

Perceptions of Sea-Level Rise and Managed Retreat: An Exploratory Survey

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1. SUMMARY

There is mounting evidence that Australian coastal communities will be seriously threatened by sea-level rise before the end of the century. Depending on their circumstances, coastal communities will respond to the risk of inundation in different ways. Likely response options are to build defences to restrain the sea, adapt to occasional inundation, retreat from advancing seas, or some combination of these. Choice of strategy, and the details of the design, will have significant and widespread implications for the value and security of private property, the ecological values of coastal areas, the safety and resilience of settlements, and the cohesiveness of communities.

We present results from a survey of people's attitudes to issues likely to influence their views on policies for adapting to sea-level rise, including attitudes to sea-level rise and coastal environments, the role of government, and property rights. We aimed to learn about the issues that will emerge if managed retreat schemes are seriously considered. To do this we asked questions about a specific, but hypothetical, retreat policy we called a Conditional Occupancy Rights scheme.

We draw some tentative conclusions from this survey about how community perceptions may influence the support for, and effectiveness of, policies that involve retreat from rising seas. Care should be taken in drawing specific policy implications from this survey, due to the general and exploratory nature of the survey questions and particularly because of the self-selected, hence non-representative sample. We addressed the problem of self-selection by classifying the 522 respondents into three groups according to their perceptions of the threats from sea-level rise, and comparing the responses of the groups to survey questions. Members of groups:

- were concerned about the threat of sea-level rise;
- were unsure whether rising seas pose a threat; or
- rejected the notion that sea levels will rise and pose a threat.

It is not possible to estimate from our self-selected sample what the actual proportions of the groups are in the coastal population, but except for a somewhat larger rejecting group, the proportions are consistent with the levels of concern about climatic change in general estimated from three large and recent representative surveys of the Australian population.

The key findings and conclusions follow.

Polarised views on sea-level rise influence views on policy options

Many of the respondents who rejected the notion that coastal communities are at risk from rising seas strongly objected to public discussion of sea-level rise policy options. A number of these participants also rejected the legitimacy of a publicly administered attitudinal survey on this topic. Unwillingness to consider the possibility of the sea-level rise scenario may have made it difficult for these individuals to respond to a number of the survey questions.

There is disagreement about the legitimacy of government interventions to protect coastal communities and ecosystems.

- The majority of participants concerned or unsure about the risks of rising seas agreed that governments should spend money to help communities prepare for sea-level rise. The majority of respondents who rejected sea-level rise risks disagreed with the government spending money to help communities prepare for sea-level rise.
- The majority (71%) of participants concerned about the risks of rising seas agreed or strongly agreed that governments should protect coastal wetlands, dunes and beaches under conditions of rising sea levels; 51% of the participants who were unsure about sea-level rise risks agreed or strongly agreed that a government priority is ecological maintenance. Only 11% of participants who reject the risk of rising seas strongly agreed or agreed with the government maintaining ecosystems in the face of sea-level rise.

Some commonly held beliefs may be a major barrier to implementing a managed retreat policy and to effective coastal planning in general

- Less than a quarter (22%) of all respondents indicated that if large numbers of houses are threatened by inundation then the owner would not be responsible for covering the loss, indicating instead that either government or insurance will compensate landholders or that governments will fund defences.
- Approximately a quarter of the respondents indicated that they expect insurance would bear the cost of rising sea levels. The insurance industry, however, is unlikely to accept this risk within the current insurance framework.
- More than a quarter of respondents expect that property owners would be allowed to build defences to protect their property.
- The majority of respondents did not agree that property rights could be removed even if sea-level rise makes a property unsafe.

There are divergent, and sometimes contradictory, views about the rights and responsibilities of property owners faced with loss due to sea-level rise

- Slightly more than half of the respondents agree that property owners should pay the costs of defending their properties against sea-level rise.
- About half of the respondents indicated that owners should be responsible for covering any loss of property due to sea-level rise.
- About half of the respondents agree that property owners should be compensated if their property is acquired by the government due to sea-level rise.

Some respondents' beliefs are consistent with key aspects of a retreat scheme

The majority of respondents indicated:

- they preferred to be personally responsible for judging the risks of sea-level rise when purchasing property;

- they did not agree with government spending money to protect private property from rising seas;
- it is fair for property rights to be relinquished based upon an agreement made before purchase; and
- it is fair for an individual who purchased a property under a retreat scheme to bear the future costs of sea-level rise on their property.

An appropriately designed retreat scheme may be supported by respondents who are concerned or unsure about the risks of sea-level rise

- The majority of respondents concerned or unsure about the risks of rising seas agree it is possible to design a fair and just scheme for governments to acquire residential property.
- People who reject the notion that sea-level rise poses a risk are as likely as other groups to state they would consider purchasing a property with conditional occupancy rights as they believe they would make money from such a scheme. However this group is unlikely to support the introduction of any policy that plans for sea-level rise.

Beliefs about the risk of sea-level rise influence participants' support for a managed retreat scheme

- 62% of participants unsure about the risks of sea-level rise and 56% of participants concerned about sea-level rise risks agreed or strongly agreed that it is possible to design a fair and just scheme for governments to acquire residential property. Only 29% of participants who reject the risks of sea-level rise strongly agreed or agreed with the possibility of governments designing a fair scheme to acquire residential property.
- 57% of the unsure and 70% of the concerned groups indicated they were either likely or extremely likely to support a retreat scheme if it were specified in an appropriate way. In contrast only 24% of respondents in the rejecting group are either likely or extremely likely to support a retreat scheme if it were specified in an appropriate way.
- When asked to suggest changes to the Conditional Occupancy Rights scheme respondents provided various alternative schemes that may make people more likely to accept them.
- The majority of respondents who reject the risks of rising sea levels indicated that they were angry after reading about the Conditional Occupancy Rights scheme, while the majority of participants who were concerned/unsure about sea-level rise risks indicated that reading about the scheme did not make them angry.

The prospect of compensation was found to influence support for the Conditional Occupancy Rights scheme

- 26% of the total sample indicated that they were likely or extremely likely to consider buying under the specified Conditional Occupancy Rights scheme. The prospect of compensation for the value of land increased the percentage of people likely to purchase to 36%. The number of people who were extremely unlikely or unlikely to purchase under a Conditional Occupancy Rights scheme decreased from 63% without to 47% with compensation.

- Most respondents indicated that private property rights can be relinquished to benefit the general public if compensated.
- While a compensation scheme may influence support for buying into a retreat scheme, participants were less likely to support compensation to bail-out communities that face loss due to sea-level rise. Only about 10% of respondents indicated that the government should compensate the owner for any loss of building and/or land if rising sea levels threaten a large number of properties.

This report presents our initial analysis of the survey with minimal interpretation and no explicit theory. We intend this descriptive report to be useful to local, state and the Commonwealth governments, and to stakeholders and researchers addressing sea-level rise, land use and adaptation. These data are also being analysed using a number of theoretical frameworks for publication in peer reviewed journals.

2. INTRODUCTION

2.1 The risk to coastal communities from sea-level rise

Sea levels have already increased measurably since 1800 and are expected to continue to rise due to global warming (IPCC 2007; Church, Woodworth et al. 2010). The predicted rate of sea-level rise for the 21st century is unprecedented in human history (Church, White et al. 2004; Holgate and Woodworth 2004; Church and White 2006). The IPCC (2007) has projected global sea levels to increase within the range of 0.18-0.59 metres by 2090-2099 relative to 1980-1999 level. However there are a number of uncertainties involved in forecasting long-term sea-level rise and there is a risk of even higher sea-level rise (Steffen 2009). For example, there is growing concern that the IPCC modelling of the contribution of melting ice-sheets to global sea-level rise is inadequate, with new forecasts suggesting the upper limit of predictions between the period of 1990s to 2100 to be between 0.79cm (IPCC AR4 cited by Church, White et al. 2008) and 1.90cm metres (Rahmstorf 2007). Furthermore, sea levels are also expected to continue to rise for coming centuries, regardless of any future mitigation of greenhouse gas emissions (Church, Gregory et al. 2001; Meehl, Washington et al. 2005).

Risks to buildings, infrastructure and livelihoods from accelerated sea-level rise and associated storm surges and erosion are expected to substantially increase during this century and into the future (Harvey and Caton 2003; Mcgranahan 2007; Markandya, Arnold et al. 2008; Department of Climate Change 2009; ECA 2009; Nicholson-Cole and O’Riordan 2009). Local coastal economies and populations are particularly vulnerable to the threat of sea-level rise (Gurran, Hamlin et al. 2008). Across Australia, community infrastructure and services near the shore are similarly at threat from sea-level rise¹. The Department of Climate Change (2009) estimated that between 157 000 and 247 600 existing residential buildings nationwide are at risk of inundation from a sea-level rise of 1.1 metres. The 2008 replacement value of these buildings ranges from \$41 billion to \$63 billion, with continuing investment in infrastructure close to the shore possibly contributing to an even higher valuation of assets at risk in the future. The large range in these estimates are due to uncertainty regarding the effectiveness of climatic change mitigation measures, the outcomes of global warming (i.e. rate of icesheet melting in Greenland and Western Antarctica) and the effects of shoreline erosion, storms and flood events. Irrespective of uncertainties, the impacts of accelerating sea-level rise are forecast to become extensive in the future, and have substantial environmental, economic and social consequences.

2.2 Coastal squeeze: coastal ecosystems between development and the deep blue sea

Coastal ecosystems and landforms such as wetlands, seagrasses, beaches and dunes are at significant risk from the combined threats of coastal development, rising seas and changing storm patterns and intensities (Gilman, Ellison et al. 2008; Defeo, McLachlan et al. 2009;

¹ In Australia these include 258 police, fire and ambulance stations, five power stations/sub stations, 75 hospitals and health services, 41 landfill sites, three water treatment plants, and 11 emergency services facilities which are located within 200m of the shoreline DCC (2009). Climate change risks to Australia’s coast: A first pass national assessment. . Canberra, ACT, Department of Climate Change..

Waycott, Duarte et al. 2009). As sea levels rise these ecological communities tend to shift landward (Lovelock and Ellison 2007). However, there is likely to be intensified competition for land as urban development advances towards the shoreline, and ecological communities attempt to shift inland. Coastal ecological communities are vulnerable to the impacts of human activities associated with development, and may be less adaptable to a changing climate if challenged by the impacts of development.

For ecological communities to continue to exist, shoreline land needs to be available for them to occupy in the future. Coastal ecological communities can then continue to provide the scenery and recreational opportunities, and habitats for plants and animals that Australians currently value. Coastal wetlands, seagrasses, beaches and dunes can also protect buildings and infrastructure from the increasing risks of storm surges and coastal erosion (Feagin, Mukherjee et al. 2010; Gedan, Kirwan et al. 2010). Providing this space will require a combination of setting land aside and managed retreat of coastal development (Titus 1998).

2.3 Adapting to the threat of sea-level rise

Previous literature (Bray, Hooke et al. 1997; Titus 1998; Klein, Nicholls et al. 2001; Few, Brown et al. 2007; Abel, Gorddard et al. 2011) outlines policy approaches that can address the threats of sea-level rise to property and infrastructure. Four generic options available to coastal communities at risk of inundation due to sea-level rise are:

1. Building hard and soft defences to protect properties and infrastructure.
2. Building or modifying properties and infrastructure to cope with periodic or permanent inundation.
3. Removing or relocating properties and infrastructure as and when required.
4. Ensuring new structures are built out of harm's way.

Both the broad strategy as well as the details of the policy design and the implementation process will have significant and widespread implications. Strategies may influence the value and security of private property, the ecological values of coastal areas, the safety and resilience of settlements, and the cohesiveness of communities. They will need to be matched to circumstances as we learn more about the risks of sea-level rise and a wide range of response options will be required to enable Australia's coastal communities to adapt to specific contexts. In general, Australian nature reserves, national parks, beaches and many wetlands are public property, and most land where development approval is given, often including dunes and low-lying land, is under freehold title. Some coastal land is held under Native Title, under which Indigenous peoples can influence resource uses, including development approval. Most of the variation in contexts is due to the density of development, which ranges from inner city, through suburbs, urban peripheries and farmland to unoccupied conservation areas.

Within this legislative framework, some options, such as building sea walls, have become familiar to Australian communities. Governments routinely fund large-scale engineering works and therefore can be relatively confident in understanding how people will be affected, how they will respond, and how to engage communities in the decision process. The engineered defences of some communities (i.e. Sydney or the Gold Coast) are likely to have widespread community support, while a policy to build a sea wall to replace a highly valued environment

(e.g. a popular beach or wetland) to protect the property of shoreline residents may not receive popular support. Options which change the exposure of people and property to risks, or involve deliberately removing houses or communities are less familiar: we know little about how Australians may respond to policies that involve preparing for adaptation or retreat from a risk that will not pose a significant danger for decades. While Australian communities have retreated from locations to avoid more immediate risks (e.g. retreat from the fire-prone face of Mt. Dandenong in 1970s) or to make way for a valued development (e.g. the town of Adaminaby in the 1950s retreated to make way for Snowy Mountains scheme), community discussions about retreat from rising seas involves planning for a new type of non-immediate risk. We know there exist strong and conflicting opinions on issues such as: who is responsible for making decisions that affect the risks to private property; who should bear the cost of property damage; or under what circumstances can individuals be fairly asked to move from their property or accept a change in the risk of inundation (Leitch and Robinson, In press). Conflicts between private property rights and the maintenance of publicly owned coastal ecosystems and beaches are likely to increase with rising seas. For other conservation issues with a longer history, such as environmental water-flows or native vegetation clearing, conflicts between private property and the environment have proved difficult to resolve. A crucial step in resolving these tensions is to increase our understanding of how people may respond to different policy options, which would improve policy design and the matching of options to circumstances.

