.135	0.735	0.056	-0.245	-0.024	-2.392	170	0.018	171	0.03
Community group	-0.322	0.946	0.077	-0.474	-0.171	-4.2	151	0.0005	152	0.10

4.1.3 Flood-affected versus not affected respondents' preferences for future responsibility

Differentiation by subgroups showed that those unaffected by flooding would also like to see central government, GWRC, and HCC take on increased responsibility in the future. Those affected by flooding would like to see central government and community groups increasingly involved in efforts to reduce any future increase in flood risk.

Table 4. Comparing present (Q19) and future (Q25) preferences for flood-affected and not affected groups (only the statistically significant variables are shown)

Experienced flooding?		Paired Differences					t	df	Sig. (2-tailed)	N	eta squared
		Mean	SD	Std. Error	95% Confidence Interval of the Difference						
					Lower	Upper					
Yes	Central Govt	-0.46	1.034	0.146	-0.754	-0.166	-3.15	49	0.003	50	0.17 large
	Community groups	-0.694	1.045	0.149	-0.994	-0.394	-4.65	48	0.0005	49	0.31 large
No	Central Govt	-0.289	0.946	0.096	-0.479	-0.098	-3.01	96	0.003	97	0.09 medium to large
	Regional Council	-0.202	0.731	0.068	-0.337	-0.066	-2.95	113	0.004	114	0.07 medium
	Hutt City Council	-0.147	0.701	0.065	-0.275	-0.018	-2.25	115	0.026	116	0.04 small to medium

4.2 Who should pay for measures to reduce flood risk? (Payment)

Respondents were asked to indicate who they thought should pay for measures to reduce flood risk. Again, a range of options was presented for ranking and included the public sector (various levels of government), the private sector (insurance companies), and individuals (property owners and tenants).

4.2.1 Flood-affected and not affected respondents' preferences for payment

Both flood-affected and unaffected groups preferred collective payment over individual payment for the costs of current and future flood risk

As with responsibility, respondents' ranking indicated a pattern of preference from the collective to the individual levels. The public sector comes first, followed by the private sector, and individuals. The following list shows the ranking (from most to least preferred) that was assigned by the entire sample. Flood-affected and unaffected respondents ranked the options similarly. When flood-affected respondents differed in their ranking, it is noted in brackets below.

1. Region as a whole
2. District as a whole
3. Local community as a whole (ranked fourth by flood-affected group)
4. Country as a whole (ranked third by flood-affected group)
5. Insurance companies
6. People who own affected properties / property owners
7. Costs should be apportioned based on value of property affected
8. Costs should be apportioned based on the income of those owning the property
9. People living in affected properties / tenants
10. Costs should be apportioned based on income of those living in the property

Respondents preferred local government to pay to reduce flood risk over central government

Respondents clearly preferred local over central government to pay for measures to reduce flood risk. This preference for local intervention is further highlighted by the fact that most respondents ranked the local community before central government. This was followed by the private sector (insurance companies). Response options relating to the individual level occupied the lower end of the preference list. This again suggests that flood risk was perceived as an issue to be dealt with by the collective, rather than the individual.

The flood-affected group (Md=5, n=52) had a significantly stronger preference for the region to pay for flood risk reduction measures compared with the unaffected group (Md=4, n=116); U=2279, z=-2.644, p=0.008, r=0.2, which was a small to medium effect size¹⁵.

4.2.2 Property owners' and tenants' preferences for payment

Respondents preferred property owners to pay to reduce flood risk over tenants

Respondents assigned a higher responsibility for property owners to pay than tenants, and when cost apportionments were considered. This may reflect (a) an assumption that property owners are perceived to be more capable of bearing the financial burden and / or (b) an assumption that property owners have a longer-term interest in protecting their physical assets (properties) and maintaining or enhancing their value by preventing them from degradation by flooding.

Property owners and tenants both preferred collective over individual payment

Splitting the sample into house owners and tenants revealed that both subgroups had the same general preference: from local and central government to the individual level. Interestingly, the preferences for property owners and tenants to pay differed only by one rank each. Notable differences in the rankings existed for insurance companies (tenants ranked them higher than owners) and the order of property owners and country. Tenants ranked property owners fifth, followed by the country; while owners ranked the country fourth, and themselves sixth.

Tenants showed a significantly stronger preference than property owners for cost apportionments based on the value of the property affected and based on the income of property owners.

Table 5. Preferences for who pays for measures to reduce flood risk (split by house ownership and ranked from most to least preferred)

Property owners	Tenants
1 Region as a whole	1 District as a whole
2 District as a whole	2 Region as a whole
3 Local community as a whole	3 Insurance companies
4 Country as a whole	4 Local community as a whole
5 Insurance companies	5 Property owners
6 Property owners	6 Country as a whole

¹⁵ Using an independent samples t-test instead yielded basically the same result with the flood-affected (M=4.13, SD=1.121) showing statistically significantly stronger support for the region to pay than the unaffected group (M=3.72, SD=1.086); t (168) = 2.29, p=0.023 (two-tailed). The magnitude of the difference in the means (mean difference=0.419, 95% CI: 0.058 to 0.78) was small to moderate (eta squared = 0.03).

7 Apportioned based on value of property affected	7 Apportioned based on value of property affected
8 Apportioned based on income of property owners	8 Apportioned based on income of property owners
9 Tenants	9 Apportioned based on income of tenants
10 Apportioned based on income of tenants	10 Tenants

4.2.3 Low, medium, and high-income households' preferences for payment

Low, medium, and high-income households ranked who should pay relatively similarly

It was also investigated whether payment preferences differed according to the total household income¹⁶. The three subgroups (low, medium, high income) ranked the various options very similarly. Only the variables ranked third to sixth were different (see list below). The most and least-preferred variables were ranked identically, except the low-income group had an even lower preference for tenants to pay. Also, the low-income group preferred insurance companies to pay (ranked third as opposed to fifth and sixth by medium and high-income groups).

The following list shows the ranking assigned by the high-income group with deviations by low and medium-income groups noted in brackets.

1. Region as a whole
2. District as a whole
3. Local community as a whole (low income put insurance companies here, medium income put country here)
4. Country as a whole (both low and medium income put local community here)
5. Property owners (low income put country here, medium income put insurance companies here)
6. Insurance companies (both low and medium income put property owners here)
7. Apportioned based on value of property affected
8. Apportioned based on income of property owners
9. Tenants (low income put cost apportionment based on income of tenants here)
10. Apportioned based on income of tenants (low income put tenants here)

Low-income respondents significantly preferred payment to be apportioned based on property owners' incomes and for property owners to be liable for costs over high-income respondents

Testing for statistically significant differences revealed no difference between low and medium-income groups. However, the low-income group (Md=3, n=36) had a significantly stronger preference for cost apportionment to be based on property owners' incomes than the high-income group (Md=1, n=85), U=1167.5, z=-2.206, p=0.027, r=0.2, which was a small to medium effect size.

¹⁶ It is difficult to compare survey data and census data. Both the census and the survey used the same income brackets, but the census asked for personal income while the survey asked for total household income. As a result, survey mean, median, and mode income are all at the high end of the income bracket range. An additional number of higher-income brackets would have been needed to gather more detailed data.

Additionally, the high-income group (Md, 1, n=29) had a significantly stronger preference for property owners to pay for measures to reduce flood risk than the medium-income group (Md=1, n=85), $U=993.5$, $z=-2.012$, $p=0.044$, $r=0.2$, which was a small to medium effect size.

4.2.4 Respondents in the labour force's preferences

Analysing preferences by labour-force status revealed that respondents in the labour force ranked the options in the same order as the sample as a whole. The following list shows this ranking, with deviations by those not in the labour force (including students, retirees, house persons, and respondents with disabilities) commented on in brackets.

1. Region as a whole
2. District as a whole
3. Local community as a whole
4. Country as a whole (ranked fifth by those not in the labour force)
5. Insurance companies (ranked fourth by those not in the labour force)
6. Property owners
7. Apportioned based on value of property affected
8. Apportioned based on income of property owners
9. Tenants
10. Apportioned based on income of tenants

No statistically significant differences in the strength of preference levels were found for any of the variables.

Overall, the same pattern of preferences from the collective to the individual level emerges irrespective of the criterion chosen for subgroup analysis

Flooding experience, house ownership, level of household income and labour force status do not appear to have a major influence on respondents' preferences for cost allocation. Local government was assigned the highest preference to pay for flood risk reduction measures while response options relating to the individual level occupied the lower end of the preference list. These results suggest that flood risk was perceived as an issue to be dealt with by the collective, rather than the individual.

4.3 Who should be protected? (Protection)

Two thirds (66.5 percent) of respondents wanted all houses to be protected to the same level of risk. About one third (29.1 percent) wanted protection levels differentiated by suburb and 10.4 percent thought that flood protection should be up to each individual household.

Additional comments reflected preferences for varying protection levels according to an area's hazard exposure or socio-economic characteristics, e.g. higher protection for socio-economically deprived areas that are likely to be most vulnerable or higher protection for higher-value assets. However, respondents also indicated that it was a personal responsibility to avoid the flood hazard in the first place by not building in high-risk areas. Part of the responsibility was assigned to councils—respondents wanted developments of flood-prone areas restricted or at least appropriate

building standards required for new houses. Generally, respondents wanted an obligation on councils to inform new developers about the flood risk of the area in question.

4.4 Consistency tests

There was general consistency between preferences for equal protection and who should pay, although associations were not always statistically significant.

4.4.1 Equal protection

Those who thought that all houses should be protected to the same level of risk had statistically significantly higher preferences for community, district, region, and country to pay for measures to reduce flood risk than the rest of the sample. This suggests consistency, since structural measures are usually financed by the public sector through rates and tax revenues, which do not distinguish on a user-pays basis for flood protection.

4.4.2 Protection according to socio-economic status

Those who did not think that all houses should be protected to the same level of risk had relatively higher preferences for property owners to pay as well as cost apportionments based on the value of the affected property and the income of property owners. This also suggests consistency because individual responsibility to pay is more likely to result in varying protection levels across an area, rather than a blanket solution. This would mean protection levels not varying according to risk, but according to socio-economic status of an area. That is, the financially more resilient would be more likely to be physically better protected as they would be better able to afford measures such as installing pumps, raising the floor level of their houses, and / or increasing their level of insurance. This could have ramifications for planning and community coherence at the local council level. Vulnerability could actually increase as the financially less resilient could not afford certain protection measures. In such cases, the individual ability to pay for measures that would benefit an individual household would (at least in part) determine a household's overall level of flood risk. This would make protection income based rather than risk based, especially when higher financial resilience coincided with higher political resilience (in terms of having one's voice heard by decision makers).