The purpose of the survey reported here was to learn about how people may respond to different policy options for adapting to sea-level rise. We focus on planned or managed retreat because, although rarely implemented in Australia, it could become an increasingly important option as sea levels rise. We therefore need to learn more about issues that emerge when a community is asked to consider policy that requires changes to property rights and responsibilities because of impending sea-level rise.

2.4 The purpose and structure of this report

Several community surveys have been conducted to assess community perceptions of climate change in an Australian context (e.g. The Climate Institute 2009; Australian Bureau of Statistics 2010; Leviston and Walker 2010, 2011; The Climate Institute 2010). At the time of writing this report, we are not aware of any survey which has examined community perceptions of managed retreat policy options designed to adapt to the risk of sea-level rise. This report presents results from an exploratory survey in which we asked questions about attitudes to issues likely to influence peoples' views on policies for adapting to sea-level rise, including attitudes to sea-level rise, the role of governments, coastal environments, and property rights. We also asked questions about a specific, but hypothetical, retreat policy we called a Conditional Occupancy Rights scheme (CORS). This requires residents to forfeit their land when sea-level rise reaches a designated point. The CORS is based on the following assumptions: (i) the land on which conditional development approval is granted was not previously built upon; (ii) property owners knew about the scheme and the development approval conditions before purchasing their property; and (iii) buildings were designed to be removable. The CORS is based upon the "rolling easement" scheme discussed by Titus (1998), but was renamed as pre-testing suggested that lay people interpreted the term "rolling easement" to mean the property boundaries move landward rather than disappearing as the sea rises.

We report results from the survey and draw some tentative conclusions about how community perceptions may influence the support for, and effectiveness of, coastal policies, particularly those that involve retreat. Care should be taken in drawing specific policy implications from this survey, due to the general and exploratory nature of the survey questions and particularly because of the self-selected and hence non-representative nature of the sample. Self selection means that the results are unlikely to reflect the overall balance of community opinions.

3. METHODS

3.1 Process for recruiting survey participants

Participants were recruited across Australia to complete an online survey which was open for a three-week period in June and July 2010. To publicise the online survey a media release was distributed to coastal news outlets on the east coast of Australia from Far North Queensland through to southern Victoria. It was published by coastal newspapers in Queensland (Magnetic Island Times, Sunshine Coast Daily, and Gympie Times), New South Wales (Gosford Express Advocate) and Victoria (Geelong Independent). A CSIRO researcher was interviewed about the survey on several radio programs including ABC radio in Queensland, New South Wales and Victoria. The survey was publicised through Google Adwords via an advertisement that appeared on the Google search engine when computer users entered property-related or environmentally-related keywords. The survey was also discussed on several blog websites, including sites that reject the evidence for climatic change. The media recruitment and discussion of the survey on the blog websites directed potential participants to the survey website.

It is important to emphasise that respondents were self-selected, hence do not represent the Australian population. The survey gathered a wide range of views from members of the community who were computer-literate and motivated to voice their opinions about sea-level rise and managed retreat.

3.2 Survey participants

In total 524 participants completed the online survey. Two responses were removed from the analysis due to inconsistent and off-the-topic responses.

3.3 Survey methods

Participants who opened the survey website page were presented with the following introduction: "Coastal property development and rising sea levels are two topics of national significance. This survey will investigate the impact of sea-level rise upon the purchase of coastal property. In this survey you will be asked questions about your future plans to purchase property and your beliefs about sea-level rise. The survey should take you about 10 – 15 minutes".

The survey contained 20 questions classified into four sections. The first section administered property purchase questions; the second questioned perceptions of sea-level rise and general policy options; the third asked participants to assess the Conditional Occupancy Rights scheme. The fourth section collected demographic information. Participants were asked to respond to questions based on a five-point Likert scale, a yes/no choice, or to provide open-ended comments.

3.4 Analysis

We report significant differences in how three risk-perception groups responded to survey questions. A χ^2 frequency analysis is used for the survey questions that offered only two response options for participants (e.g. they either could agree with statement or not agree). The distributions for nearly all the questions that offered participants a 5-point response scale did not demonstrate a normal distribution. Because of the non-normality and the unequal sample sizes in the three risk perception group we use the non-parametric Kruskal-Wallis analysis of ranks to evaluate whether the median responses were the same for all three risk-perception groups. The parametric equivalent of the Kruskal-Wallis analysis of ranks test is the one-way Analysis of Variance. The factual null hypothesis is that the populations from which the samples originate have the same median. When the Kruskal-Wallis test leads to significant results, then at least one of the samples is different from the other samples. When a Kruskal-Wallis test revealed a significant difference the Mann-Whitney U test was used to test which pairs of the risk perceptions groups were significantly different. The Mann-Whitney U test is a restricted version of the Kruskal-Wallis test that only compares the medians of two groups. Unless stated otherwise, significant differences are reported in the results for the χ^2 , Kruskal-Wallis and Mann-Whitney U test are at a .01 level.

4. SURVEY RESULTS

4.1 Perceptions of sea-level rise

4.1.1 Perceptions of the risk of sea-level rise

The concept of “risk” is central to understanding the implications of climate change events such as sea-level rise (Gurran, Hamlin et al. 2008). Traditionally, risk is conceptualised as a combination of the probability of an event occurring and the magnitude of consequences that arise from the event. Scientists often attempt to numerically describe risk. The survey undertook a different approach for measuring community “perceptions of risk” by asking participants to evaluate statements on a 5-point Likert scale. It has been proposed that most people find it more psychologically intuitive to assess their perceptions with Likert scale attitudinal ratings than via providing numerical estimates (Kahneman, Ritov et al. 1999) or probability estimates (Kahneman and Tversky 1973; Tversky and Kahneman 1973; Kahneman, Slovic et al. 1982). The survey included four risk related statements that formed a scale measuring perceptions of sea-level rise (SLR) risk:

Statement 1: The sea level is likely to rise by at least half a metre by 2100

Statement 2: I am concerned about the possible consequences of sea-level rise for houses near the coast

Statement 3: I am concerned about the possible consequences of rising sea levels for local beaches

Statement 4: The science that predicts future sea-level rise is weak (reverse-scored item).

Participants responded to each statement on a 5-point scale (1 = Strongly Disagree; 2 = Disagree; 3 = Neither Agree nor Disagree; 4 = Agree; 5 = Strongly Agree)². The four items making up the SLR risk scale were found to have a high reliability coefficient (Cronbach’s α = .95)³. The SLR risk scale items were aggregated and divided by 4 to produce an average score for each participant. The distribution of the SLR risk scale is presented in Figure 1.

It is clear that responses to most of the survey questions were moderated by perceptions of sea-level rise risk, so responses to the SLR scale are grouped into three categories. Figure 1 displays the cut-off scores for classifying participants into three groups those who: rejected the notion that sea-level rise poses a risk (n=264); were unsure about the risks posed by sea-level rise (n=81); were concerned about the risks posed by sea-level rise (n=177).

² Statement 4 was reverse-scored (1= strongly agree; 5=strongly disagree)

³ Cronbach’s α is a statistic commonly used as a proxy measure of internal consistency or reliability for multiple item psychometric scale. As a basic rule of thumb, psychometric scales that report a Cronbach’s α of 0.70 or higher are considered to have acceptable reliability. Scales that report a Cronbach’s α above 0.90 are considered to have excellent reliability.

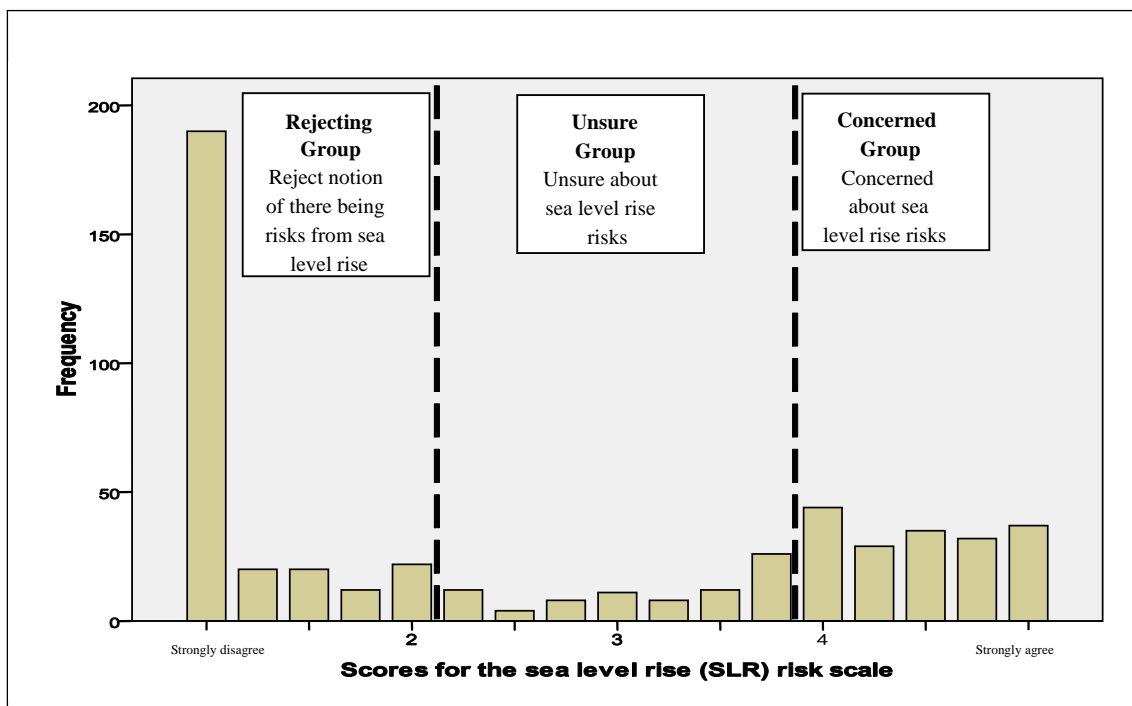


Figure 1 Distribution of the scores for the SLR risk scale

Community engagement with the public about SLR policy will most likely include a mixture of citizens who reject, are unsure or concerned about the risks of SLR. In Table 1 the distribution of SLR risk-perception groups in the current study is compared with the distribution of responses to other climate-change concern surveys that were representative of the Australian population. The results suggest that around the time it was conducted, the CSIRO sea-level rise survey had an over-representation of responses from those who reject the risks of sea-level rise (rejecting group).

Table 1 Comparison of the beliefs about sea-level rise for the non-representative CSIRO sea-level rise study and beliefs about climate change from representative surveys.

Research survey	Proportion of participants concerned about climate change and sea-level rise
*CSIRO sea-level rise survey (2010)	33.9% concerned about sea-level rise risk 15.5% unsure about sea-level rise risks 50.6% reject sea-level rise risk predictions
Climate Institute (2009) survey	15% extremely concerned about climate change 28% very concerned about climate change 36% concerned about climate change 17% not very concerned about climate change 5% not at all concerned about climate change
Australian Bureau of Statistics (2010)	73% of Australian adults said in 2007-2008 that they were concerned about climate change

*Non-representative survey

Table 2 displays the demographics for the three risk perception groups. A χ^2 analysis was employed to compare the expected and observed frequencies of the demographics for the three risk perception groups. There was a significantly higher proportion of males in the rejecting group compared to the other risk perception groups. The rejecting group was also slightly older and was more likely to own a property near the coast. The concerned group was less likely to hold a technical degree for their highest level of education. There were no significant differences between the risk perception groups in distance lived from the coast or for income level.

Table 2 Demographics for the risk perception groups

Participants	Group classification based on SLR Risk scale		
	Rejecting (n = 264)	Unsure (n = 81)	Concerned (n = 177)
Gender**	86% Males 14% Females	69% Males 31% Females	58% Males 42% Females
Age*	7% <=35 years 76% > 35 < 65 years 17% >= 65 years	14% <=35 years 66% > 35 < 65 years 20% >= 65 years	15% <=35 years 75% > 35 < 65 years 10% >= 65 years
Highest level of education*	11% High School 24% Tech degree 28% Undergrad 37% Post-grad	11% High School 24% Tech degree 24% Undergrad 41% Post-grad	13% High School 10% Tech degree 35% Undergrad 42% Post-grad
Income before Tax (\$000)	18% <\$50 34% \$50-\$100 21% \$100 - \$150 27% >\$150	24% <\$50 35% \$50 - \$100 23% \$100 - \$150 17% >\$150	23% <\$50 39% \$50 - \$100 21% \$100 - \$150 16% >\$150
Owns a property near coast*	58%	53%	46%
Distance of residence to Coast	29% <1km 23% 1-5km 15% 5-10km 34% >10 km	33% <1km 19% 1-5km 16% 5-10km 32% >10 km	25% <1km 18% 1-5km 18% 5-10km 38% >10 km

**Demographics significantly different at a 0.001 level probability level

* Demographics significantly different at a 0.05 level probability level

4.1.2 Comment on participants who reject the risk of sea-level rise

Many in the rejecting group made comments specifically about sea-level rise science, questioning the trustworthiness of any scientist who concludes that there is evidence of accelerated sea-level rise⁴. One respondent classified in the rejecting group stated *"I don't trust CSIRO or the government to be honest in matters about climate change"*. Other rejectionists claimed that climate science is guilty of deliberate fraud, with one suggesting *"I trust that the instigators of this fraud will be duly prosecuted and punished"*. The majority in the rejecting group suggested discussing sea-level rise risk is morally wrong and openly challenged the legitimacy of any evidence that accelerated sea-level rise is occurring, with one noting that *"I have read Dr Morner's papers and find his work impressive....I have the recent CSIRO/BOM publication on climate change and found it to be unconvincing and biased"*.