Consistency was also suggested by the results on whether or not individual households should be responsible for their flood protection. Those who preferred individual households taking responsibility for protection, showed relatively higher preferences for property owners to pay. Those who did not think that it should be up to individual households to protect themselves against flooding had relatively higher preferences for country and region to pay for risk-reduction measures.

Only two respondents favoured higher protection levels for low-income households. They did not differ significantly from those who did not think that low-income households should be protected more than the other institutions suggested. No one supported the statements: 'the most valuable properties should be protected more' and 'those with high incomes should be protected more'.

Those who thought that some suburbs should be protected more than others had relatively higher preferences for cost apportionment based on property owners' incomes (on the value of the property affected), and on tenants' incomes, as well as for property owners to pay. Those who did not think that protection levels should vary between suburbs had relatively higher preference levels

for the district and the local community to pay. These results suggest consistency as protection levels may vary between suburbs if payment responsibility lies with individuals (various cost-apportionment arrangements and property owners) as opposed to the district level.

5 Communicating and understanding flood risk

The third research question was to determine whether different ways of communicating flood risk affected residents' understand of flood risk and preferences for measures to manage it.

5.1 Ways of communicating flood risk: Probabilities and return intervals

To determine whether respondents understood the different ways of communicating flood risk, they were asked two questions using different flood-risk terminology: annual exceedance probability (AEP) and average return intervals (ARI). The responses to the two questions were then evaluated for consistency.

5.1.1 Annual exceedance probability (AEP)

Question 15: 'What chance of flooding above floor level do you find acceptable for an average residential property in any given year?' (The five answer options ranged from 'less than a 0.5 percent chance' to 'less than 5 percent chance' and included 'don't know'.)

Fifty-seven percent of respondents considered a <0.5 percent chance acceptable (the smallest chance among the suggested answers) and another 13 percent indicated a <1 percent chance as acceptable. The second most frequent response was 'Don't know', ticked by almost one in five respondents (18 percent). This may be a result of respondents not thinking of flooding in terms of a percentage chance per year or found it difficult to understand. For example, one respondent remarked: 'Never considered it in terms of %'. This and other selected comments are grouped **reference source not found.** below.

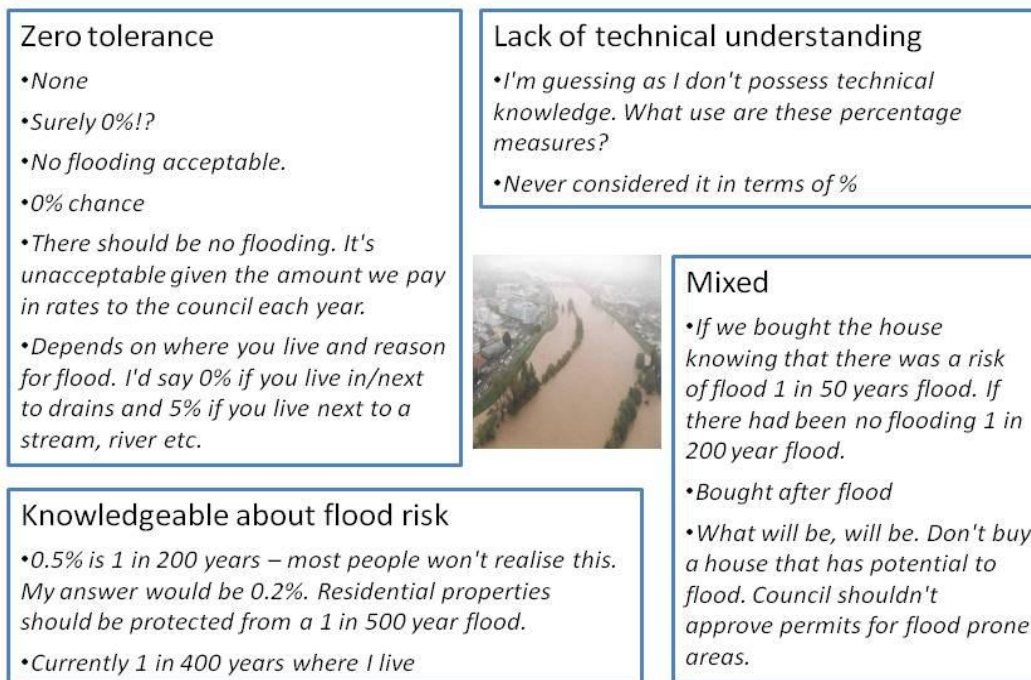


Figure 1. Additional comments on annual probabilities of flooding

5.1.2 Average return intervals (ARI)

Question 16: 'Over the course of the next 50 years, how often do you feel it would be acceptable for the average residential property to be flooded above floor level?' (The five option answers ranged from 'never' to 'three times' and included 'don't know'.)

The intent of this question was to elicit respondents' understanding of risk communication. However, several respondents who had previously experienced flooding inside their houses did not regard any flooding above floor level as acceptable.

The vast majority of the sample (84 percent) was not prepared to accept more than one flooding incident of residential properties over the course of the next 50 years. Sixty-five percent said 'never' and another 19 percent considered one flooding incident acceptable within this timeframe. Some participants qualified their responses with additional comments, which are grouped **Error! Reference source not found.** below.

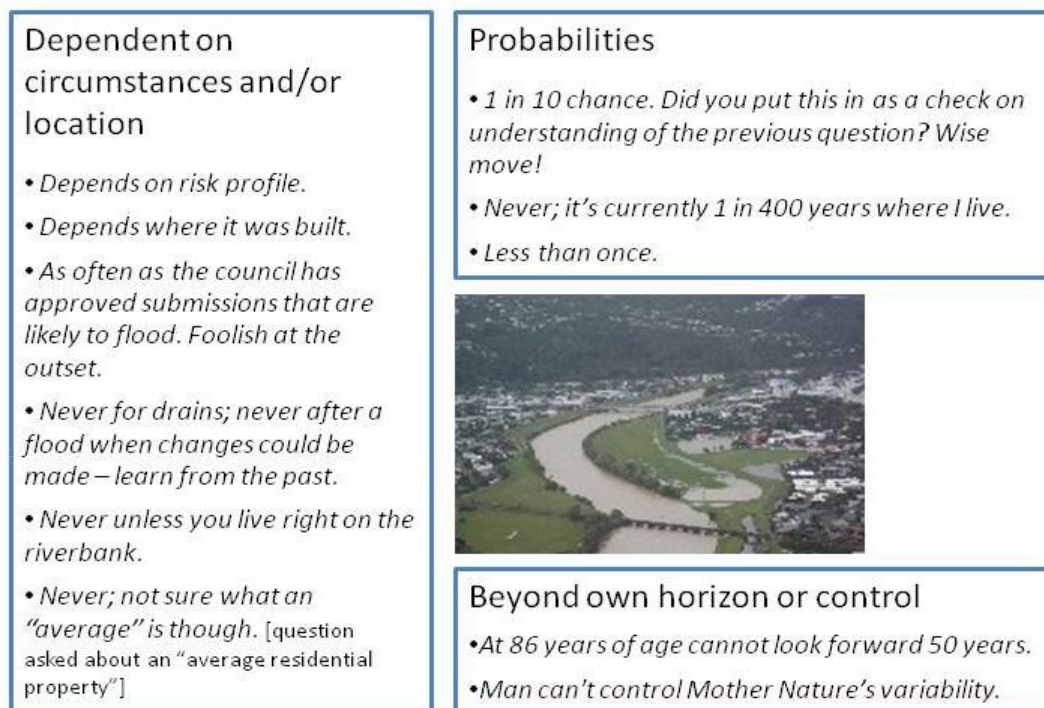


Figure 2. Additional comments on average flooding incidents over the next 50 years

5.1.3 Consistency tests

Results suggested that respondents answered the questions consistently. Preferences for a <0.5 percent and 1 percent AEP were consistent with an ARI of not accepting any flooding over the next 50 years (i.e. responding with 'never' to Question 16) as the cumulative probability of flooding during a 50 year period would be less than 50 percent (i.e. less than once on average). A 2 percent probability implies a 65 percent probability of flooding at least once during a 50 year period and would be consistent with allowing at least one flood event. Statistical testing confirmed a significant association between the answers to the two questions¹⁷. Respondents who preferred low annual

¹⁷ A chi-square test for independence revealed a significant association between preferences for annual probabilities (AEP) and acceptance of flooding over the next 50 years (ARI), $\chi^2(9, n=136) = 63.194, p=0.0005$,

probabilities (AEP)(<0.5 percent and 1 percent) also preferred a low frequency of flooding (ARI) (never or once) over the course of the next 50 years.

5.2 Planning time horizons

Question 24: *'How far into the future should one look when planning for future changes in flood risk in residential areas?'* (Answer options ranged from '10 years' to 'more than 100 years' and included 'unsure' as an option.)

5.2.1 Preferred planning time horizons

Eighty percent of respondents preferred planning time horizons of 50 years or more

While this question was not intended to test respondents' understanding of risk terminology, it nevertheless required an understanding of flood risk expressed in terms of return intervals (ARI). Respondents' views on this matter would also affect their potential support for spatial planning and engineering measures in the context of climate change that would need to consider long time scales. Respondents' varying levels of understanding of such terminology needs to be taken into account when interpreting results. Forty percent of respondents considered 50 years sufficient, 29 percent deemed a 100-year planning time horizon more appropriate, and 11 percent favoured more than 100 years.

5.2.2 Relationships between planning time horizons and acceptance of AEP or ARI

Accepting higher AEP was significantly correlated with preferring shorter planning time horizons

A chi-square test for independence was conducted to test the hypothesis that respondents who preferred relatively shorter planning time horizons also accepted higher levels of flood risk. For this purpose, the sample was split into two groups (preference for up to and more than 50 years planning time horizon) and then compared for their preferences for (i) annual probability of flooding (AEP) and (ii) acceptance of frequency of flooding over the next 50 years (ARI). Together these variables are taken to indicate acceptance of flood risk. Those who preferred shorter planning time horizons were significantly more likely to accept a higher annual probability of flooding (AEP)¹⁸, $\chi^2(3, n=129) = 8.258, p=0.041$, Cramer's $V=0.253$, a medium effect size. However, a chi-square test for independence indicated no significant association between planning time horizon preference and accepting frequency of flooding over the next 50 yrs (ARI)¹⁹, $\chi^2(3, n=151) = 2.835, p=0.418$, Cramer's $V=0.137$, a small to medium effect size.

Cramer's $V=0.394$, which is a large effect size. However, 75 percent of cells did not fulfil the minimum expected cell count which may render the p-value unreliable.

¹⁸ Note that four cells (50 percent) did not fulfil the minimum expected cell count, which may render the p-value unreliable.

¹⁹ Note that four cells (50 percent) did not fulfil the minimum expected cell count, which may render the p-value unreliable.

5.2.3 Relationships between planning time horizons and preferences for measures to manage flood risk

Additionally, it was explored whether those who preferred relatively shorter planning time horizons differed significantly in their preferences for specific measures to manage current and future flood risk due to climate change. The measures differed in the time needed to implement them as well as timeframes over which they are intended to reduce vulnerability. For example, emergency response measures such as earlier and improved warning and evacuation systems do not require the same planning time horizon as restrictions on new buildings in high-risk areas.

There was a weak significant relationship between preferring shorter planning time horizons and having lower support for certain measures for managing current flood risk

Using a chi-square test for independence, no significant association between preferences for planning time horizons and preferences for current measures for managing flood risk was found.

However, if an independent samples t-test was used, significant differences for the groups were found for shifting houses²⁰, increasing buffers like natural ponding areas²¹, and restricting new buildings²² with those preferring shorter planning time horizons less supportive of these measures. These results weakly support the hypothesis since all these measures have relatively long lead times and are intended to contribute to reducing vulnerability long term. However, it should be kept in mind that the practical significance of the differences between the two groups was only small to moderate.

There was a weak significant relationship between preferring shorter planning time horizons and having lower support for certain measures for managing future flood risk

A chi-square test for independence revealed that those who preferred shorter planning time horizons were significantly less likely to support increasing buffers like natural ponding areas (χ^2 (4, n=155) = 10.876, p=0.028, Cramer's V=0.265, which is a medium effect size) and were also significantly less likely to support restricting new buildings in high-risk areas (χ^2 (4, n=159) = 10.108, p=0.039, Cramer's V=0.252, a medium effect size).

²⁰ Independent samples t-test results for shifting houses, present: short-preference group M=2.22, SD=1.26, long-preference group M=2.71, SD=1.40; t (144) = -2.17, p= 0.032 (two-tailed); mean difference = -0.482, 95 percent CI: -0.92 to -0.043, eta squared =0.03.

²¹ Independent samples t-test results for increasing buffers, present: short-preference group M=3.11, SD=1.24, long-preference group M=3.66; t (146) = -2.70, p= 0.008 (two-tailed); mean difference = -0.543, 95 percent CI: -0.94 to -0.15, eta squared = 0.05.

²² Independent samples t-test results for restricting new buildings, present: short-preference group M=3.62, SD=1.46, long-preference group M=4.13, SD=1.25; t (156) = -2.36, p= 0.019(two-tailed); mean difference = -0.512, 95 percent CI: -0.94 to -0.08, eta squared = 0.03.

An independent samples t-test revealed similar results with statistically significant differences for shifting houses away from high-risk areas²³, increasing buffers like natural areas and ponds,²⁴ and restricting new buildings or renovations in high-risk areas²⁵ with those preferring shorter planning time horizons being less supportive of those measures. These results again provide weak support for the hypothesis as all these measures have relatively long lead times and are intended to contribute to vulnerability reduction in the long term. Again, the practical significance of the differences between the two groups is only small to moderate.

5.3 Socio-economic variables

No significant relationship were found between AEP / ARI / planning time horizons and flooding experience, house ownership, or ethnicity

Further, it was explored whether answers to each of the three questions described above (probabilities, return periods, planning time horizons) differed significantly between subgroups. However, no statistically significant differences were found when the sample was split according to flooding experience, house ownership, and ethnicity.

²³ Independent samples t-test results for shifting houses, future: short-preference group M=2.61, SD=1.30, long-preference group M=3.11, SD=1.27; $t(155) = -2.17$, $p=0.018$ (two-tailed); mean difference = -0.50, 95 percent CI: -0.91 to -0.09, eta squared = 0.04.

²⁴ Independent samples t-test results for increasing buffers, future: short-preference group M=3.40, SD=1.12, long-preference group M=3.79, SD=1.19; $t(155) = -2.70$, $p=0.036$ (two-tailed); mean difference = -0.40, 95 percent CI: -0.77 to -0.03, eta squared = 0.03.

²⁵ Independent samples t-test results for restricting new buildings, future: short-preference group M=3.81, SD=1.36, long-preference group M=4.37, SD=0.90; $t(159) = -2.36$, $p=0.003$ (two-tailed); mean difference = -0.57, 95 percent CI: -0.93 to -0.20, eta squared = 0.05.

6 Preparedness

For each of the questions (Q9–14, Q20 and Q22, see Appendix 1: Postal survey) responses were first analysed for the entire sample and then for different subgroups according to five socio-economic attributes.

1. Flooding experience: flood-affected versus unaffected
2. House ownership: owners / buyers versus tenants
3. Education: comparing all six groups with each other and then collapsing the six groups to three and two groups and comparing those respectively
4. Labour-force status: in the labour force versus not in the labour force
5. Income: low versus medium, low versus high, medium versus high

6.1 Knowledge of risk exposure

Over half of the respondents did not know what level of risk they were exposed to

More than half who answered the question did not know the level of risk that they were exposed to (54.6 percent). About a quarter (23.8 percent) had some idea about their risk exposure while a fifth (21.2 percent) indicated that they were informed about the level of flood risk that their property was exposed to. However, whether that knowledge is meaningful to people, and whether it translated into action, may be questionable—as the following quote may illustrate:

'1:10yr level flood according to HCC & GWRC 2010. I don't know what exactly this means for my property and neither does HCC.'

This suggests that providing understandable information is necessary, but not sufficient where the ultimate aim is for people to enhance their ability to gauge the implications of floods of various sizes for their properties and adjust their behaviour accordingly (i.e. concerning their level of preparedness). This is supported by research findings indicating that 'provision of information will not by itself lead people to prepare. They must see some personal reason for doing so' (Farley, 1998, p. 140).

Respondents who had previously experienced a flood had greater knowledge of the level of risk they were exposed to

Comparing various subgroups according to various socio-economic attributes revealed that only past flooding experience contributed to increased knowledge about one's flood risk.

Most respondents learned about flood risk from Hutt City Council

'Hutt City Council' was by far the most frequently cited source of information about flood risk exposure, followed by 'the Hutt News' and 'own or friends' and neighbours' experiences'.

6.2 Flood-hazard maps and their use

Over half of the respondents had not seen a flood-hazard map for their community

More than half (55 percent) of the respondents had not seen a flood-hazard map for their community. More than a third (36 percent) had seen a map, while 9 percent were unsure. There was no significant association between any of the five socio-economic attributes and having seen flood-hazard maps.

Most respondents considered flood-hazard maps ‘very useful’ or ‘somewhat useful’

Concerning the usefulness of such maps, respondents’ opinions varied from ‘very useful’ (44 percent), to ‘somewhat useful’ (43 percent), to ‘not useful’ (13 percent). Additional comments noted detail, clarity, and ease of reading as positive aspects. In contrast, some respondents found that the maps they had seen were difficult to read, were of too small a scale for the data supplied, or did not clearly show the risk level of particular areas. Respondents also found that flood-hazard maps and information on the flood risk of particular properties were difficult to access and were not routinely supplied by councils. The expectation of many respondents was that councils should not only supply information about the flood risk, but also take action to reduce it in the form of structural and non-structural measures. Respondents mostly mentioned HCC and, in some instances, GWRC if they had had contact with them.

Less-educated respondents were more likely to consider flood-hazard maps useful than better-educated respondents were

Testing for statistical significance revealed that the less educated were more likely to consider flood-hazard maps useful, than the better educated (when categories were collapsed and the sample was split into two educational groups only).

6.3 Obtaining information and becoming involved

Hutt Valley residents witnessed and / or were directly affected by a major flooding incident in February 2004. This research investigated whether witnessing or experiencing this flood triggered or intensified:

- the search for information on flood-risk exposure
- any measures taken to reduce risk
- concern about, and involvement in, the community.

Several actions were suggested and respondents were asked to indicate to which extent they had undertaken each (‘not at all’, ‘a little’ or ‘a lot’).

Most respondents had not taken the suggested actions

Most respondents did not take any of the information-seeking or communication actions suggested—the percentage of ‘no’ answers ranged from 80 percent to 96.8 percent. One fifth of respondents reported seeking information on risk exposure and preparedness. Less than 8 percent of respondents reported taking actions involving higher degrees of participation, personal interaction, and time commitment.

Flood-affected respondents sought more information and communicated with their local council more than unaffected respondents

Only previous flooding experience contributed to increased preparedness. Flood-affected respondents sought more information on the flood risk to their community and on what to do to prepare for a possible flood. They also communicated more with their local council than those unaffected by flooding.

6.4 Household action since the February 2004 floods

Respondents were asked to indicate whether they had taken any of a suggested list of measures as a result of the February 2004 flood.

The most popular measures were keeping ditches and drains clean and compiling emergency kits

- About half of the respondents (52.8 percent) kept ditches and drains around their property clean.
- About half the respondents (50 percent) collected emergency survival items or compiled a preparedness kit. However, this was a general emergency kit not specifically compiled for floods.
- One quarter (25.3 percent) made a plan about what to do in the event of a flood.
- Of those who had a house with more than one floor, 18.2 percent avoided keeping irreplaceable items or items of sentimental value on the ground floor.
- Less than 7 percent of respondents:
 - talked to their council about flood risk management measures
 - protected their septic tank
 - increased their level of insurance
 - raised the floor level of their house.

The high percentage of respondents who kept ditches and drains clean and compiled emergency items reflects that these are comparatively low-cost, easy-to-do options. This is consistent with the literature on household preparation for other hazards (see for example Brenkert–Smith, et al., 2006; Bright & Burtz, 2006; Faulkner, et al., 2009). All other suggested actions required considerably more time commitment and / or financial resources.