There were several comments by participants in the rejecting group suggesting that they did not feel comfortable discussing sea-level rise policy because of a lack of scientific evidence to justify such policy. One stated that *"You seem to think that sea-level rise is likely to be significant in the future whereas peer reviewed science shows otherwise. The bias in this survey assumes that climate science is settled"*. Others in the rejecting group objected to the wording of the survey. A participant stated that *"from the wording of some questions it would appear that rising sea levels are imminent. Therefore, in some answer choices there was no place to voice the fact that I think otherwise"*, while another participant noted that *"a lot of these questions are not applicable unless you believe in significant sea-level rise"*. In the presentation of results we indicate where our wording of the survey assumes sea-level rise and did not allow respondents to express their concerns about the lack of risk from sea-level rise.

A common theme for the rejectionist group was that the topic of sea-level rise policy should be dropped from public discussion. Many of the rejectionists did not accept the legitimacy of the survey and a common suggestion was to *"Stop wasting taxpayers money"*. Some rejectionist respondents commented that they found it difficult to respond seriously to statements and questions that assume sea-level rise is a risk, with one noting that *"Homes are just as likely to be destroyed by a meteor or more likely to burn down in an electrical fire"*.

While many in the rejecting group were uncomfortable with discussing sea-level rise policy, this was not always the case. One participant suggested *"there are better ways to address a rising sea level (should it happen) than vacating the land...after all the sea is not rising half a metre over night"*, while another noted *"The provision of an independent arbiter to resolve disputes as to what constitutes 'sea-level rise'. Must be able to differentiate from 'storm surges' and effect of land subsidence that may be caused by erosion or other factors"*. When engaging with the public over sea-level rise policy it may be important to differentiate the people who simply do not believe the science that concludes sea levels are rising at a rate that will threaten coastal communities but are willing to discuss the issue, from those whose primary goal is to discourage the public from any discussion of sea-level rise science or policy.

⁴ A more detailed qualitative analysis of open-ended comments) reveals that such rejection of the risk could not be explained by a lack of awareness of sea level rise science (Alexander et al., 2011).

4.2 Perceptions of property ownership and risks from rising seas

This section reports respondents' expectations of policy responses to sea-level rise, perceptions of property rights, the role of individuals and governments in judging and managing the effects of risks to private property, the role of governments and the legitimacy of removing houses to maintain coastal ecosystems

4.2.1 Expectations about responses to the threat of inundation

Expectations about rights and responsibilities for losses from inundation are likely to influence peoples' decision to invest in properties that may be at risk of inundation. This question explores the range of expectations of management options if private properties are inundated.

Participants were asked: *"If sea-level rise threatens a large number of coastal properties in the future, my expectation is that:*

- *the owner would be responsible for covering any loss of property*
- *insurance would compensate the owner for any loss of building and land*
- *the government would build a sea wall to protect the property*
- *the government would compensate the owner for any loss of building and land*
- *the owner would be allowed to build defences to protect their property"*

Participants had the option to agree with all, some or none of the statements.

Figure 2 shows the proportions of each of the three survey groups in agreement with each of the five statements. For all three groups there was no clear-cut expectation as to whether owners should be responsible for covering property losses, with 49% of the survey participants (44% of the rejecting group; 49% of unsure group; 57% of concerned group) indicating that the owner should be responsible for covering any loss of property. Of survey participants 22% (17% of the rejecting group; 33% of the unsure group; 23% of the concerned group) did not expect the owner to be responsible, but preferred one of the other options where responsibility for loss rested with someone else, (i.e. either the government would be responsible for protection or the government or insurance would cover any loss). In addition 32% of respondents (36% of the rejecting group; 37% of the unsure group; 25% of the concerned group) indicated that they expected owners to be able to build defences to protect their property from inundation. If responsibility for the costs of sea-level rise is not clarified conflicts could further intensify over this issue (e.g. Leitch and Robinson, 2012).

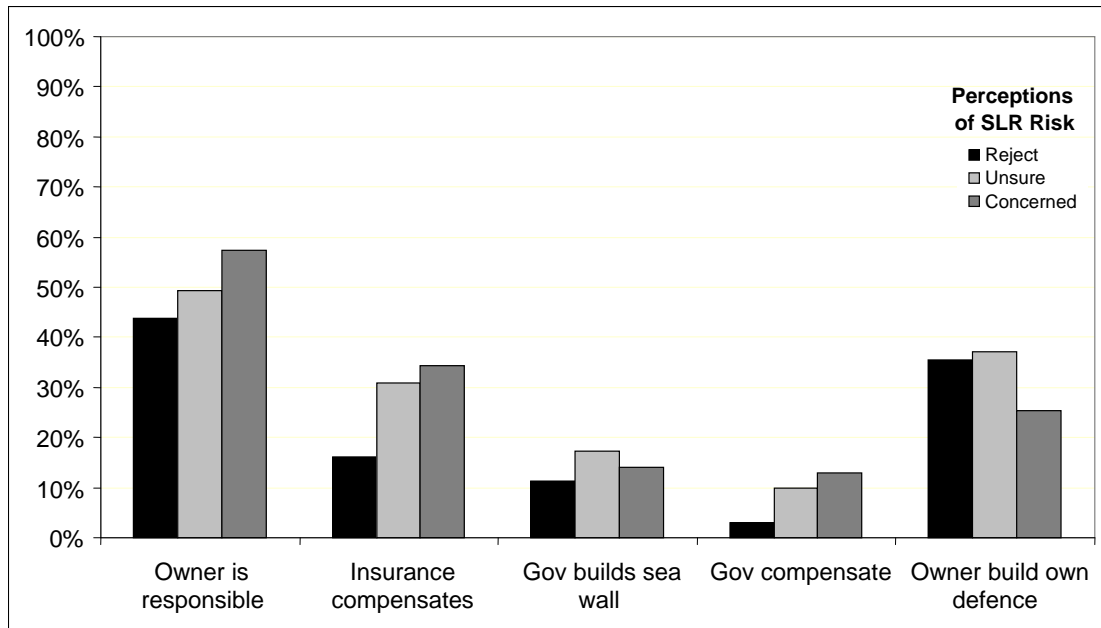


Figure 2 Percentage agreeing with the statement, "If sea-level rise threatens a large number of coastal properties in the future, my expectation is that...".

A χ^2 test revealed that the:

- rejecting group were less likely than the concerned group to agree that insurance would compensate the owner for any loss of building and land
- rejecting group were less likely than the concerned group to agree that the government should compensate the owner for any loss of building and land
- concerned group were more likely than the rejecting group to agree that the owner should be responsible for covering property loss at a .05 significance level only.

In the qualitative responses to this question some rejecting participants commented that they found it difficult to respond to this statement because they do not deem sea-level rise to be a legitimate risk, which could explain this result. A second explanation is that a significantly higher proportion of the rejecting group did not agree with any of the five statements.

There were no significant differences between the three risk perception groups in the proportion of participants who agreed that:

- the owner should be allowed to build defences to protect their property
- the government would build a sea wall to protect the property.

4.2.2 Property rights and rising seas

Participants were asked: “When you purchase residential property, do you believe your right to the land is:

- a fundamental right that cannot be taken away under any circumstance
- can be relinquished to benefit the general public if compensated
- under some circumstances could be relinquished to benefit the general public without compensation
- can be relinquished under circumstances agreed to before property purchase
- can be relinquished if the property becomes unsafe to live on”

Participants could agree with all or none of the statements and the responses are summarised in Figure 3.

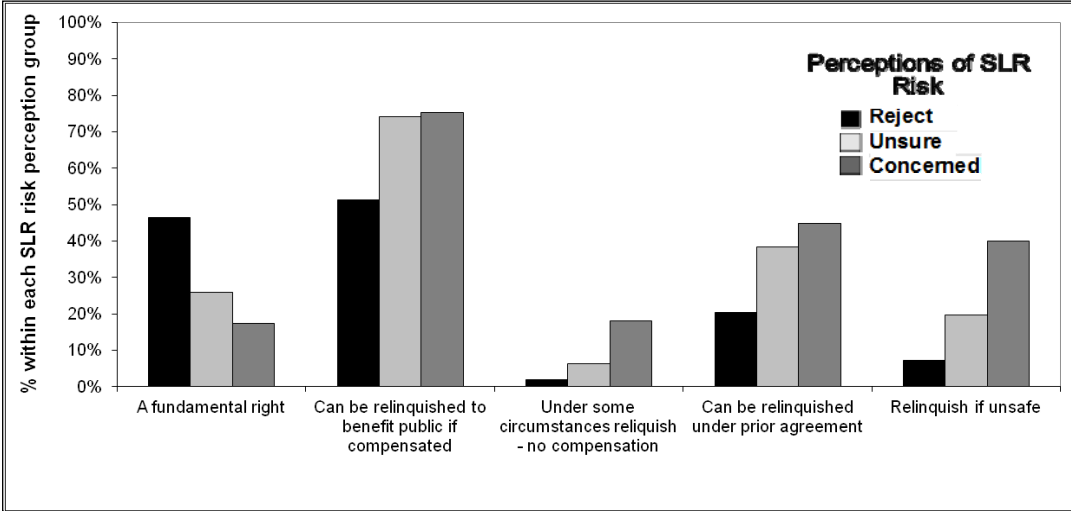


Figure 3 Percentage agreeing with the statement, “When you purchase residential property, do you believe your right to the land is...”.

Overall there was general agreement that land “can be relinquished for public benefit if compensated” while only a few agreed that right to land “under some circumstance can be relinquished with no compensation”.

Significantly more in the rejecting group agreed that “land is a fundamental right” compared to the unsure/concerned groups (χ^2 test). Significantly fewer in the rejecting group agreed, when compared to the unsure/concerned groups, that land can be relinquished: (i) to benefit the public, (ii) with no compensation, (iii) under prior agreement, and (iv) if the property becomes unsafe.

4.2.3 The fairness of property buyers judging the risks of sea-level rise

Participants were asked “Is it fair for individuals to be responsible for judging the risks of rising seas when investing in property?”. Responses are summarised in Figure 4.

The majority (80%) of respondents (83% of rejecting group; 79% of unsure group; 75% of concerned group) indicated they felt it was fair or extremely fair for individuals to be responsible for judging the risks of rising seas when investing in property. A comparison of medians found that the rejecting group when compared to the concerned group had a higher fairness rating for individuals being responsible for judging the risks of rising seas when investing in property.

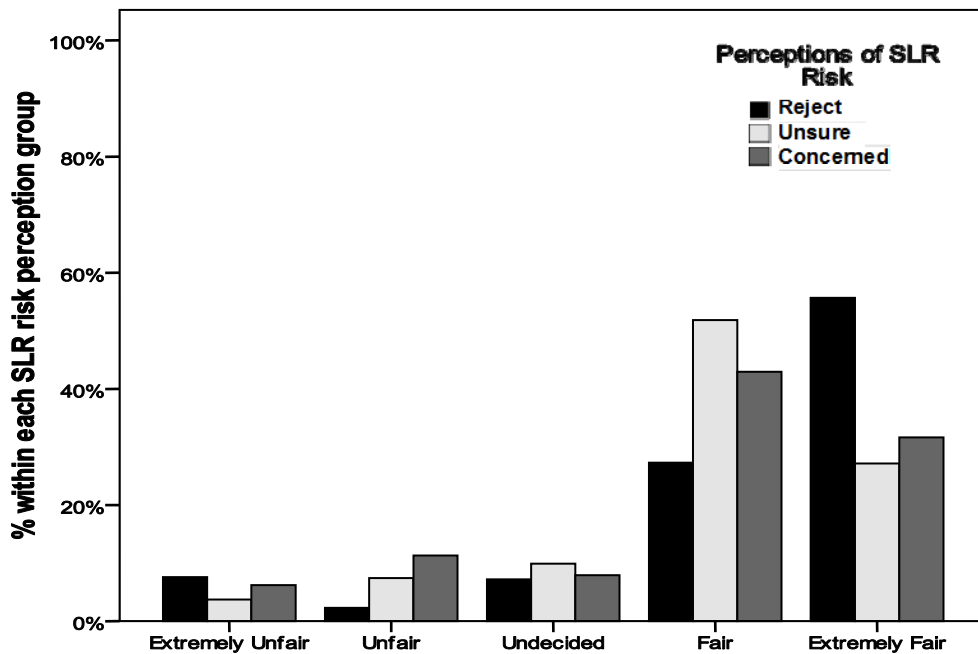


Figure 4 Responses to statement “Is it fair for individuals to be responsible for judging the risks of rising seas when investing in property?”

4.2.4 Who should pay to defend property from rising seas?

Figure 5 presents the distribution of responses to the statement “Property owners should pay the costs of defending their properties against sea-level rise” for each risk-perception group.

In the survey 52% of the participants (48% of rejecting group; 57% of unsure group; 55% of concerned group) strongly agreed or agreed with this statement, while 21% of the participants (25% of rejecting group; 21% of unsure group; 15% of concerned group) strongly disagreed or disagreed with the statement. A comparison of medians reveals no significant differences in the median responses between the risk-perception groups. The rejecting group, however, may have found it difficult to respond to this if they were not willing to consider the possibility of sea-level rise.

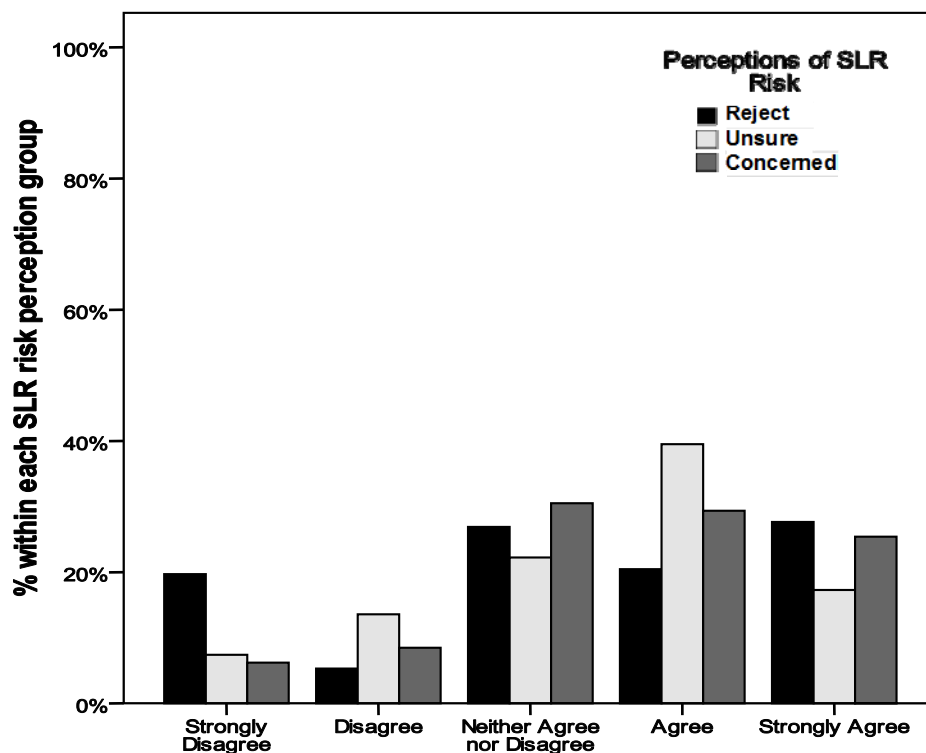


Figure 5 Responses to the statement “Property owners should pay the costs of defending their properties against sea-level rise”

4.2.5 Liability for losses from rising seas

Figure 6 presents the distribution of responses to the statement “Homeowners should be liable for loss of their property from rising sea levels” for each risk perception group.

In the survey 41% percent of the survey respondents (43% of the rejecting group; 36% of the unsure group; 40% of the concerned group) indicated that they either agreed or strongly agreed with this statement. There is a relatively even distribution of responses for all three risk-perception groups. This suggests that there are divergent views within each risk perception group on whether or not the homeowner should be liable. A comparison of medians reveals no significant differences in the median responses between the risk-perception groups.

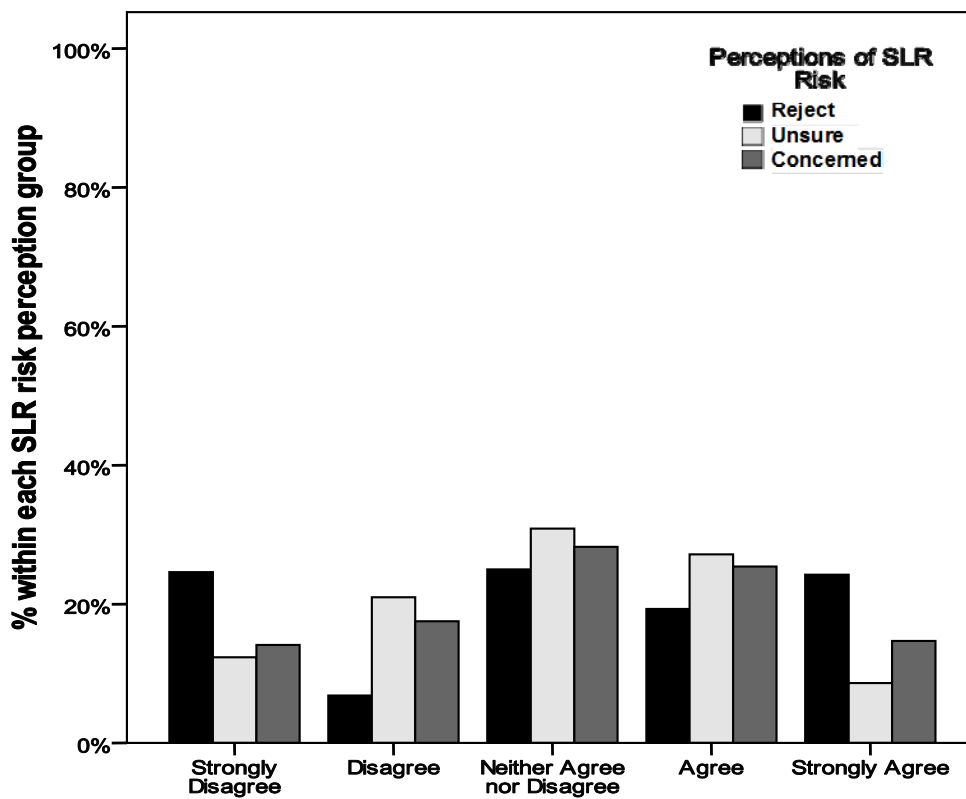


Figure 6 Responses to statement “Homeowners should be liable for loss of their property from rising sea levels”

4.2.6 Compensation for property acquired to adapt to sea-level rise

The responses to the statement “homeowners should be compensated if their property is acquired by the government due to sea-level rise” are summarised in Figure 7.

Of the survey respondents 49% percent (48% of the rejecting group; 56% of the unsure group; 47% of the concerned group) indicated that they either agreed or strongly agreed with this statement. A comparison of medians reveals no significant differences in the median responses between the risk-perception groups. A notable feature of the responses is that a large proportion of the rejecting group disagreed with this statement, implying that the rejecting group are against publicly funded compensation. This result may be explained by the rejecting group finding this question difficult to answer if they are unwilling to consider the possibility of accelerated sea-level rise and therefore do not want to discuss compensation.

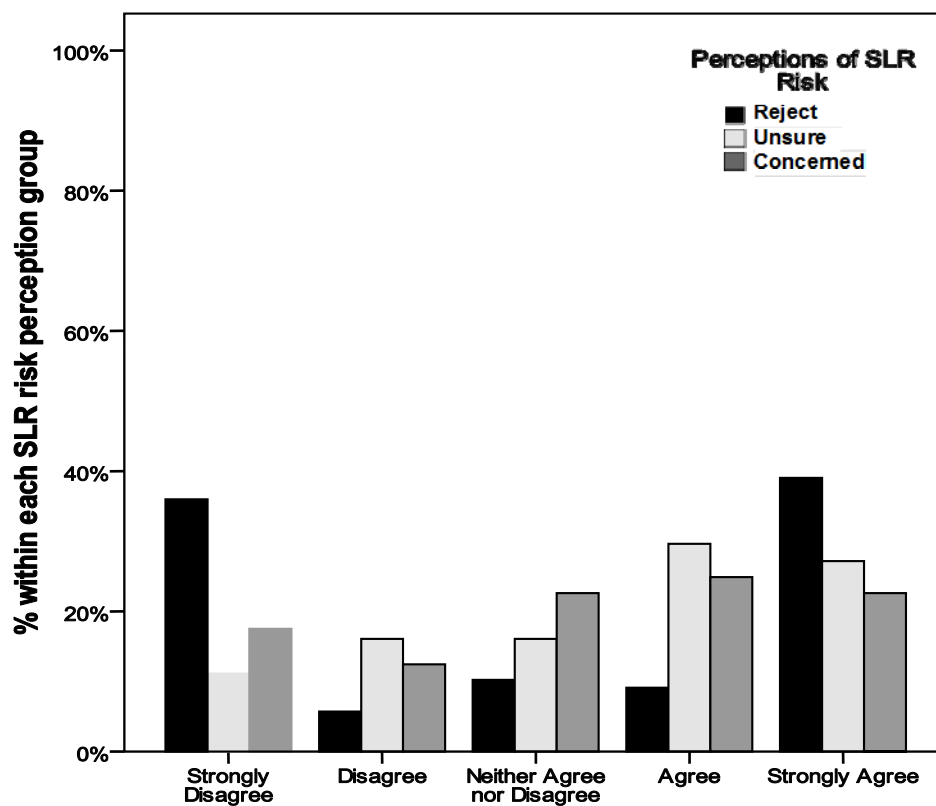


Figure 7 Responses to statement “Homeowners should be compensated if their property is acquired by the government due to sea-level rise”

4.2.7 Protection of public versus private land

The responses to the statement “It is more important to protect private property than to protect the beach” are summarised in Figure 8.

Over half (54%) of all respondents (35% of the rejecting group; 56% of the unsure group; 79% of the concerned group) either disagreed or strongly disagreed with this statement, while 35% of the survey respondents (31% of the rejecting group; 12% of the unsure group; 9% of the concerned group) agreed or strongly agreed with the statement. This result suggests that most people unsure or concerned about the risk of sea-level rise would support, in principle, maintaining beaches at the expense of private property. A comparison of medians revealed that the rejecting group were significantly more likely than the unsure and concerned groups to support protection of private property rather than beaches. (However, people who reject sea-level rise as a plausible risk will find this question leading or irrelevant.) The unsure group were found to be more likely than the concerned group to support protection of private property rather than beaches.

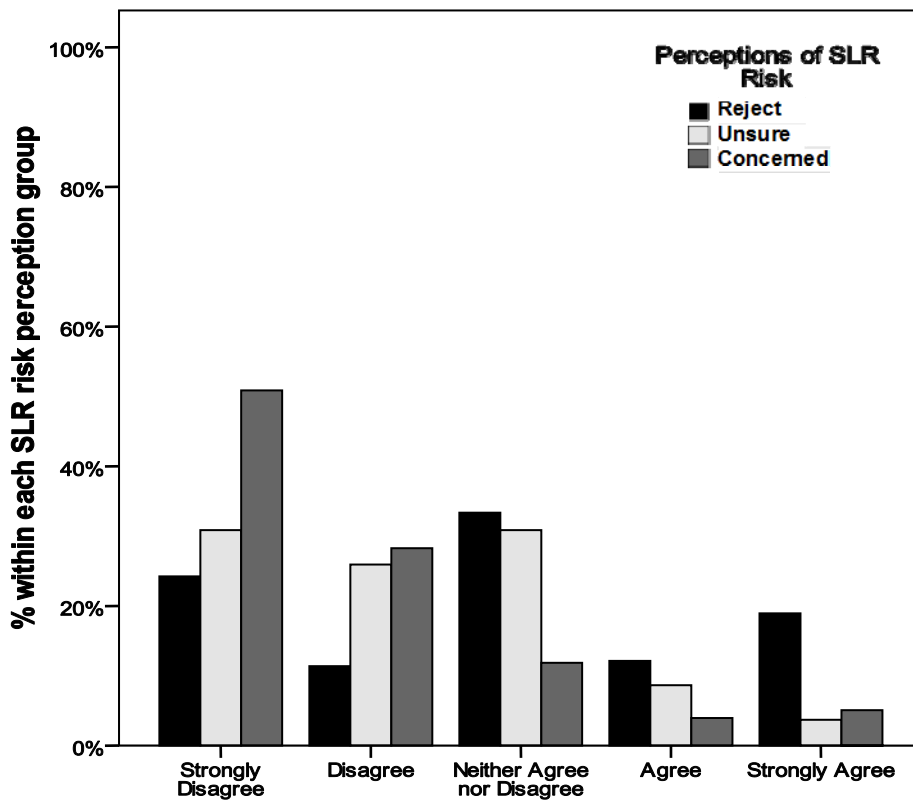


Figure 8 Responses to statement “It is more important to protect private property than to protect the beach”

4.3 Perceptions of the role of government

4.3.1 The use of public funds to prepare communities for sea-level rise

Figure 9 summarises responses to the statement “Governments should spend money to help communities prepare for sea-level rise”.

The majority of respondents classified as unsure (54%) and concerned (81%) about sea-level rise strongly agreed or agreed that governments should spend money to help communities prepare for sea-level rise. The majority of the rejecting group (79%) strongly disagreed. A comparison of medians revealed the rejecting group to have a significantly lower median score than the unsure/concerned groups. The median score of the unsure group was significantly lower than that of the concerned group.

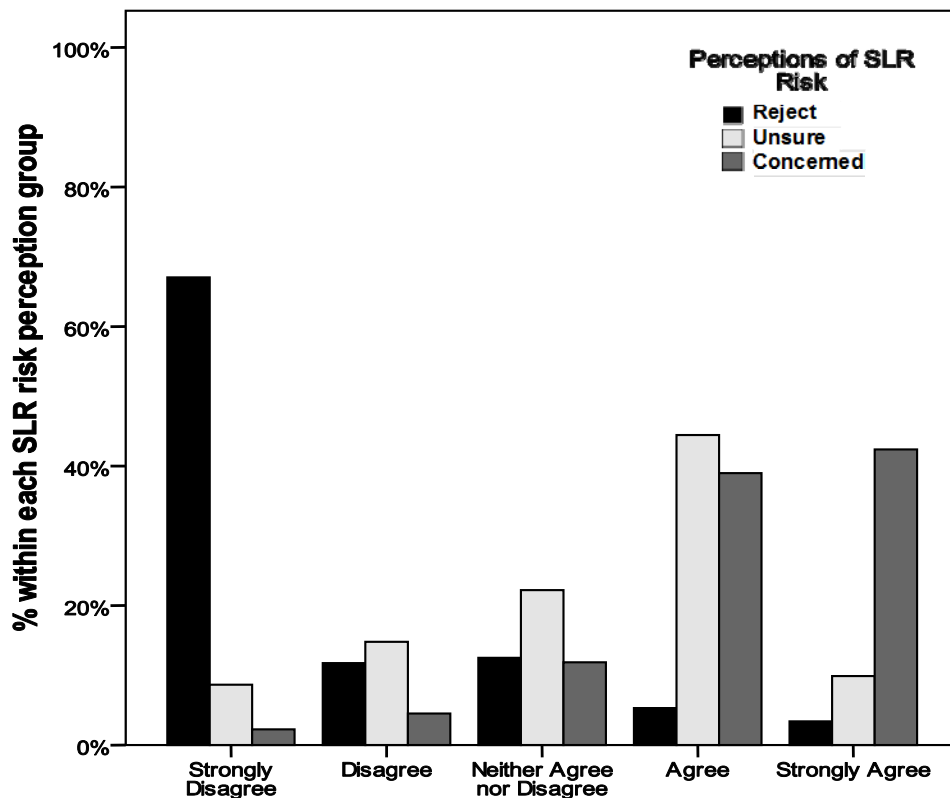


Figure 9 Responses to statement “Governments should spend money to help communities prepare for sea-level rise”

4.3.2 The use of public funds to protect private property

Figure 10 presents distribution of responses to the statement “Governments should spend money to protect private property from rising seas”.