Flood-affected respondents were more likely to have taken measures than not affected respondents

Again, those with flooding experience were more likely to have undertaken specific measures, namely raising the floor level of their house, keeping ditches clean, talking to council, and planning what to do in the event of a flood.

6.5 Perceived preparedness of various institutions and stakeholders

All stages of flood-risk management from pre-event planning through emergency management to post-event recovery involve a variety of stakeholders and institutions that may differ in their level of preparedness. This study does not evaluate the actual preparedness of, for example, central and local government institutions, but their *perceived* preparedness. Respondents were asked to indicate how prepared they perceived a range of institutions and stakeholders to be. These perceptions may indicate the level of trust attached and responsibilities assigned to them.

The following table lists the suggested institutions and stakeholders as ranked by the total sample as well as by flood-affected and unaffected subgroups, ranked from highest to lowest levels of perceived preparedness²⁶.

Table 6. Perceived preparedness of various institutions and stakeholders, ranked by mean score from believed to be most prepared to believed to be least prepared; total sample and subgroups of flood-affected and unaffected respondents; ranking excludes ‘don’t know’ responses

Rank	Total sample	Flood-affected	Unaffected
1	EQC	EQC	EQC
2	Hutt City Council	Central government	Regional council
3	Regional council	Regional council	Hutt City Council
4	Central government	Hutt City Council	Central government
5	Insurance companies	Insurance companies	Insurance companies
6	Service providers	Your household	Service providers
7	Your community	Your community	Your community
8	Your household	Service providers	Your household

The Earthquake Commission and local and central government institutions were perceived to be the most prepared

For the total sample, the local and regional council were believed to be at the better-prepared end of the range. Generally, institutions (EQC, insurances companies) were considered relatively better prepared than communities and households. Respondents identified their households at the lower end of the preparedness scale. The sample is almost split in half: 54 percent believed themselves to be ‘very prepared’ or ‘somewhat prepared’, while 45 percent considered themselves to be ‘not very prepared’ or ‘not at all prepared’.

Cognitive dissonance can lead people to discount risk

While this seems to suggest that some respondents acknowledged that there was room for improving their households’ preparedness, it does not necessarily mean that this would translate into action. People may not prepare, despite knowing that it would be beneficial to do so.

²⁶ NB: This ranking includes only the answers which indicated a level of preparedness (very, somewhat, not very or not at all prepared) and excludes those who ticked ‘don’t know’.

Inconsistencies arising from holding two conflicting ideas is a phenomenon called cognitive dissonance in social psychology (Festinger, 1957). People may consider preparation unnecessary based on the assumption that ‘... a probabilistic harm in the future will not come to fruition at all, or will not be particularly bad if it does’ (Sunstein, 2007, p. 531). Such a reaction arises due to inconsistencies between the information received (e.g. the level of flood risk of the property) and the personal commitment made (e.g. not to prepare for a flood). People aim to restore consistency by changing either their commitment (chosen course of action) or their perception of the meaning, importance, or validity of the information received, whichever element is relatively less resistant to change (Adams, 1973).

It has been suggested that when making decisions that relate to the interaction between nature and humans, people perceptually distort the meaning of environmental information, thereby acting as risk manipulators, rather than as risk takers (Adams, 1973). Thus, people may justify their rejection of the need for flood preparation by reverting to the notion that a serious flood is unlikely to occur during their lifetime. One of the survey questions tested this by asking respondents to indicate their level of agreement with the statement ‘a serious flood is unlikely to occur during my lifetime’. No significant association was found, but the percentage of unprepared respondents who agreed was higher than the percentage of prepared respondents who agreed with the statement. However, this does not imply that cognitive dissonance necessarily applies, as statistical tests merely assess relationships, not causality (Pallant, 2007).

Respondents ranked their own households least prepared for future floods

Flood-affected respondents assigned a lower preparedness to HCC (ranked fourth instead of third) and GWRC (ranked third instead of second), while they believed central government to be better prepared (ranked second instead of fourth) when compared with the ranking of unaffected respondents. Those with flooding experience assigned a lower level of preparedness to service providers (ranked eighth instead of sixth), but higher levels of preparedness to their own households (ranked sixth instead of eighth) than those unaffected. However, both subgroups ranked their own households as the least and third-least prepared groups.

6.5.1 Analysing statistically significant differences

There were no statistically significant differences between flood-affected and not affected respondents’ perceptions of different institutions’ preparedness for floods.

6.5.2 Consistency tests

Respondents who considered themselves relatively well prepared perceived flood preparation as a worthwhile investment compared to respondents who tended to be sceptical of the benefits of flood preparation

Evaluating the self-stated level of preparedness against actual measures undertaken revealed that respondents who considered themselves relatively better prepared were significantly more likely to have undertaken the following preparation measures.

- Kept ditches and drains clean
- Talked to council about measures to manage flood risk

- Made a plan of action
- Compiled an emergency kit

Statistically significant differences between the relatively better-prepared and relatively less-prepared groups were found for their actions and also for their attitudes to flood preparation. Well-prepared respondents tended to consider a serious flood more likely than less-prepared respondents. Well-prepared respondents also tended to see added value in flood preparation, in terms of improving their everyday living conditions. These results suggest consistency.

6.6 Barriers to measures for managing flood risk

Respondents were asked to indicate how big a barrier they thought the suggested options were. Table 7 shows the options ranked by mean scores from the highest to the lowest perceived barrier. There was a high proportion of missing responses for ‘I agree flood risk is a problem but the way it’s dealt with is wrong’ (27.4 percent missing) and ‘I don’t trust information about flood risk’ (22.1 percent missing). It is possible that this response rate was because respondents did not understand the answer options.

Table 7. Barriers to measures to manage flood risk, from highest to lowest barrier as ranked (by mean score) by the total sample and the subgroups of flood-affected and not affected respondents

Rank	Total sample	Flood-affected	Not affected
1	Costs are too high	Costs are too high	Costs are too high
2	Need for cooperation with others	Need for cooperation with others	Floods don’t happen often enough to make preparation a high priority
3	Floods don’t happen often enough to make preparation a high priority	Have other priorities to think about instead	Need for cooperation with others
4	Have other priorities to think about instead	Information is required to prepare	Information is required to prepare
5	Information is required to prepare	Floods don’t happen often enough to make preparation a high priority	Skills are required to prepare
6	Skills are required to prepare	Skills are required to prepare	Have other priorities to think about instead
7	I agree flood risk is a problem but the way it's dealt with is wrong	I agree flood risk is a problem but the way it's dealt with is wrong	I agree flood risk is a problem but the way it's dealt with is wrong
8	I don't trust information about flood risk	I don't trust information about flood risk	I don't trust information about flood risk

Respondents perceived costs and the need to cooperate with others as the main barriers to measures to mitigate flood risk

Results indicated that it was not so much a matter of trust, skills, and information than it was of resource constraints. Costs were perceived to be the highest barrier followed by the need for cooperation with others. This suggests that financial and time constraints may need to be overcome to implement what are perceived as effective flood protection measures. A starting point may be to highlight the benefits of specific measures to manage flood risk in terms of reduced damages (avoided damage cost), as opposed to emphasising the costs of implementing such measures. Complementing this with efforts to deliver information in a targeted manner may help reduce the barriers to risk mitigation.

6.6.1 Analysing perceptions of barriers by socio-economic attributes

Flood experience

Statistically significant differences between subgroups were found for costs which the flood-affected group perceived to be a higher barrier than did those unaffected. This may relate to the delayed implementation of flood protection following the 2004 floods.

Employment

Respondents who were in the labour force perceived costs to be a higher barrier than respondents who were not in the labour force.

Income

For low, medium, and high-income groups, significant differences were found for information requirements for flood preparation. Those with low incomes perceived information requirements to be a higher barrier than those with higher incomes. On the other hand, the high-income group considered the presence of other priorities a significantly higher barrier than the low income group.

Education

Statistically significant differences were also found between educational subgroups. When split into three educational groups ((1) no school qualifications, (2) secondary school certificate or trade certificate, and (3) university undergraduate or postgraduate degree), the relatively less educated perceived a lack of trust in information about flood risk as a higher barrier than the relatively higher educated.

Splitting the sample into only two educational groups ((1) no school certificate, secondary school certificate and trade certificate and (2) university undergraduate or postgraduate degree), a significant difference was found for perceiving information requirements to be a barrier. The relatively less educated perceived information requirements to pose a higher obstacle, compared to the relatively more educated.

7 Attitudes to flood preparation and sense of empowerment

To gather contextual information and to relate respondents' approaches and attitudes to flood preparation to the broader context of their decision making, respondents were asked to indicate their level of agreement with statements about how they generally deal with problems. Overall, respondents appeared to be thinking ahead, trying to anticipate and prepare, and taking a strategic approach to general life problems. Whether such a predisposition extends to flood preparation was explored by providing various statements about the nature and potential benefits and costs of preparing for floods. Participants were then asked to indicate the extent to which they agreed or disagreed with the statements.

Most respondents believed it likely that serious flood could occur during their lifetimes

Respondents considered flood preparation both 'difficult' (by 34.6 percent of respondents) and 'inconvenient' (by 30.4 percent of respondents). In terms of awareness raising, it may be encouraging for councils to see that more than three quarters of respondents (76.5 percent) either disagreed or strongly disagreed with the statement that 'a serious flood is unlikely to occur during my lifetime', suggesting that respondents perceived flood risk as an issue of concern. This view may make people receptive to flood risk management measures that involve non-structural approaches in addition to structural protection works. Community support is particularly important if changes in non-statutory plans, statutory regulations, or planning or prioritising of structural measures may impinge on private property rights, or if changes may lead to perceived or real inequalities or disparities in vulnerability within the community.

Most respondents considered flood preparation worthwhile

The vast majority of respondents (87.4 percent) either disagreed or strongly disagreed with the statement that 'floods are too destructive to bother preparing for', while only 6 percent agreed or strongly agreed. This suggests that most respondents considered flood preparation worthwhile. It may also indicate that the majority did not subscribe to a fatalistic attitude, but instead felt positioned to actively shape the impact a flood would have on them. It seems respondents acknowledged that they had an important role to play by preparing themselves to reduce their own vulnerability as well as flood damage to physical assets.

Respondents felt more empowered to prepare for the social and psychological impacts of a flood than for physical impacts

An important driver for flood preparation seems to be an improved ability to deal with disruptions to family and community life following a flood. Three quarters of respondents (74.4 percent) considered this a key reason for flood preparation. On the other hand, only about half of the respondents (54.9 percent) thought that preparing for floods would significantly reduce damage to their home should a flood occur. Almost a quarter (22.5 percent) did not think that preparation was an effective way to reduce damage to physical assets. Another quarter (22.5 percent) was undecided and neither agreed nor disagreed. This may indicate that respondents felt more empowered to prepare for the social and psychological impacts of a flood than for physical impacts. This shows consistency with respondents' preferences for who should be responsible for flood-risk management

and who should pay for implementation of relevant measures (see sections 4.1 and 4.2). Preferences showed a pattern from the collective to the individual level, with local government unequivocally being assigned the leading role in both management and financial responsibility.

Respondents were divided on whether flood preparation would improve their property values

With regard to whether or not preparing for floods will improve the value of their house or property the sample is almost split in thirds: 31.3 percent either disagreed or strongly disagreed, 35.2 percent neither agreed nor disagreed and 33.5 percent agreed or strongly agreed. This contrasted with respondents' concerns about the adverse economic impact of floods on property values (see section 3.2). The potential for flood preparation to enhance or maintain property values in the longer term does not seem to provide enough motivation to take action. On the other hand, this may again highlight respondents' preferences for the collective, rather than the individuals taking on responsibility and paying for flood risk reduction measures, e.g. raising floor levels.

Respondents did not believe that flood preparation would improve their everyday living conditions

Improved everyday living conditions as a co-benefit of flood preparation were not perceived as offering motivation for preparation measures. One third disagreed (33.3 percent) and another third was undecided (35 percent). This suggests that flood preparation is not seen as an integral part of considerations in everyday living conditions.

8 Flood risk as a proxy for climate change: Addressing the implications for increasing flood frequency and risk

Projected future increases in flood frequency in the Hutt Valley due to climate change will contribute to increasing flood risk to residents and businesses in the area. Flood-risk management decisions by local government will need to consider such effects of climate change as mandated by the Resource Management Act 1991 (RMA) (s7 (i)).

This research sought community perspectives on future flood-risk management that could result from climate change and its implications for local government. The three key areas of interest for future local government decision making may be:

1. Are people concerned about the increasing flood risk?
2. What do people think should be done about future flood risk?
3. Who should be responsible for doing something about flood risk?

These questions have been dealt with individually in the above sections. Here, the key findings are synthesised and implications derived as they pertain to local government decision making on flood-risk management in the Hutt Valley.

8.1 Are people concerned about the increasing flood risk?

Respondents considered doing nothing about increasing flood risk inappropriate and not an option for present flood-risk management and even less so for decisions relating to future flood-risk management. They saw denying future increases in flood risk as erroneous and it was commented that it would be 'silly to think that way'.

Overall, responses suggested that respondents were concerned about flood risk and how it was being managed. They assigned a high level of importance to managing flood risk on an ongoing basis and maintaining continuous engagement with the issue.

8.2 What do people think should be done about future flood risk?

Overall, better flood information and assurances that people matter, especially in areas that might be of lower socio-economic status, were highlighted as issues warranting councils' attentions

Respondents assigned utmost priority to improving the stormwater network followed by restricting new buildings or renovations in high-risk areas. These were followed by structural measures (raising stopbanks and deepening river channels) and emergency response measures (give earlier warnings and improve evacuation plans for floods). Modifying or shifting existing buildings were options that occupied the lower end of the preference list only followed by inaction, which was rated as unacceptable.

8.2.1 The Building Code

Updating the Building Code to require a stricter AEP standard would support climate change adaptation

A clear role for land-use planning and regulations to restrict new or infill development in flood-risk areas was identified. Respondents highlighted the role of local councils in carefully assessing future resource consent applications for such areas. At the same time, the legacy of past decisions was identified as compromising present community resilience (or inversely, contributing to community vulnerability):

'Council initially should not give licence to build in flood prone areas.'

A few respondents sensed pressure on councils by developers and real estate agents, which may work to actively counter efforts to reduce flood risk. Respondents perceived potential conflicts of interest for councils—councils may grant consent for further developments that increase the revenue stream from rate payments. However, efforts to reduce risk could have been strengthened if the proposed tightening of the Building Code's flood protection requirement was put into effect²⁷. This proposal was to raise the design standard of new buildings and upgrade existing buildings to meet a 1 percent AEP standard, from the previously required 2 percent AEP. Expressed in return intervals (ARI), this would have increased the flood protection level from a 50-year flood to a 100-year flood. Taking a more precautionary approach seems prudent in the face of more frequent and higher intensity rainfall events projected for New Zealand as a result of climate change (Ministry for the Environment, 2010a) and would be better aligned with the Ministry for the Environment's guidance on tools for estimating the effect of climate change on flood flow (Ministry for the Environment, 2010b).

Some territorial authorities already require 1 percent AEP in their resource management plans that override the Building Code standard. In some cases this leads to conflicts where developers argue that they should be required to only meet the (lower) Building Code standard. Thus, aligning Building Code requirements with those used by some territorial authorities would not only support climate change adaptation, but would also strengthen councils' positions in applying the higher standard. Both tighter standards for design and upgrade and restriction of new or infill development in flood-risk areas were strongly endorsed by survey respondents.

8.2.2 Stormwater

Respondents were more concerned about stormwater floods than river floods

On a local government level, regional and city councils have distinct responsibilities with regional councils managing rivers of regional significance and city councils managing stormwater and smaller urban streams. However, in their everyday experience people do not seem to distinguish between stormwater-based and river-based flooding. Given the frequency and continuity with which survey respondents raised concerns about stormwater issues it suggests that stormwater presents an ongoing issue, which is of higher salience to people than river-based flooding. This may be because rivers flood less frequently than stormwater does. Even if asked specifically about flooding affecting the property and particularly the house, respondents frequently mentioned ponding, surface

²⁷ This strengthening of the Building Code was not agreed to by Government.

flooding, or mud build-up during and after heavy rain events as problematic. Respondents identified that large parts of the existing stormwater network were inadequate and not meeting current requirements. This raises issues for increases in frequency and intensity of heavy rainfall events in the future due to climate change. This may also highlight an adaptation deficit, which refers to circumstances in which, even under existing climatic conditions, efficiency and resilience levels are lower than they could be (World Bank, 2010a).

The stormwater system in the Hutt Valley is currently designed to cope with relatively frequent, lower-flow events (5-year rainfall storms) compared with less frequent but higher-consequence events. Such higher-consequence events will become more frequent with climate change. Consequently, capacity upgrades will be needed to cope with 10-year and 50-year rainfall storms (Hutt City Council, 2009, pp. 167, 180). The level and timing of maintenance, upgrading, and new construction of parts of the stormwater system between 2009 and 2019 are specified in the Long Term Community Council Plan (LTCCP) (Hutt City Council, 2009, pp. 116-117) and performance measures and future targets for HCC's activities in relation to stormwater are given in Table 8 below.

Table 8. Performance measurement in regard to stormwater service provided (Hutt City Council, 2009, p. 83)

MEASURE	ACHIEVED 2006/07	ACHIEVED 2007/08	TARGET 2008/09	TARGET 2009/10 TO 2018/19
Residents' satisfaction with the city stormwater service (measured by independent survey)	80% (peer average 89%)	86% (peer average 89%)	≥ 80%	≥ 80%
Provide a reliable stormwater service (measured by contract reports)	Achieved 0.12 incidents	Achieved 0.075 incidents	Fewer than one stormwater incident reported per kilometre of stormwater pipeline	Fewer than 0.5 stormwater incident reported per kilometre of stormwater pipeline
Achieve water quality at main recreational beaches (measured by contract reports)	Achieved Recreational Water Quality Standards	Achieved Recreational Water Quality Standards	90% of sampling days when water quality meets Ministry for the Environment guidelines	90% of sampling days when water quality meets Ministry for the Environment guidelines
Respond promptly to stormwater disruptions (measured by contract reports)	99%	98%	97% of requests responded to within one hour of notification	97% of requests responded to within one hour of notification

The Hutt City stormwater system comprises a primary system of 528km of stormwater pipes, 24 km of open drains and canals, 13 pumping stations and five retention dams, streams, and a secondary system of overland flow paths (Hutt City Council, 2009, p. 167). It is managed by Capacity Infrastructure Services Ltd on behalf of HCC. Capacity is a Council Controlled Trading Organisation (CCTO), owned by Wellington City Council and Hutt City Council (Capacity Infrastructure Services Ltd, 2011).

Given that stormwater overflow into the wastewater system and stormwater-based flooding have both been identified as existing problems, investment to increase the capacity of the stormwater system would improve the current situation. Such an investment would yield even larger benefits if climate change leads to more frequent and higher intensity rainfall events (Intergovernmental Panel on Climate Change, 2007; World Bank, 2010b) as projected for New Zealand (Ministry for the Environment, 2010a).

A further priority issue for respondents was the development of the Waiwhetu Floodplain Management Plan that was put on hold in 2007 and has now resumed in 2010. Respondents saw resuming and finishing this work as urgent and imperative as 6 years have already passed since the last major flood event.

8.3 Who should be responsible for doing something about flood risk?

8.3.1 Responsibility

Respondents assigned responsibility for alleviating flood risk unequivocally to local government

Both regional and city councils were identified as the institutions responsible for dealing with current as well as future increases in flood risk. After local government, respondents perceived central government to hold responsibility, as central government plays an important role in guiding local government action.

'Central Government may need to direct ... HCC and GWRC to take necessary measures to reduce risks.'

Allocating responsibility to local and central government was seen as fair because 'that's what we pay them for'. To a large extent, this responsibility arises from local government's land-use planning authority, which was perceived to be an important instrument in flood-risk management.

Clearly, respondents allocated responsibility for flood risk management at the collective / public rather than the individual / private level, for both land-use planning and financing. The following comments may offer a sense of the views held by the community.

'Not a lot I can do personally to prepare for a flood apart from trenches etc. After the flood all falls back on planning on a higher level—stop banks, creeks, and streams management.'