The majority (65%) of all respondents (75% of the rejecting group; 54% of the unsure group; 55% of the concerned group) either disagreed or strongly disagreed with the statement that Governments should spend money to protect private property from rising sea levels. The rejecting group were significantly less likely than the other two groups to support government spending on the protection of private property from the threat of rising sea levels.

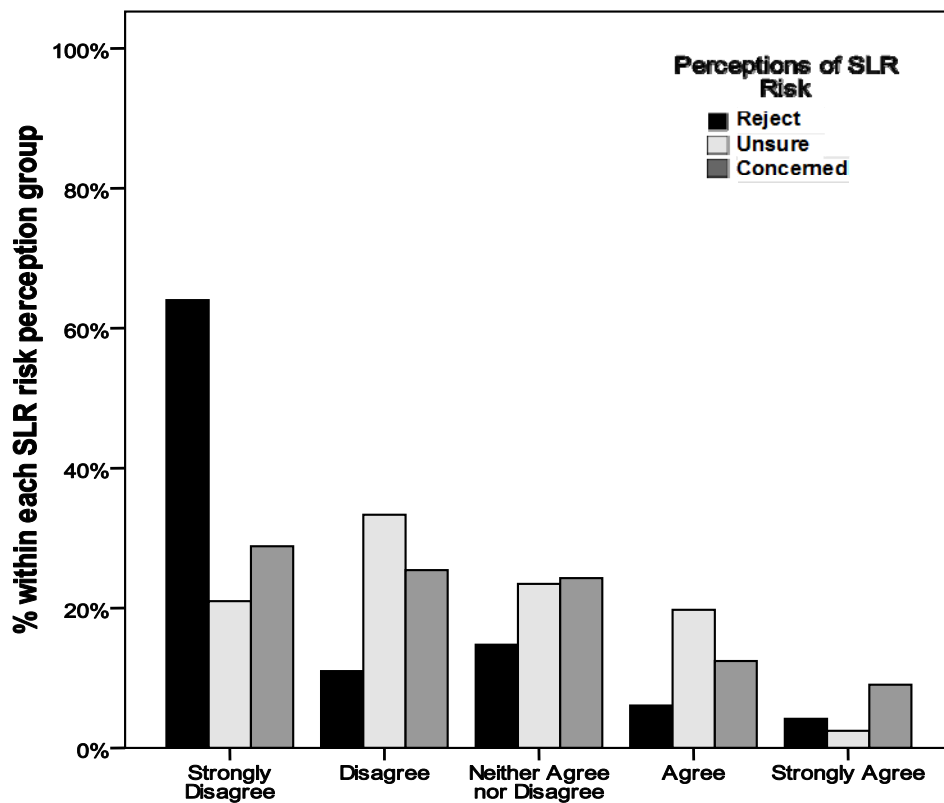


Figure 10 Responses to statement “Governments should spend money to protect private property from rising seas”

4.3.3 The use of public funds to maintain coastal ecosystems in the face of climate change

Figure 11 reports responses to the statement “Governments should ensure that coastal wetlands, dunes and beaches are maintained in the face of sea-level rise”.

In the survey 38% of all respondents (11% of the rejecting group; 51% of the unsure group; 71% of the concerned group) either agree or strongly agree that governments should maintain these coastal ecosystems in the face of sea-level rise. The concerned group were significantly more likely to agree with this statement than either the unsure or rejecting groups. The rejecting group were significantly more likely to disagree with the statement when compared to the unsure and concerned groups. Some of the rejecting group may have found this statement difficult to respond to if they were not willing to consider the possibility of sea-level rise. Their responses may therefore indicate rejection of the threat of sea-level rise, rather than an assertion that they do not value the ecosystems.

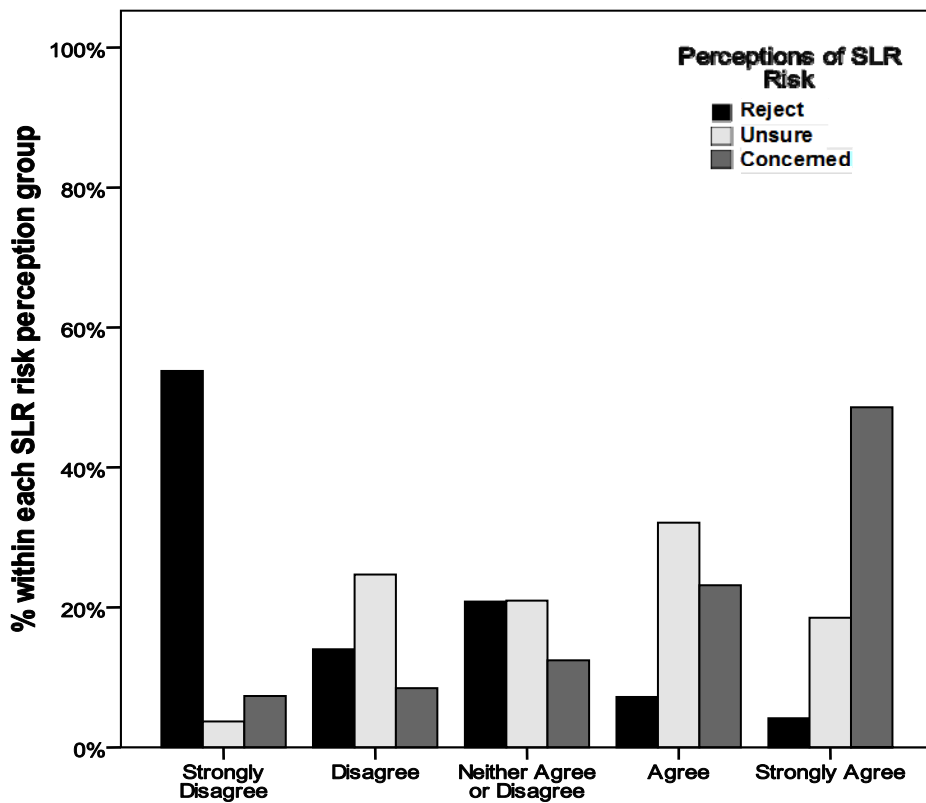


Figure 11 Responses to statement “Governments should ensure that coastal wetlands, dunes and beaches are maintained in the face of sea-level rise”

4.4 Perceptions of a retreat policy

To learn more about how people will respond to the prospect of investing in a house with a retreat clause under conditions of sea-level rise, we asked survey participants to assess a hypothetical Conditional Occupancy Right scheme (Figure 12).

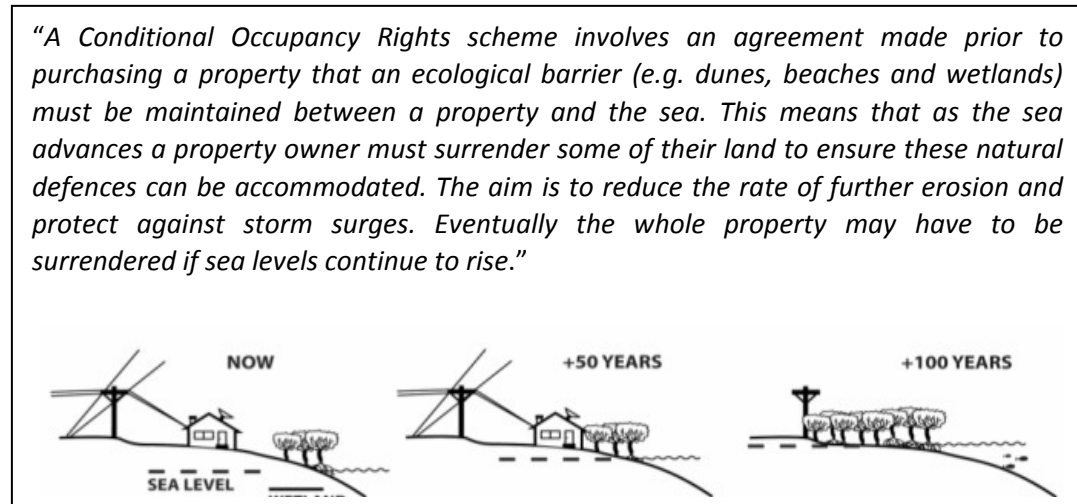


Figure 12 The diagram and text used in the online survey to describe the conditional occupancy scheme.

4.4.1 Will people invest in property if occupancy is linked to sea level?

Figure 13 summarises the responses to the question “If you were planning to buy a property near the coast, would you consider buying a property with a Conditional Occupancy Rights scheme, that is under the condition that you had to vacate the property if the sea rises to a predefined level?”

A minority, 26% of the sample (28% of the rejecting group; 16% of the unsure group; 29% of the concerned group) indicated that they were likely or extremely likely to consider buying under a Conditional Occupancy Rights scheme. Interestingly, 65% of the participants who indicated they would consider a Conditional Occupancy Rights scheme also indicated in their commentary that they would expect to purchase with a discount. Conversely 62% of the sample (63% of the rejecting group; 63% of the unsure group; 58% of the concerned group) indicated that they would be extremely unlikely or unlikely to invest under the scheme.

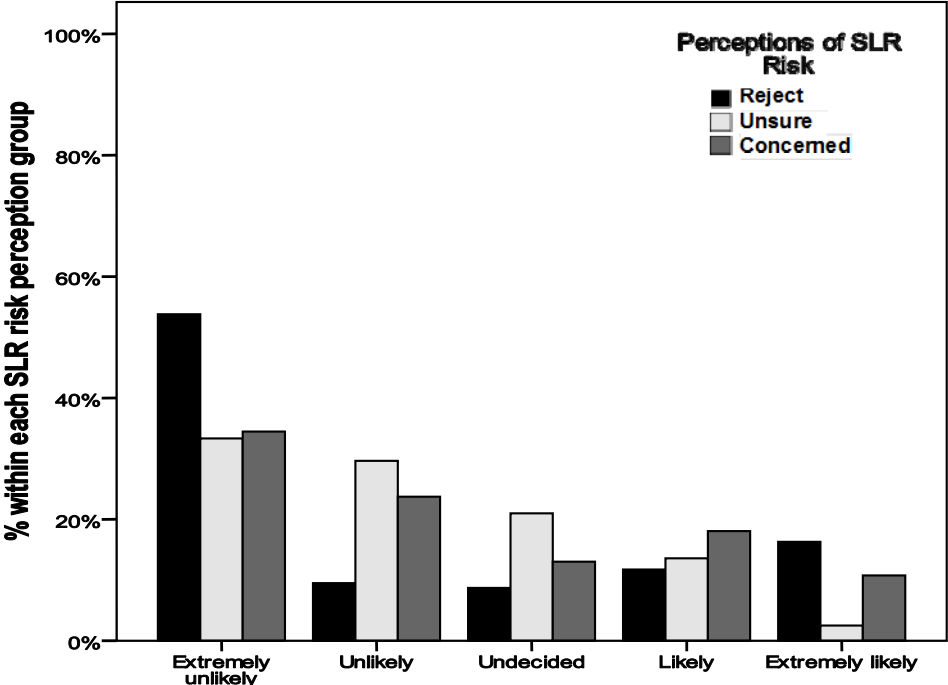


Figure 13 Responses to question “If you were planning to buy a property near the coast, would you consider buying a property with a Conditional Occupancy Rights scheme, that is under the condition that you had to vacate the property if the sea rises to a predefined level?”

Participants were asked to explain why they would or would not buy a property under a Conditional Occupancy Rights scheme. A common response from the rejecting group who were willing to invest in the scheme was that they expected to make money over the long-term because the sea level will not rise. For example qualitative responses included: “Since the major sea-level rise isn't going to happen, this scheme might enable me to buy more [land] cheaply with no subsequent need to move”. A number of the concerned group noted they would be interested in investing to enjoy the benefits and discounts before the sea rose

significantly. For example *“I won't be here in 50 years - and if I lose money I understand it will be my heirs' loss”*.

Table 3 displays reasons given for not investing in a Conditional Occupancy Rights scheme. Concerns include investment risks, lack of compensation, the retreat scheme not suited to needs, lack of information, the concept of retreat, ethical issues, increasing government powers, undue government interference, the validity of the science sea-level rise, legal risks, personal loss, and the threat of sea-level rise.

Respondents also raised concerns about the objectivity and consistency with which the conditions would be applied and enforced. One participant noted *“I would consider it but the conditions required to vacate would have to be very clear and objective prior to purchase”*.⁵ While Table 3 summarises the various reasons put forward for not investing in a Conditional Occupancy Rights scheme, we suggest that other qualitative methods such as focus groups and interviews are required to learn more about the nature of these investment barriers.

Some reasons for not investing in the Conditional Occupancy Rights scheme were common to more than one of the survey groups. Statements with an “R” next to them in Table 3 are reasons provided by the rejecting group only. These included: the scheme being undemocratic, being against common law rights, being against buyer beware principle, difficult to write up a fair contract, represents an additional government cost, represents unwanted government red tape, freehold property should not be conditional and courts would not uphold this condition.

Statements with an “U/C” next to them in Table 3 are reasons for not investing in the scheme given by Unsure or Concerned only. They included: the argument that development in areas at risk should not be approved, costs should be paid by industry, it is not ethical to sell such a property, the need for intergenerational responsibility.

⁵ A significant number of rejectionists also commented that they found it difficult to respond to this question

Table 3 Reason for disinterest in investing in property with Conditional Occupancy Rights

<i>Investment concerns</i>	
•	Bad investment
•	Want capital gain from investment
•	Other investment options available
•	Too much uncertainty with investment
•	Do not want to take unnecessary risk
•	Want secure tenure
•	The contract condition would influence resale value
•	Would not get finance for such an investment
•	Investment is too big to take risk
•	Don't want to risk most expensive asset that will own
•	Property close to the sea is subject to risks that are not related to sea-level rise (R)
<i>Lack of Compensation concerns</i>	
•	Would need guaranteed compensation
•	Concerned about unfair compensation
•	Would require compensation if giving up land for a public purpose
<i>Scheme not suited to their needs</i>	
•	Would politically support the scheme, but would not personally invest due to the risk
•	Would only purchase property in an elevated position
•	Currently seeking to sell from a location at risk of sea-level rise
<i>Would like more information</i>	
•	Depends on price
•	Depends on local conditions
•	Depends on how long property could be used for
•	Would like to know more about the conditions that would require retreat and who decides
•	Depends on probability of inundation
<i>Concerns with concept of retreat</i>	
•	Would defend property against sea-level rise
•	It is not moral to force someone off their property
•	Such a retreat process would be undemocratic (R)
•	Would be against common law rights (R)
•	Better options available to address sea-level rise
<i>Ethical concerns</i>	
•	Believe in principle of buyer beware (R)
•	Could not write up a fair contract—legal concerns (R)
•	Development at risk of sea-level rise should be not be approved (U/C)
•	The risks are transferred to owner when they should be paid by polluter (U/C)
•	If owned such a property it would not be ethical to sell it (U/C)
•	Have an intergenerational responsibility to family (U/C)
<i>Concerns with increasing government powers</i>	
•	Do not trust government to have a mandate to relinquish property rights
•	Don't trust government not to change rules
•	Don't trust governments to fairly compensate
•	It is not moral for a government to have mandate to nullify property rights (R)
<i>Concern with costs of government interference</i>	
•	An additional government cost (R)
•	Unwanted government regulation/red tape (R)
<i>Personal loss concerns</i>	
•	Too emotionally attached to house to want to surrender it. (U/C)
<i>Concerns about the sea-level rise science</i>	
•	Does not believe in the possibility of sea-level rise (R)
•	Don't trust sea-level rise science (R)
•	Scheme is not required because sea-level rise science is making wrong conclusions (R)
<i>Concerns about the threat of sea-level rise</i>	
•	Because sea-level rise is accelerating (U/C)
<i>Legal concerns</i>	
•	If the title is freehold, it should not be conditional (R)
•	Courts would not uphold this condition (R)

U/C = only Unsure or Concerned participants made this comment

R = only rejecting group participants made this comment

4.4.2 Is it possible to design an acceptable retreat scheme?

Would it be possible to develop a managed retreat scheme that overcomes some of the concerns raised in Table 3? Addressing this question, Figure 14 presents the distribution of responses to the question “Under the right conditions would you be supportive of a Conditional Occupancy Rights Scheme?”

In the survey 42% of the sample (24% of the rejecting group; 57% of the unsure group; 70% of the concerned group) indicated that they were either likely or extremely likely to support a retreat scheme if it were specified in an appropriate way. Note however that many people may require schemes with different specifications. A comparison of medians found the rejecting group to be less likely to support a retreat scheme they consider to be specified in an appropriate way than the unsure/concerned risk groups. The unsure group were less likely to support the scheme they consider to be specified in an appropriate way than the concerned group.

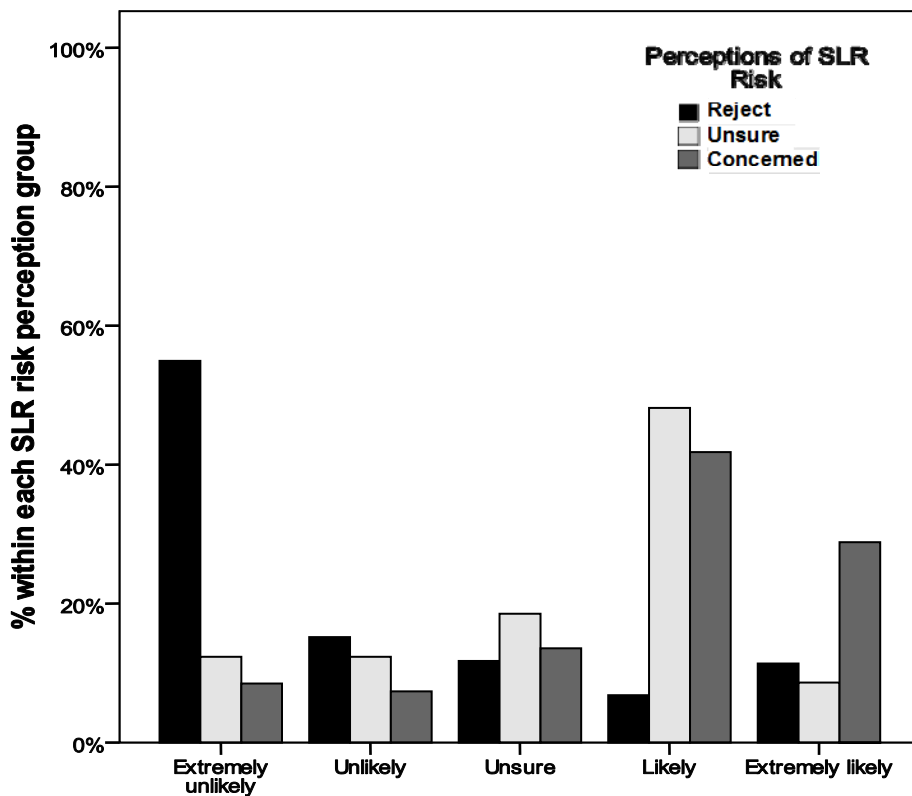


Figure 14 Responses to question “Under the right conditions would you be supportive of a Conditional Occupancy Rights Scheme?”

To check if responses to the conditional retreat scheme were due to concerns about government acquisition of property, we also specifically asked about attitudes to this.

Figure 15 presents the distribution of responses to the statement “It is possible to design a fair and just scheme for governments to acquire residential property” for each risk perception group. Results are similar to the responses to the previous question, as 43% of the participants (29% of the rejecting group; 62% of the unsure group; 56% of the concerned group) agreed or strongly agreed that it is possible to design a fair and just scheme for governments to acquire residential property. The rejecting group were significantly more likely to disagree with this statement than the unsure/concerned groups, even though the rejecting group should be more likely to identify the Conditional Occupancy Rights scheme as being a profit opportunity.

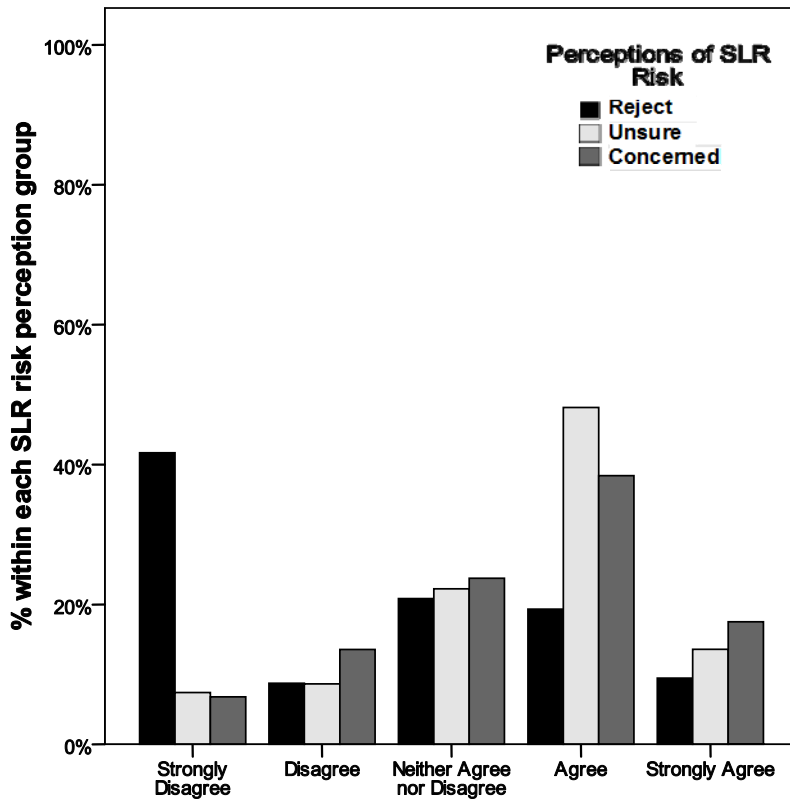


Figure 15 Responses to statement “It is possible to design a fair and just scheme for governments to acquire residential property”

4.4.3 The influence of compensation on property purchase under a Conditional Occupancy Rights scheme

To understand the extent to which purchase under the Conditional Occupancy Rights scheme was related to financial considerations we asked, “If you were to be compensated for the value of the surrendered land would you consider buying a property with a Conditional Occupancy Rights Scheme?” Figure 16 presents the distribution of responses for each of the risk perception groups.

In the survey 36% of the total sample (34% of the rejecting group; 32% of the unsure group; 41% of the concerned group) indicated they would be likely or extremely likely to consider buying into a Conditional Occupancy Rights scheme when compensated for the loss of land value, while 43% (47% of the rejecting group; 46% of the unsure group; 36% of the concerned group) stated that they were unlikely or extremely unlikely to consider investing under these conditions.

The prospect of compensation increased the percentage of people who said they were likely or extremely likely to purchase under a conditional rights scheme from 26% to 36%. The prospect of compensation also reduced the proportion of respondents in the rejecting group who stated they were extremely unlikely to consider investing under a Conditional Occupancy Rights scheme from 63% to 47%.

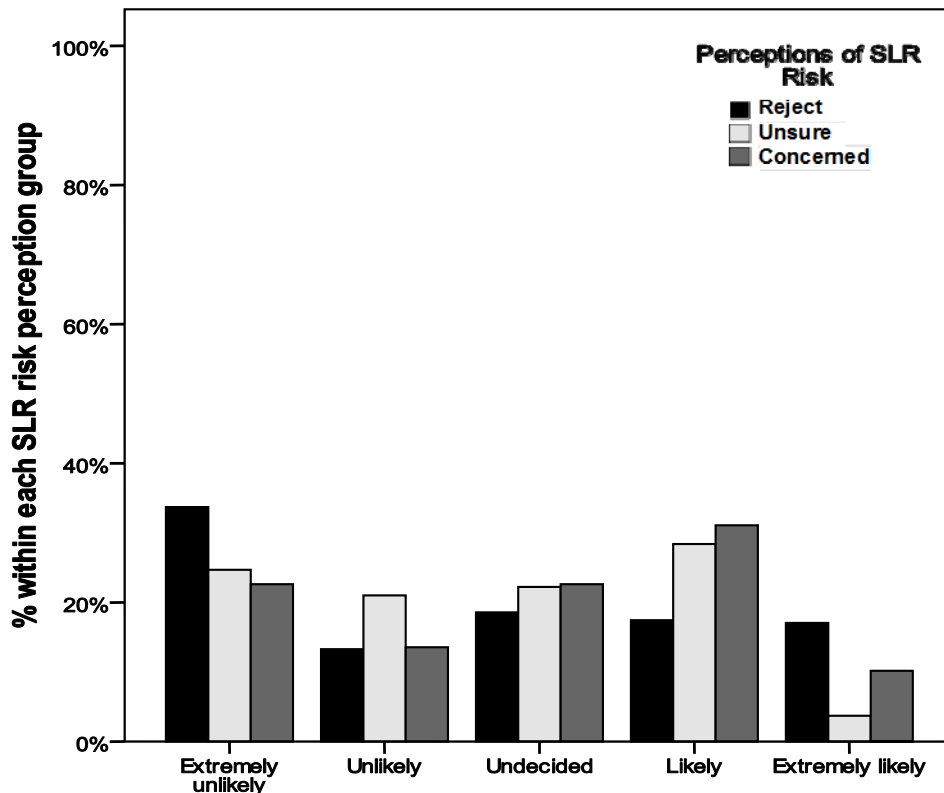


Figure 16 Responses to question “If you were to be compensated for the value of the surrendered land would you consider buying a property with a Conditional Occupancy Rights Scheme?”

4.4.4 Credible enforcement of occupancy conditions

Figure 17 presents the distribution of responses to the question “Do you think it is likely that the local government would enforce the Conditional Occupancy Rights Scheme and actually require the owners to vacate the property?”