'Why should a property owner pay [for flood risk reduction measures]? The council is responsible for the area. The flood doesn't start on private property. It starts from the stream and stormwater if it cannot cope; that's infrastructure. Individual owners cannot afford the burden. The collective can and should.'

8.3.2 Payment

Respondents thought that determining who pays for measures to manage flood risk was an important issue. They also thought that there was a need to take account of current risk factors and the impact of climate change on flood risk and of the impact of deforestation and further urbanisation.

While some respondents clearly preferred public financing by local government, others felt that a combination of public and private expenditures would be appropriate. Arrangements for co-financing with contributions from property owners, the community, the district, and the region were proposed to spread the cost on many shoulders. Others favoured purely privately funded options:

'I would like to say user pays! However, it's hard to just target particular areas, although [flood risk reduction measures are] an investment in property values.'

Figure 3 **Error! Reference source not found.** summarises comments on responsibilities for and levels of flood protection. The views expressed occupy the full spectrum from purely public to entirely private responsibility for both exposure as well as protection with the positions in between arguing for differentiated levels of flood protection based on various suggested criteria.

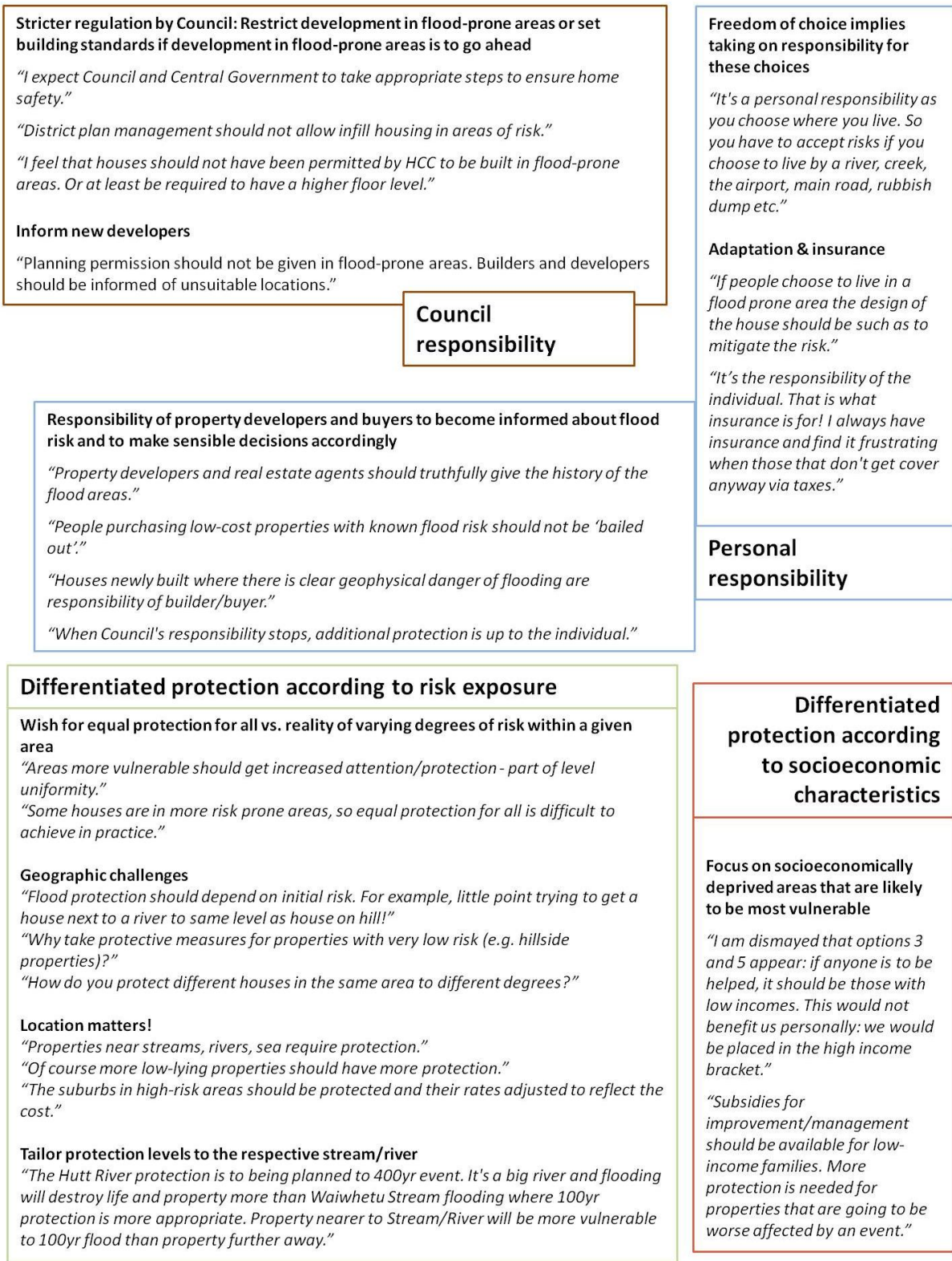


Figure 3. Responsibility for flood protection and flood protection levels

Flood-affected respondents had stronger preferences for government being responsible for managing flood risks than not affected respondents did

Flood-affected respondents expressed significantly stronger preferences for GWRC and HCC to be responsible for managing present flood risk than not affected respondents did. Flood-affected respondents also had stronger preferences for GWRC, HCC, and central government to be responsible for managing future flood risk than not affected respondents did.

Comparing preferences for present and future responsibilities revealed that respondents wanted central government, GWRC, and community groups to take on increased future responsibility.

In sum, it can be said that Hutt Valley residents considered flood risk a matter of high and ongoing importance. They attached primary responsibility for planning, implementation, and financing to the public / collective level, headed by local government and guided by central government. Stormwater and land-use planning were perceived as the key issues determining the Hutt Valley community's position between the poles of resilience and vulnerability as it is shaped by present flood risk and its projected increase in the future due to climate change.

9 Consistency of attitudes with actions

To test response consistency across different questions, respondents' views on flood preparation were assessed against any self-reported actions that they had undertaken since the February 2004 flood.

9.1.1 Inconvenience of flood preparation

When assessing beliefs or attitudes against actions, those who thought that flood preparation was not too inconvenient should show higher levels of preparedness than those who thought that flood preparation was inconvenient. This was confirmed for two out of eight measures suggested. Those who considered preparation inconvenient were more likely to have increased their level of insurance and were less likely to have kept ditches and drains around their properties clean than those who thought that preparation was not inconvenient. This may seem contradictory but could reflect that drains were maintained because people considered it a relatively easy, cheap, and effective measure. However, the significant association does not indicate causality.

9.1.2 Difficulty of flood preparation

Similar to inconvenience, it may be hypothesised that those who thought that flood preparation was not too difficult, should show higher levels of preparedness than those who thought that flood preparation was difficult. This was confirmed for six out of eight listed actions, suggesting largely consistent responses across different questions.

9.1.3 Communicating with councils

Those who talked to councils were more likely to consider flood preparation difficult than those who did not talk to councils. This may reflect the frustration that some participants expressed in the context of council action and inaction (see Figure 4 **Error! Reference source not found.**). Also, those who found it difficult to prepare for floods considered information a higher barrier than those who did not find flood preparation difficult²⁸.

9.1.4 Effectiveness of flood preparation

No statistically significant association was found between respondents' beliefs about whether or not flood preparation would significantly reduce damage to their homes and the various actions suggested. This may confirm the earlier findings where 50 percent of respondents were either undecided or did not consider preparation to be an effective way of reducing damage to physical assets.

²⁸ However, for all three significant associations the p-value may be unreliable as 50 percent of cells in the chi-square test did not fulfil the minimum expected cell count. This was due to the small numbers of respondents who, for example, talked to council. The ongoing concern and resulting involvement of these residents with council reflected their continued location in the area compared with many who had moved away. While this may skew the results it also reflected some residual level of concern about flood preparation because long-term residents perceived council to be delaying implementing the protection measures, including raising floor levels.

Besides the list of various actions that respondents were presented with, they were also asked to indicate any additional household actions undertaken as a result of previous floods. Responses of the 33 respondents who provided comments are summarised and grouped in Figure 4. **Reference source not found.** below.