Of the participants 55% (52% of the rejecting group; 59% of the unsure group; 58% of the concerned group) indicated that they believe that it was likely or extremely likely that the local government would enforce the Conditional Occupancy Rights scheme. A comparison of medians revealed no significant differences in the responses of the three groups. Figure 13, however, indicates that the distribution of the rejecting group responses is different to the distribution of the concerned/unsure groups. The rejecting group may have found it difficult to respond appropriately to this question if they were not willing to consider the sea-level rise scenario.

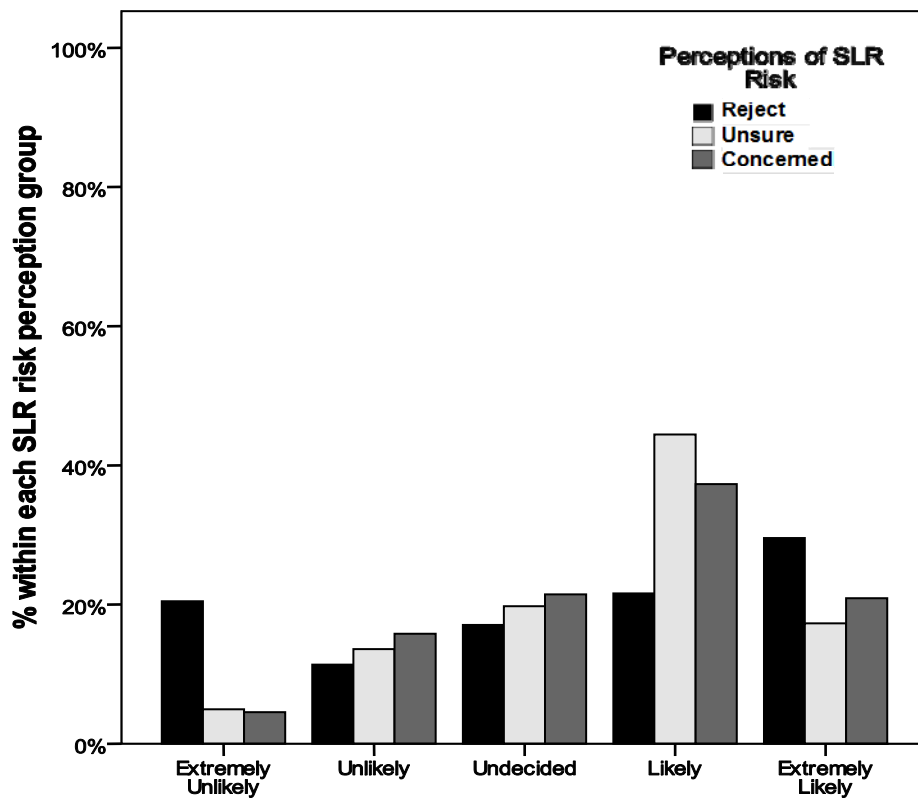


Figure 17 Responses to statement “Do you think it is likely that the local government would enforce the Conditional Occupancy Rights Scheme and actually require the owners to vacate the property?”

4.4.5 Fairness of removal under a Conditional Occupancy Rights scheme

Figure 18 summarises the responses to the question “Do you think it is fair that someone who purchases a property under a Conditional Occupancy Rights Scheme should be expected to vacate the property if the sea level rises?”

In the survey 59% of respondents (36% of the rejecting group; 73% of the unsure group; 86% of the concerned group) indicated that they thought it was fair or extremely fair to expect people to vacate their property purchased under Conditional Occupancy Rights Scheme if there is a rise in sea levels. A comparison of medians found that the rejecting group had a lower median score suggesting they thought the expectation to vacate if the sea level rises was less fair than the unsure/concerned groups. Furthermore, the unsure group had a lower median score than the concerned group.

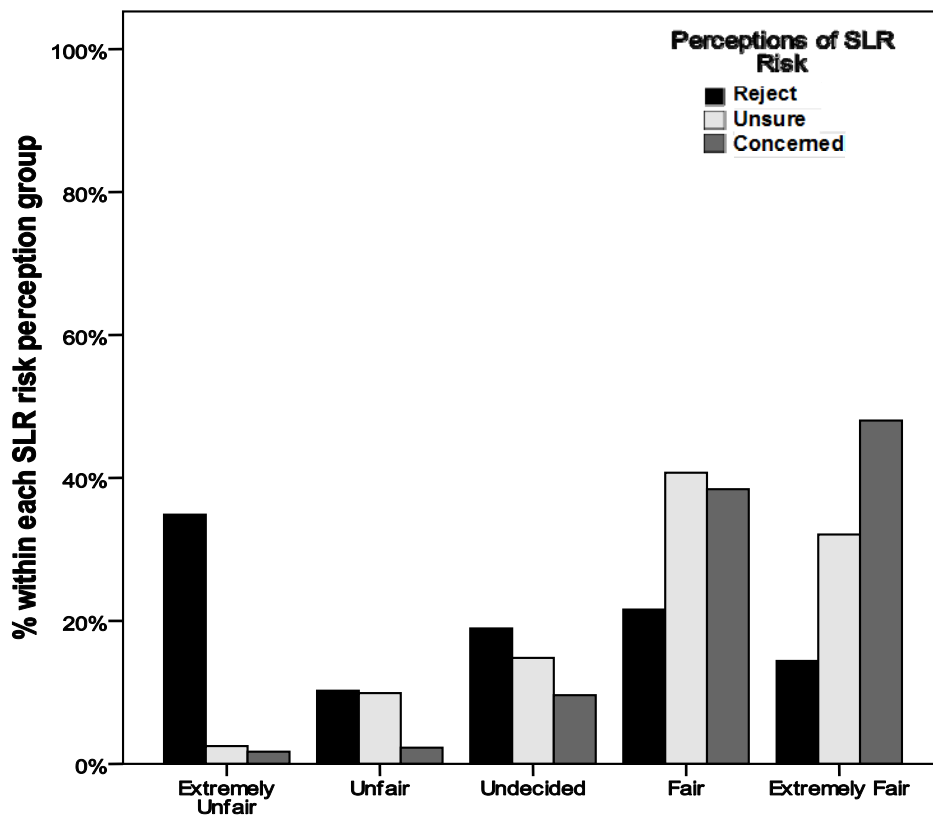


Figure 18 Responses to statement “Do you think it is fair that someone who purchases a property under a Conditional Occupancy Rights Scheme should be expected to vacate the property if the sea level rises?”

4.4.6 The fairness of imposing future costs on owners

Figure 19 summarises responses to the question “If an individual purchases a property under the proposed Conditional Occupancy Rights Scheme, is it fair for them to be personally responsible for bearing the costs of sea-level rise on their property decades later?”

In the survey 67% of total respondents (64% of the rejecting group; 64% of the unsure group; 74% of the concerned group) said it would be fair or extremely fair for the owner to be personally responsible for the costs of sea-level rise in future decades. No median different was found between the sea-level rise risk groups. The 16% of rejecting group who indicated that it would be extremely unfair may have found this question difficult to answer if they were not willing to seriously consider the risk of sea-level rise.

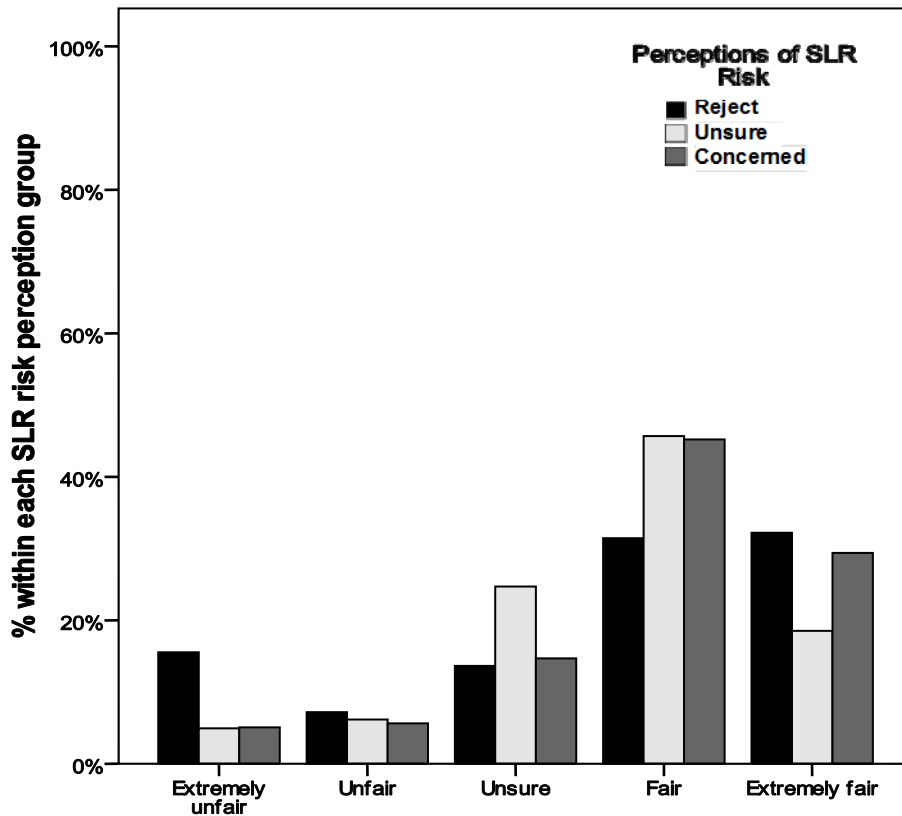


Figure 19 Responses to question “If an individual purchases a property under the proposed Conditional Occupancy Scheme, is it fair for them to be personally responsible for bearing the costs of sea-level rise on their property decades later?”

4.4.7 Anger towards a Conditional Occupancy Rights scheme

Figure 20 presents the distribution of responses to the questions “Did you feel angry when reading about the Conditional Occupancy Rights Scheme?” for each risk perception group.

Participants were asked about their level of anger because anger is described as being a destructive emotion that if felt widely by a community can be a major impediment to any policy implementation (Litvak, Lerner et al. 2010). A more open-ended question about how survey respondents felt about the Conditional Occupancy Rights scheme may have also found a different range of emotions.

A comparison of medians revealed large differences between the risk perception groups. Around half (49%) of respondents (25% of the rejecting group; 63% of the unsure group; 77% of the concerned group) indicated that they did not feel at all angry when reading about the proposed scheme. However, 38% of the rejecting group responded that reading about a Conditional Occupancy Rights scheme made them feel extremely angry.

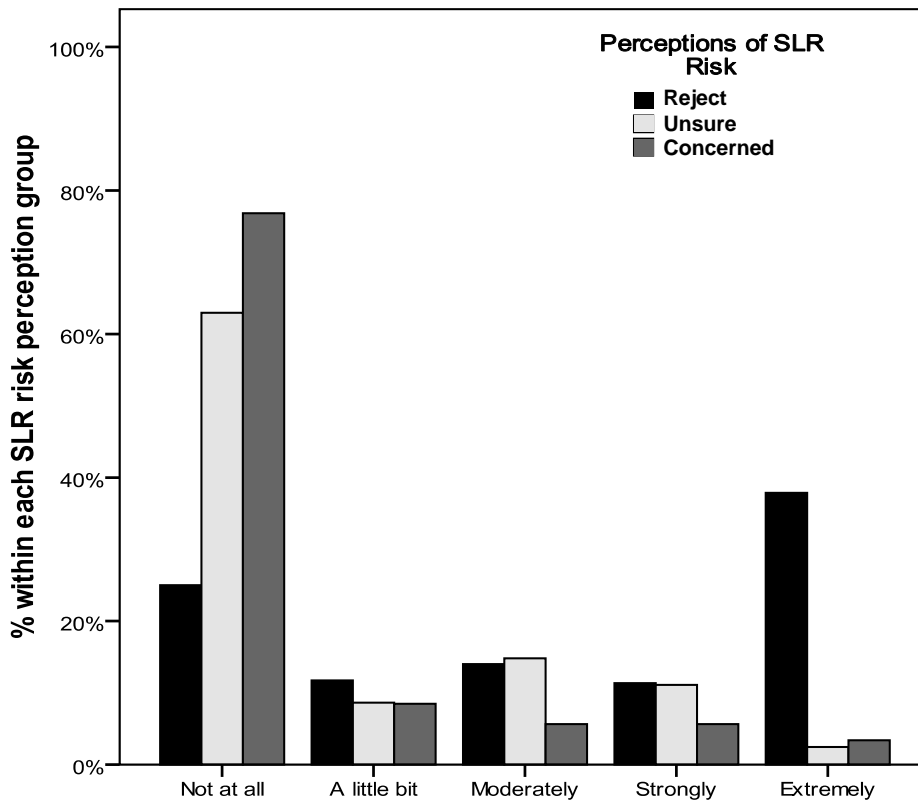


Figure 20 Responses to question “Did you feel angry when reading about the Conditional Occupancy Rights Scheme?”

Respondents who indicated they were angry were asked the open-ended question: “If you felt angry, what were you angry about?” Table 4 lists the reasons for anger. Some reasons for being angry when reading about the Conditional Occupancy Rights scheme were common to more than one of the survey groups. Reasons for being angry that were only put forward by the rejecting group included: concerns that people will make money from the scheme, the

potential for a ‘bureaucratic nightmare’, greens ‘stomping over individual rights’, the waste of time and money, the buyer beware principle, and anger at this survey which has raised the prospect of sea-level rise.

Reasons for being angry that were only put forward by people who were concerned or unsure about sea-level rise risks included: governments trying to avoid liability, local governments should not approve risky construction, humans should not have caused climate change, polluters avoiding cost of climate change, fear that people ignoring risks will want a bail out, and a lack of distinction between current housing purchases (where buyers should be aware of risk) and houses purchased prior to public knowledge of sea-level rise.

Table 4 Reason for anger at the Conditional Occupancy Rights (COR) Scheme

Specific concerns about scheme

- Potential loss of property
- Conditional Occupancy Rights scheme will destroy property values
- There should be no Conditional Occupancy Rights scheme (R)
- Not enough information about the Conditional Occupancy Rights scheme was provided
- People will make money off the Conditional Occupancy Rights scheme (R)
- Who will enforce the COR scheme?

Concerns with government powers

- Government interference
- Don't expect government to keep its side of deal
- Potential of acquisition by stealth
- Potential for being a bureaucratic nightmare (R)
- Government trying to avoid liability (U/C)

Political concerns

- Greens are stomping over rights of individuals (R)
- Local governments should not approve construction of houses in risky locations (U/C)
- Humans should not have caused climate change (U/C)

Personal concerns

- Concerned about losing house as live in risky area (U/C)

Distributional justice concerns

- Climate change costs being pushed on individuals rather than polluters (U/C)
- People living on beaches expecting taxpayers to bail them out (U/C)
- Lack of distinction between new and old property purchases (U/C)

Don't want changes

- Should leave it to buyers to be aware of risks (R)
- Waste of time and money (R)
- Want to make own judgements (R)

Concerns about property rights

- Loss of rights
- Change of land tenure

Don't believe sea-level rise science

- Sea-level rise science is fraudulent (R)
- The science is not settled (R)
- Accelerated sea-level rise is unlikely (R)

Concern about survey

- Money is being wasted on survey (R)
- Anger at the survey assuming that sea levels will rise (R)

U/C = only unconcerned participants made this comment

R = only rejecting group participants made this comment

4.4.8 Suggestions to improve a Conditional Occupancy Rights scheme

The survey participants were asked “Can you think of any changes to Conditional Occupancy Rights Scheme that may make people more likely to accept them?”

Table 5 presents a list of suggestions made by participants on how to improve a Conditional Occupancy Rights scheme. Comments not common across other risk groups are indicated as either R (rejecting) or U/C (unsure or concerned).

Suggestions put forward only by the rejecting group include: fears of a land grab, claims that the scheme is not constitutional, request for rights of appeal, the scheme must have adequate proof of sea-level rise, request for measured outcome and suggestions that sea-level rise should not be publically discussed.

Suggestions for the Conditional Occupancy Rights scheme that were only put forward by concerned or uncertain participants include: a variety of compensation suggestions, government buybacks, green credits, guarantees for housing, government renting land, stopping development, strong government commitment to reducing carbon emissions and climate change education.

Table 5 Suggestions for the Conditional Occupancy Rights Scheme

<i>Compensation justifications</i>
<ul style="list-style-type: none">• Higher compensation for existing owners• Compensation for loss of land• Compensation for moving• Compensation for poor government decisions• Compensation for poor scientific predictions
<i>Compensation suggestions</i>
<ul style="list-style-type: none">• Significant or full compensation• Compensation that is much lower than the purchase price• Have a guaranteed rate of return on Conditional Occupancy Rights property• Land swap for other government land• Purchase includes a bond that could be used for compensation later• Coastal retreat insurance• Indexed compensation (U/C)• Government buyback (U/C)• Transferrable development rights(U/C)• Compensation that diminishes with time(U/C)• Income Tax breaks/deductions(U/C)• No local government rates(U/C)• Yearly contribution to bond that could be used for compensation later(U/C)• Green carbon credits for giving up property for ecological barrier(U/C)• Guarantee that person moving has access to housing(U/C)
<i>Other compensation suggestions</i>
<ul style="list-style-type: none">• Clear compensation specifications• A compensation clause that is transparent at time of purchase• Have compensation tribunal• Compensation based on existing not future law (U/C)
<i>Assessment of Conditional Occupancy Rights scheme</i>
<ul style="list-style-type: none">• Fair if you have been warned prior to purchase• Must be based on valid science• Must be based on valid scenarios• The scheme is only workable if the rights and obligations are transparency• Doubt they will be required in 50 years (R)• Must ensure that this is not a land grab(R)• Too many opportunities for property to be stolen by government(R)• Drop the idea of Conditional Occupancy Rights(R)

Retreat policy recommendations

- Retreat must be based on ironclad agreement that cannot be reversed by residents lobbying
- No retreat scheme or sea-level rise policy

Provide more information

- Ensure full disclosure at time of sale
- Need more information about compensation
- Who defines the sea rise level for retreat?
- Want independent information about climate change not paid by government
- Provide regularly updated sea-level rise prediction models and new data on current level
- Clearly define council and owners obligations
- Is this constitutional?(R)
- Is it possible to differentiate sea-level rise from storm surges and erosion?(R)
- Outline information about all rights of appeal(R)
- Provide information about risk of specific sites(U/C)
- Clarity on length of the conditional occupancy rights contract(U/C)
- Provide a multiple scenario plan for purchases so as to show the impacts at various sea level rises (e.g. create a risk map) (U/C)

Who should be responsible for specifying when retreat is required?

- Not the local or state government
- An independent body
- Have an independent and affordable arbiter to resolve disputes

Suggestions on retreat conditions

- Assurances that resumption can only be the result of sea-level rise
- Clearly defined trigger points
- Ironclad agreement that cannot be reversed by residents lobbying
- Specifications of what is adequate proof of sea-level rise. (R)
- Based on measured outcomes rather than a model(R)
- Retreat would have to be based on a greater sea-level rise than 10cm (R)
- There should be some leeway with retreat requirements (U/C)

Other mentioned sea-level rise policy options

- Engineered defences
- Buyer beware
- Have a lease which can be terminated under certain conditions or be renewed
- Government rents out land (U/C)
- Don't develop in some areas(U/C)

Other suggestions

- Do not have any sea-level rise policy (R)
- Do not publically discuss sea-level rise(R)
- Avoid a scare campaign on sea-level rise(R)
- Decrease in sea level should increase persons property (R)
- Do not apply conditional occupancy rights to existing properties (U/C)
- Ensure building codes suit retreat requirement (e.g. movable houses) (U/C)
- Need ratepayers to agree to scheme(U/C)
- Introduce conditional occupancy rights as soon as possible(U/C)
- Advertise well if scheme is implemented(U/C)
- Have measure to ensure ecological barrier is protecting others(U/C)
- Need laws that prevent new buildings on coastlines(U/C)
- Conditional Occupancy Rights residents should be consulted by government/experts at fixed periods(U/C)
- There should be a strong government commitment to reducing carbon emissions(U/C)
- There should be education on climate change(U/C)

U/C = only unconcerned participants made this comment

R = only rejecting group participants made this comment

5. SUMMARY OF SURVEY RESULTS

We draw some tentative conclusions from this survey about how community perceptions may influence the support for, and effectiveness of, policies that involve retreat from rising seas. Care should be taken in drawing specific policy implications from this survey due to the general, and exploratory, nature of the survey questions and particularly because of the self-selected, and hence non-representative, nature of the sample. The size of the sample is sufficient to justify the conclusion that the three categories based on perceptions of risk – rejecting, uncertain and concerned – are likely to comprise significant proportions of the Australian population. However, because it is self selecting, it has excluded other categories (e.g. people who do not care or know about SLR risk issues) who for various reasons did not participate. A stratified random survey which follows up those who do not respond is needed for a better understanding of the national responses to sea-level rise and land use policies. Additional qualitative studies are warranted to further understand the reasoning of individuals.

Polarised views on sea-level rise influence views on policy options

We identify three groups of respondents to our survey based on whether they: (i) are concerned about the risk of sea-level rise, (ii) are unsure about whether rising seas pose a risk or (iii) reject the notion that sea levels will rise and pose a risk. Many respondents who reject the notion that coastal communities are at risk from rising seas also objected to public discussion about this issue. Many participants in the rejecting group also objected to this survey. An unwillingness to consider the possibility of the sea-level rise scenario may have made it difficult for these individuals to respond to a number of the survey questions.

There has been much interest recently in examining community perceptions of climate change risks and how research and community consultation processes should respond to people who reject the possibility of climate change risks (The Climate Institute 2009; Hanson 2010; The Climate Institute 2010). Here we note that the views of the rejecting group are likely to be over-represented in our survey sample and analyse the responses in separate risk perception groups.

There is disagreement about the legitimacy of government interventions to protect coastal communities and ecosystems from sea-level rise

- The majority of participants concerned or unsure about the risks of rising seas agreed that governments should spend money to help communities prepare for sea-level rise. The majority of respondents who rejected sea-level rise risks disagreed with the government spending money to help communities prepare for sea-level rise.
- A high 71% of participants concerned about the risks of rising seas agreed or strongly agreed that governments should protect coastal wetlands, dunes and beaches under conditions of rising sea levels; 51% of the participants who were unsure about sea-level rise risks agreed or strongly agreed that a government priority is ecological maintenance. Only 11% of participants who reject the risk of rising seas strongly agreed or agreed with the government maintenance of ecosystems in the face of sea-level rise.

Some commonly held beliefs may be a major barrier to implementing a managed retreat policy and to effective coastal planning in general

- Under a quarter (22%) of all respondents indicated that if large numbers of houses are threatened by inundation that the owner would not be responsible for covering the loss, indicating instead that either government or insurance will compensate landholders or that governments will fund defences.
- Approximately a quarter of the respondents indicated that they expect insurance would bear the cost of rising sea levels. The insurance industry, however, is unlikely to accept this risk within the current insurance framework.
- More than a quarter of respondents expect that property owners would be allowed to build defences to protect their property.
- The majority of respondents did not agree that property rights could be removed even if sea-level rise makes a property unsafe.

There are divergent and sometimes contradictory views about the rights and responsibilities of property owners faced with loss due to sea-level rise

- Slightly more than half of the respondents agree that property owners should pay the costs of defending their properties against sea-level rise.
- About half of the respondents indicated that owners should be responsible for covering any loss of property due to sea-level rise.
- About half of the respondents agree that property owners should be compensated if their property is acquired by the government due to sea-level rise.

Some respondent's beliefs are consistent with some key aspects of a retreat scheme.

The majority of respondents indicated:

- they preferred for individuals to be responsible for judging the risks of sea-level rise when purchasing property
- they did not agree with government spending money to protect private property from rising seas
- it is fair for property rights to be relinquished based upon an agreement made before purchase
- it is fair for an individual who purchased a property under a retreat scheme to bear the future costs of sea-level rise on their property.

An appropriately designed retreat scheme may be supported by respondents who are concerned or unsure about the risks of sea-level rise.

- The majority of respondents concerned or unsure about the risks of rising seas agree it is possible to design a fair and just scheme for governments to acquire residential property.
- People who reject the notion that sea-level rise poses a risk are as likely as other groups to state they would consider purchasing a property with conditional occupancy rights as they believe they would make money off such a scheme. However this group is unlikely to *support* the introduction of *any* policy that plans for sea-level rise.

Beliefs about the risk of sea-level rise influence participants' support for a managed retreat scheme.

- 62% of participants unsure about the risks of sea-level rise and 56% of participants concerned about sea-level rise risks agreed or strongly agreed that it is possible to design a fair and just scheme for governments to acquire residential property. Only 29% of participants who reject the risks of sea-level rise strongly agreed or agreed with the possibility of governments designing a fair scheme to acquire residential property
- 57% of the unsure and 70% of the concerned groups indicated they were either likely or extremely likely to *support* a retreat scheme if it were specified in an appropriate way. In contrast only 24% of respondents in the rejecting group are either likely or extremely likely to *support* a retreat scheme if it were specified in an appropriate way.
- When asked to suggest changes to the Conditional Occupancy Rights scheme respondents provided various alternative schemes that may make people more likely to accept them.
- The majority of respondents who reject the risks of rising sea levels indicated that they were angry after reading about the Conditional Occupancy Rights scheme, while the majority of participants who were concerned/unsure about sea-level rise risks indicated that reading about the scheme did not make them angry.

The prospect of compensation was found to influence support for the Conditional Occupancy Rights scheme

- 26% of the total sample indicated that they were likely or extremely likely to consider buying under the specified Conditional Occupancy Rights scheme. The prospect of compensation for the value of land increased the percentage of people likely to purchase to 36%. The number of people who were extremely unlikely or unlikely to purchase under a Conditional Occupancy Rights scheme decreased from 63% without to 47% with compensation.
- Most respondents indicated that private property rights can be relinquished to benefit the general public if compensated.
- Respondents suggested various alternatives when asked if there were any changes to the Conditional Occupancy Rights scheme that may make people more likely to accept them.
- While a compensation scheme may influence support for buying into a retreat scheme, participants were less likely to support compensation to bail-out communities that face loss due to sea-level rise. Only about 10% of respondents indicated that the government should compensate the owner for any loss of building and/or land if rising sea levels threaten a large number of properties.

This report has summarised our initial analysis of the survey, and we present the results with minimal interpretation and no explicit theory. We intend this descriptive report to be useful to local, state and the Commonwealth governments, and to stakeholders and researchers addressing sea-level rise, land use and adaptation.

The results highlight two major challenges in adapting coasts to climate change that will focus our future research on coastal adaptation. First people have strongly held and polarised views about many aspects of coastal management. It may therefore be necessary to rethink how communities are engaged in processes for developing adaptation policies in these highly contested environments. Second, the details of an adaptation policy are important to how people respond to it. Improving processes and options for adaptation require that we understand the ways in which people think and behave in uncertain and risky situations. We have therefore begun to analyse and interpret the data within theoretical frameworks that help explain the diversity of ways in which people perceive and respond to risk such as Tetlock's (2002) Social Functionalist theory (see Alexander et al. (2011)) and Cultural Risk theory (Douglas and Wildavsky 1982, Thompson 2003, Kahan and Braman 2006).

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