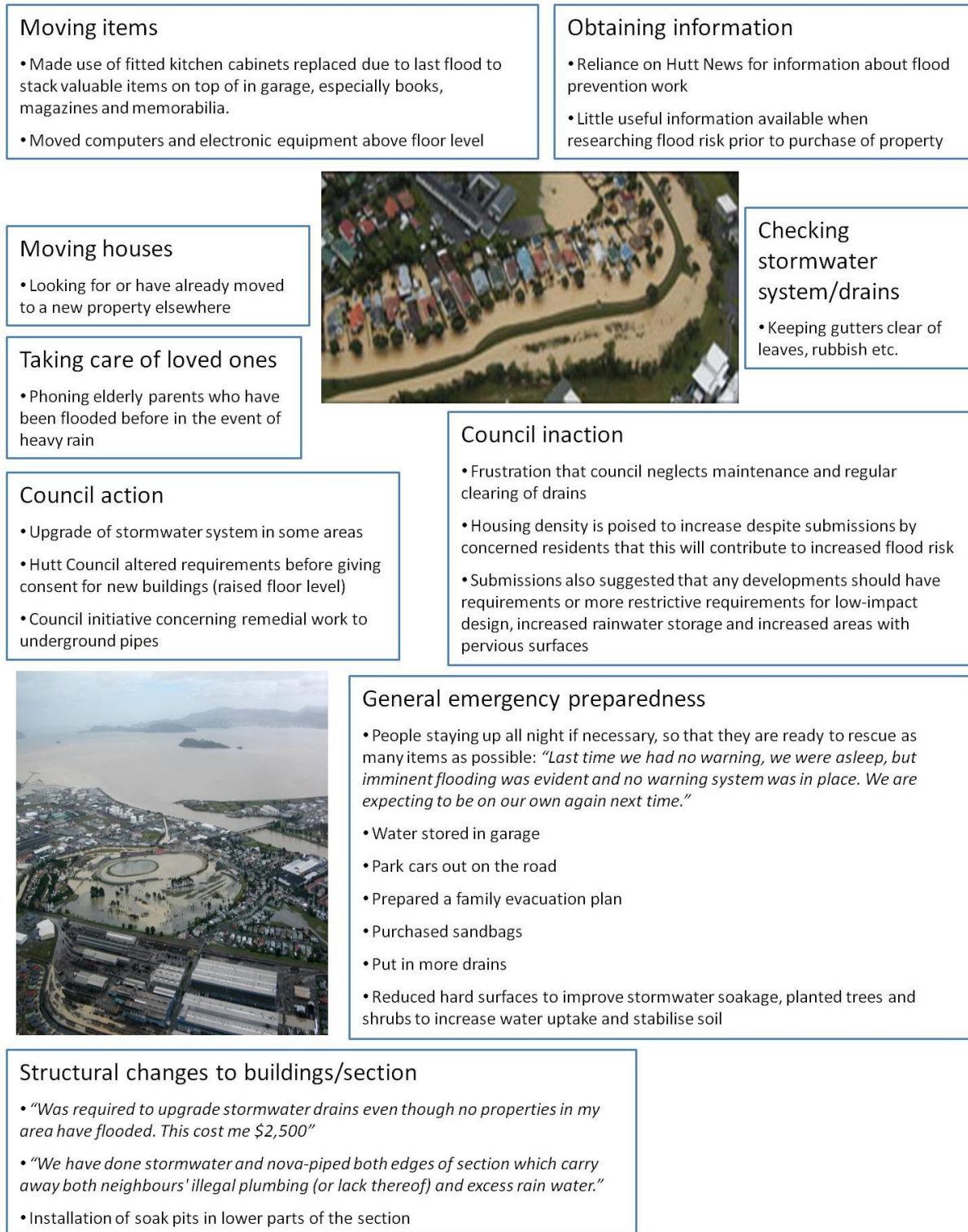


Figure 4. Additional household action as a result of previous floods

9.1.5 Time planning horizons

No significant association was found between respondents' beliefs of whether or not a serious flood was likely to occur during their lifetime and preference for planning time horizons. That is, those who considered it likely that they would witness a serious flood, did not show a significantly stronger preference for flood-risk mitigation planning looking ahead 100 years rather than 50 years.

It was hypothesised that respondents who were more intensely involved in their communities would be more likely to believe that preparing for floods would improve their ability to deal with disruptions to family and community life following a flood. Only one significant association was found. Respondents who participated relatively more often in local activities or events (e.g. festivals, fairs) were more likely to believe that their level of preparedness would reduce the disruptive impact of floods on their family and community life²⁹.

9.1.6 Trust and leadership

Respondents who trusted their local council to do what is right for the people they represent were more likely to attach higher responsibility to community groups for future flood-risk management, than those who did not trust their council.

²⁹ The p-value ($p=0.016$) may be unreliable due to 50 percent of cells not fulfilling the minimum cell count in the chi-square test.

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11 Appendix 1: Postal survey

QUESTIONNAIRE ON FLOOD AND STORM IMPACTS ON HOUSEHOLDS in LOWER HUTT

**This survey should take about 30 minutes to complete
All answers will be kept confidential**

The main purpose of this survey is to learn more about whether and how past floods have a long term impact on residents and their views about flood risk reduction.

To help with this, please tell us if you:

- ₁ Lived at this address during the February 2004 floods and were affected.
- ₂ Lived at this address during the February 2004 floods but were NOT affected
- ₃ Did not live at this address during the February 2004 floods, but have been affected by flooding during other occasions (here or elsewhere)
- ₄ Did not live at this address during the February 2004 floods, and have not been affected by flooding during other occasions (here or elsewhere)

Even if you have never been affected by a flood, here or elsewhere, we still would like you to answer all questions in this survey

If you have filled in the previous survey in 2004, it would be helpful (but not absolutely necessary) if the same person could also complete this survey.

SECTION A: Overall impacts

This section asks about flood events that have occurred in Lower Hutt from February 2004 onwards, and the impacts those events have (or haven't) had on you.

1. Has anyone in your household suffered an ongoing injury or illness due to past flood events?

- ₁ No
- ₂ Yes - If yes, please describe in detail, including which flood:

2. Are any parts of your property still affected by impacts from past floods? (Tick all where structural damage remains, or a permanent loss of function occurred)

- ₁ No recent flood affected this property directly
- ₂ Recent floods affected this property but there are no ongoing damages
- ₃ Section (land)
- ₄ Out-buildings
- ₅ Garage
- ₆ House
- ₇ Other – please give details:

3. Please list any individual possessions that suffered permanent damage or loss, and give the reasons for this (e.g. because insurance did not pay for it and you were unable to afford a replacement, or because they were items of special value (such as photographs, documents etc))

- ₁ Item: _____
Reason for permanent damage: _____
- ₂ Item: _____
Reason for permanent damage: _____
- ₃ Item: _____
Reason for permanent damage: _____
- ₄ Item: _____
Reason for permanent damage: _____

(add more items on separate sheet of paper if necessary)

4. Which was the biggest past flood event that you are aware of that directly affected your property? (Please give details.)

- ₁ Approximate date: _____
- ₂ I do not know of any events that have affected my property

SECTION B: Insurance and costs

5. With regard to insurance, which of the following statements are correct in your case? Please answer this question regardless of whether you may have answered this already in previous surveys.

	Does not apply	Yes	No
My insurance didn't cover the losses I expected it to	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃
EQC ¹ has settled my claim in a fair way	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃
My insurance company has settled my claim in a fair way	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃
My insurance premium has gone up since the event because of increased flood risk	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃
My insurance excess has gone up since the event because of increased flood risk	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃
I have found it difficult to get insurance cover since the event	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃
I can't afford insurance cover now	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃

¹ EQC: Earthquake Commission

6. Is your household financially worse off today than it would have been without the February 2004 or other past floods? Please consider only the consequences of and council or community responses to past flood events, not other changes such as the global economic recession.

₁ No

₂ Yes - If yes, please give details:

SECTION C: Community effects of flood events and flood risk management measures

7. Have **past flood events** had any ongoing positive or negative effects on your community (e.g. social networks, parks and reserves, amenities)?

- 1 No effects I can think of
- 2 Don't know
- 3 Positive – please give details

- 4 Negative – please give details

8. Have **flood risk management measures** (such as works to strengthen stop banks) had any ongoing positive or negative effects on your community (e.g. social networks, parks and reserves, amenities)?

- 1 No effects I can think of
- 2 Don't know
- 3 Positive – please give details

- 4 Negative – please give details

SECTION D: Knowledge about flood risk and concrete actions to reduce flood risk

9. Do you know what level of flood risk your property is exposed to? (Tick only one)

- ₁ Yes
 ₂ Only a little
 ₃ No

If “yes” or “only a little”, please tell us the level of risk (as far as you know) where you obtained the information from:

10. Have you seen any flood hazard maps for your community? (Tick only one)

- ₁ Yes
 ₂ Not sure
 ₃ No

11. If you have seen flood hazard maps, how useful do you think they are to inform residents about their flood risk? (Tick only one)

- ₁ Very useful
 ₂ Somewhat useful
 ₃ Not useful

Details: _____

12. Since the February 2004 flood, have you: (Tick one in each line)

	No	A little	A lot
Sought information on flood risk to your community	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃
Sought information on what to do to prepare for a possible flood	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃
Become involved with a local community group related to flooding	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃
Communicated with the council about how to reduce flood risk in your area	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃
Participated in meetings related to flooding and flood risk management measures	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃

13. Since the February 2004 flood, has your household undertaken any of these measures, and if so how much has been spent? (Fill in all that apply in each line)

		If yes, approximately how much has been spent?
Increased your level of insurance	Yes / No	\$ _____ on additional insurance per year
Raised the floor level of your house	Yes / No	\$
Kept ditches and drains around the property clean	Yes / No	\$
Protected your septic tank	Yes / No / Does not apply	\$
Avoided keeping irreplaceable items or goods of sentimental value on the ground floor of your home?	Yes / No / My house has only one floor	comments
Talked to a council about flood risk management measures	Yes / No	about _____ hours
Made a plan about what you will do if a flood is threatening (e.g. lift items off ground, evacuation, check drains)	Yes / No	comments
Collected emergency survival items or compiled a preparedness kit	Yes / No	comments

14. Please list any other actions you have undertaken as a result of previous floods:

SECTION E: Roles and responsibilities to manage flood risk

15. What chance of flooding above floor level do you find acceptable for an average residential property in any given year? (Tick only one)

- ₁ In any given year, there should be a less than a 0.5% chance of flooding
- ₂ In any given year, there should be a less than 1% chance of flooding
- ₃ In any given year, there should be a less than 2% chance of flooding
- ₄ In any given year, there should be a less than 5% chance of flooding
- ₅ Don't know

Other: ₅ _____

16. Over the course of the next 50 years, how often do you feel it would be acceptable for the average residential property to be flooded above floor level? (Tick only one)

- ₁ Never
- ₂ Once
- ₃ Twice
- ₄ Three times
- ₅ Don't know

Other: ₆ _____

17. Do you feel that all houses should be protected to the same level of risk? (Tick all that you support)

- ₁ Yes
- ₂ No, it should be up to each individual household
- ₃ No, the most valuable properties should be protected more
- ₄ No, those with low incomes should be protected more
- ₅ No, those with high incomes should be protected more
- ₆ No, some suburbs should be protected more than others

Additional comments:

18. Do you feel that current flood risk should be reduced by: (Tick one in each line)

	←..... (Scale)→ Least Most				
Raising stop banks	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
Deepening river channels	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
Improving the stormwater network	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
Shifting houses away from high-risk areas	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
Increasing buffers like natural areas and ponds	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
Give earlier warnings and improve evacuation plans for floods	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
Modify buildings (e.g. raise floor levels and utility services)	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
Restrict new buildings or renovations in areas with high flood risk	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
Nothing needs to be done - I'm happy with the flood risk level in my community	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅

Other:

19. Please indicate on the scale whose responsibility you believe it is to manage the risk from floods. (Tick one in each line)

	Not at all ←..... (Scale)→ A great deal				
Central Government	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
Regional Council	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
Hutt City Council	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
Community groups	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
Individual households	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
Nobody; if a flood wants to come then it will come	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅

20. How big are the following barriers to flood risk management measures: (Tick one in each line)

	No barrier ← (Scale) → Major barrier				
Cost are too high	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
Skills are required to prepare	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
Information is required to prepare	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
Other priorities to think about instead	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
Need for co-operation with others	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
Floods don't happen often enough to make preparation a high priority	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
I don't trust information about flood risk	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
I agree flood risk is a problem but the way it's dealt with is wrong	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅

Suggestions for reducing barriers to managing flood risk:

21. Who do you feel should pay for measures to reduce flood risk? (Tick one in each line)

	pay least ← (Scale) → pay most				
People who own affected properties (property owners)	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
People living in affected properties (tenants)	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
Costs should be apportioned based on the value of the property affected	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
Costs should be apportioned based on the income of those owning the property	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
Costs should be apportioned based on the income of those living in the property	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
The local community as a whole	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
The district as a whole	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
The region as a whole	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
The country as a whole	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
Insurance companies	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅

22. How prepared do you believe the following groups are for future floods affecting your community? (Tick one in each line)

	Very prepared	Somewhat prepared	Not very prepared	Not at all prepared	Don't know
Your household	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
Your community	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
Central government Ministries (such as Ministries of Civil Defence and Emergency Management, the Environment, Health, or Social Development)	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
Regional Council, including regional Civil Defence	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
Hutt City Council, including district Civil Defence	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
Service providers (such as roads, electricity, telephone companies, water suppliers, garbage collectors, energy supplies, sewage treatment companies)	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
Earthquake Commission (EQC)	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
Commercial insurance companies	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅

SECTION F: Dealing with future changes in flood risk

Climate change is generally expected to increase the occurrence of heavy rainfall, which could result in more frequent river floods and flood damages unless additional measures are taken to reduce the impacts of floods. Sea level rise will further increase flood risk in low-lying areas. Please answer the next 3 questions with this likely future increase in flood risk in mind.

23. By which measures do you think any increase in future flood risk should be dealt with? (Tick one in each line)

	←..... (Scale)→ Least Most				
Raising stop banks	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
Deepening river channels	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
Improving the stormwater network	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
Shifting houses away from high-risk areas	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
Increasing buffers like natural areas and ponds	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
Give earlier warnings and improve evacuation plans for floods	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
Modify buildings (e.g. raise floor levels and utility services)	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
Restrict new buildings or renovations in areas with high flood risk	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
Nothing needs to be done; I don't believe that flood risk will increase sufficiently to present any cause for concern	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5

24. How far into the future should one look when planning for future changes in flood risk in residential areas?

- 1 10 years
- 2 50 years
- 3 100 years
- 4 more than 100 years
- 5 Unsure

25. Please indicate on the scale whose responsibility you believe it is to reduce any increase in future flood risk. (Tick one in each line)

	Not at all ←..... (Scale)→ A great deal				
Central Government	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
Regional Council	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
Hutt City Council	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
Community groups	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
Individual households	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
Nobody; I don't believe that flood risk will increase	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5

SECTION G: Community participation, trust and leadership

26. **Thinking about how you normally deal with any problem in your *life*, please describe the extent to which you agree or disagree with each of the following statements: (Tick one in each line)**

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
I try to come up with a strategy about what to do	<input type="checkbox"/> ₅	<input type="checkbox"/> ₄	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁
I make a plan of action	<input type="checkbox"/> ₅	<input type="checkbox"/> ₄	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁
I think hard about what steps to take	<input type="checkbox"/> ₅	<input type="checkbox"/> ₄	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁
I think about how I might best handle the problem	<input type="checkbox"/> ₅	<input type="checkbox"/> ₄	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁

27. **Please describe the extent to which you agree or disagree with each of the following statements: (Tick one in each line)**

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
Floods are too destructive to bother preparing for	<input type="checkbox"/> ₅	<input type="checkbox"/> ₄	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁
A serious flood is unlikely to occur during my lifetime	<input type="checkbox"/> ₅	<input type="checkbox"/> ₄	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁
Preparing for floods is inconvenient	<input type="checkbox"/> ₅	<input type="checkbox"/> ₄	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁
It is difficult to prepare for floods	<input type="checkbox"/> ₅	<input type="checkbox"/> ₄	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁

28. **Please describe the extent to which you agree or disagree with each of the following statements: (Tick one in each line)**

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
Preparing for floods will significantly reduce damage to my home should a floods occur	<input type="checkbox"/> ₅	<input type="checkbox"/> ₄	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁
Preparing for floods will improve my everyday living conditions	<input type="checkbox"/> ₅	<input type="checkbox"/> ₄	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁
Preparing for floods will improve the value of my house/property	<input type="checkbox"/> ₅	<input type="checkbox"/> ₄	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁
Preparing for floods will improve my ability to deal with disruptions to family/community life following a flood	<input type="checkbox"/> ₅	<input type="checkbox"/> ₄	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁

29. Thinking about how you participate in life in your *community*, please describe how often you undertake each of the following: (Tick one in each line)

	Often	Sometimes	Rarely	Never
I have worked with others on something to improve community life	<input type="checkbox"/> ₄	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁
I participate in local activities or events (e.g., festivals, fetes, fairs)	<input type="checkbox"/> ₄	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁
I have contributed money, food or clothing to local causes, charities, or to others in my community	<input type="checkbox"/> ₄	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁
I have attended a public meeting on a community issue	<input type="checkbox"/> ₄	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁
I have been involved in volunteer activities intended to benefit my community (e.g., fundraising, clean-up days, local groups, Scouts/Brownies).	<input type="checkbox"/> ₄	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁

30. Given your general feelings about living in your wider *community*, please describe the extent to which you agree or disagree with each statement. (Tick one in each line)

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
I trust my Local Council to respond to meet the needs of its residents	<input type="checkbox"/> ₅	<input type="checkbox"/> ₄	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁
I trust the community leaders in my community	<input type="checkbox"/> ₅	<input type="checkbox"/> ₄	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁
I trust scientists and engineers to give me a fair idea of the actual risk of flooding	<input type="checkbox"/> ₅	<input type="checkbox"/> ₄	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁
I trust the media (newspapers, TV, radio) to report fairly	<input type="checkbox"/> ₅	<input type="checkbox"/> ₄	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁
I trust my Local Council to do what is right for the people they represent.	<input type="checkbox"/> ₅	<input type="checkbox"/> ₄	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁
I have confidence in the law to protect and maintain order in my community	<input type="checkbox"/> ₅	<input type="checkbox"/> ₄	<input type="checkbox"/> ₃	<input type="checkbox"/> ₂	<input type="checkbox"/> ₁

SECTION H: Demographic and household information

Note: The information you provide us will be kept confidential. We will only look at correlations between demographic information and people's views on flood risk issues. Information about individual households will not be released to anybody outside this research project.

31. What is your gender? (Tick only one)

- ₁ Male ₂ Female

32. Into which age bracket do you fall? (Tick only one)

- ₁ 18-19 yrs ₂ 20-24 yrs ₃ 25-29 yrs
₄ 30-34 yrs ₅ 35-39 yrs ₆ 40-44 yrs
₇ 45-49 yrs ₈ 50-54 yrs ₉ 55-59 yrs
₁₀ 60-64 yrs ₁₁ 65-69 yrs ₁₂ 70-74 yrs
₁₃ 75-79 yrs ₁₄ 80-84 yrs ₁₅ 85 years +

33. Which ethnic group do you belong to? (Tick the box or boxes that apply to you)

- ₁ New Zealand European ₂ Māori
₃ Samoan ₄ Cook Island Maori
₅ Tongan ₆ Niuean
₇ Chinese ₈ Indian
₉ Other (e.g., Dutch, Japanese) (Please specify):

34. What is your main occupation? (Tick only one)

- ₁ Employed: What is your job?
₂ Unemployed
₃ Retired
₄ House person
₅ Student: What are you studying?
₆ Other (Please specify):

35. What is your highest educational qualification? (Tick only one)

- ₁ No school qualifications
₂ Secondary school qualifications
₃ Trade certificate or professional certificate or diploma
₄ University undergraduate degree (e.g., diploma or bachelor's degree)
₅ University postgraduate degree (e.g., Master's, Ph.D.)
₆ Other **(Please specify):** _____

36. How long have you lived in your current house? _____ year/s

37. Which of the following best describes your household now? (Tick only one)

- 1 A couple without children
- 2 One person household
- 3 Two parent family with one dependent child or more
- 4 One parent family with one dependent child or more
- 5 Non family household (e.g. flatting)
- 6 Other. Please state:

How many people currently live in your household in total? _____

How many bedrooms does your household have? _____

38. How well does your household speak English? (Tick only one)

- 1 English is the native language of the entire household
- 2 English is the native language of some members of the household
- 3 English is a second language but fluent for all household members
- 4 English is a second language and fluent for some household members
- 5 English is a second language that we are still learning to speak

39. Do you, or someone in your house, own or rent the home you live in? (Tick only one)

- 1 Own or buying, to live in it
- 2 Own or buying, but only for use as a holiday home
- 3 Rent, to live in it
- 4 Rent as a holiday home
- 5 Other (Please specify):

40. What was your household's total income (before tax) for the 2007 financial year (April 1 2007-March 2008)? (Tick only one)

- | | |
|--|---|
| <input type="checkbox"/> 1 Loss | <input type="checkbox"/> 2 Zero Income |
| <input type="checkbox"/> 3 \$1 – \$5,000 | <input type="checkbox"/> 4 \$5,001 – \$10,000 |
| <input type="checkbox"/> 5 \$10,001 – \$15,000 | <input type="checkbox"/> 6 \$15,001 – \$20,000 |
| <input type="checkbox"/> 7 \$20,001 – \$25,000 | <input type="checkbox"/> 8 \$25,001 – \$30,000 |
| <input type="checkbox"/> 9 \$30,001 – \$35,000 | <input type="checkbox"/> 10 \$35,001 – \$40,000 |
| <input type="checkbox"/> 11 \$40,001 – \$50,000 | <input type="checkbox"/> 12 \$50,001 – \$70,000 |
| <input type="checkbox"/> 13 \$70,001 – \$100,000 | <input type="checkbox"/> 14 \$100,001 or more |

41. Does anybody in your household live on a sickness benefit or have a special medical need? (Tick only one)

1 No

2 Yes

42. Does your household have internet access? (Tick only one)

1 No

2 Yes

43. Does your household have access to a telephone? (Tick only one)

1 No

2 Yes

44. Does your household regularly read newspapers? (Tick only one)

1 No

2 Yes

45. Does your household regularly listen to the radio? (Tick only one)

1 No

2 Yes

46. Does your household have a car? (Tick only one)

1 No

2 Yes, one

3 Yes, more than one