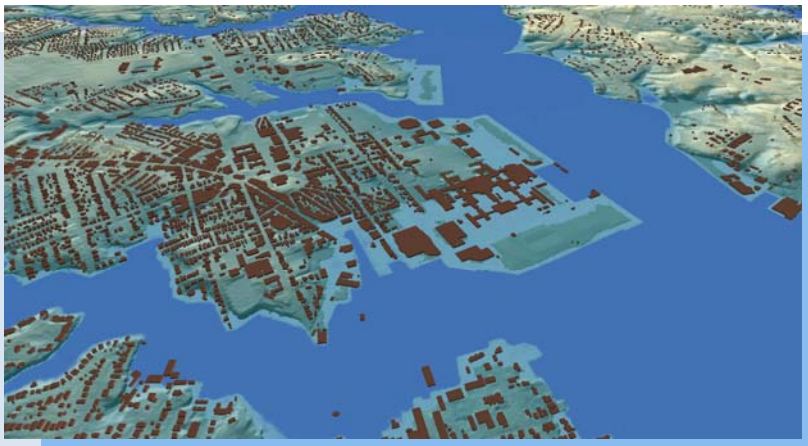
SURVEY
REPORT



Public Opinion and Policy Preferences on Coastal Flooding and Sea-Level Rise

Anne Arundel County, Maryland

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GEORGE MASON UNIVERSITY

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EXECUTIVE SUMMARY

With more than 530 miles of shoreline bordering Chesapeake Bay, Anne Arundel County will likely face important policy questions in coming decades in deciding how best to respond to increased impacts from coastal flooding and sea-level rise. Hurricane Isabel in 2003 left county residents with memorable images of historic Annapolis more than knee-deep in water, and widespread flooding, erosion and structural damage[1,2]. At about a tenth of an inch a year[3], the rate of sea-level rise in the region is one of the highest on the East Coast and is believed to be increasing[4], contributing to the severity of storm surge from events like Isabel[5,6], slowly extending the coastal floodplain inland, and eventually potentially leaving some areas permanently underwater.

Local governments in the past few years have begun evaluate the scope of the problem and possible policy solutions to protect community assets, including public infrastructure, private property, and natural resources[7,8,9,10,11]. Yet the effects of slowly rising waters may be difficult for county residents to recognize, and the issue seemingly removed from their daily lives. This report is part of a study funded by Mid-Atlantic Sea Grant[12] to test a public engagement model for making sea-level rise impact data salient to individuals and facilitating public deliberation on assessed vulnerabilities and policy responses, as conditions under which communities may be more likely to adopt policies that will lead to long-term solutions.

The study consists of two components. First, we conducted a survey of Anne Arundel County residents from randomly selected households that was fielded from March 28 to June 19. The resulting sample is of 378 adults age 18 years or older with a margin of error of +/-5 percentage points within a 95% probability. Second, we invited survey participants to attend a daylong Citizens' Discussion on coastal flooding and sea-level rise on April 28th in Severna Park, Maryland. A follow-up questionnaire was given to the 40 event participants to evaluate changes resulting from the deliberative experience.

Key findings, Anne Arundel County survey

Anne Arundel residents are uncertain how sea-level rise and coastal flooding will manifest in their communities – when impacts will become significant, and whether local governmental policies will adequately address them – but they are aware of the issue, and supportive of an array of local government responses. Incorporating sea-level rise into government planning is the most strongly preferred option, but there is even majority support for increased government spending on this issue. In line with Maryland state legislation[13], residents favor maintaining natural forms of shoreline protection over employing structural barriers, like sea walls.

Perceived risks from sea-level rise and coastal flooding

- Majorities of county residents (60.4%) say that sea-level rise is occurring and that coastal flooding has become more of a problem in recent years (54.3%) (Figure 1).
- Half of residents do not know, or have no opinion, whether their local government's policies are adequate for addressing coastal flooding long term (50.0%) (Figure 2).
- It is not clear to most residents when the effects of sea-level rise will significantly impact the county. Almost a third – at the largest percentage of the response options (29.4%) – say they don't know (Figure 3).
- County residents are most concerned about the effects of shoreline erosion (64.6%), followed by private property damage or loss (59.3%), habitat loss (54.8%), and public infrastructure damage or loss (52.6%).

Knowledge about sea-level rise

- Though a slight majority, most residents correctly believe that scientists do not expect the current rate of sea-level rise to stay the same over the next 100 years (51.2%).
- Factors contributing to high regional rates of relative sea-level rise are not well understood. Fewer than one in five (15.8%) correctly say that about half of observed sea-level rise in the region is due to sinking land (subsidence).
- Almost two-thirds say that climate change is one of the causes of observed changes in sea-level rise (63.4%), but only slightly more than one-third (36.9%) correctly say that current sea-level rise is not solely the result of natural cyclical processes. This suggests that the majority of residents do not associate sea-level rise with human-induced climatic changes from greenhouse gas emissions.

See references for knowledge questions in appendix, p. 68.

Policy preferences for coastal adaptation

- Of policy tools that local governments could use to address coastal flooding and sea-level rise, long-range planning is the most supported (81.9%), followed by regulatory changes (72.5%), and tax incentives to property owners to reduce their risk (67.2%). Use of government spending is the least supported (51.7%).
- County residents are most in favor of maintaining beaches and wetlands against rising waters in publicly owned natural areas (73.3%), followed by buying adjacent lands to enable the movement of natural areas inland (62.5%), and building walls and other structural barriers to

Figure 1.
In your opinion, has coastal flooding become more or less of a problem in the county in recent years? *n=376*

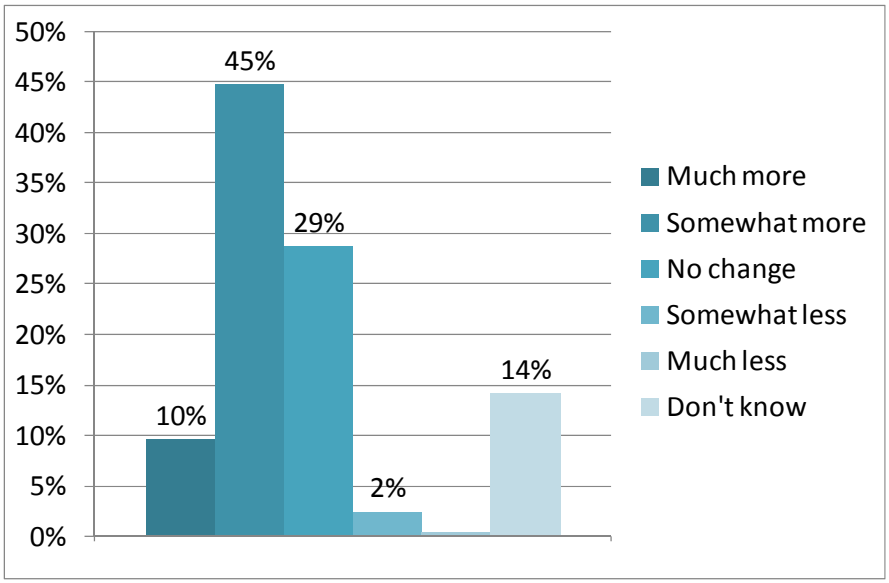


Figure 2.
Would you agree or disagree that your local government's policies are adequate for addressing coastal flooding over the long term (e.g., over a decade or more)? *n=376*

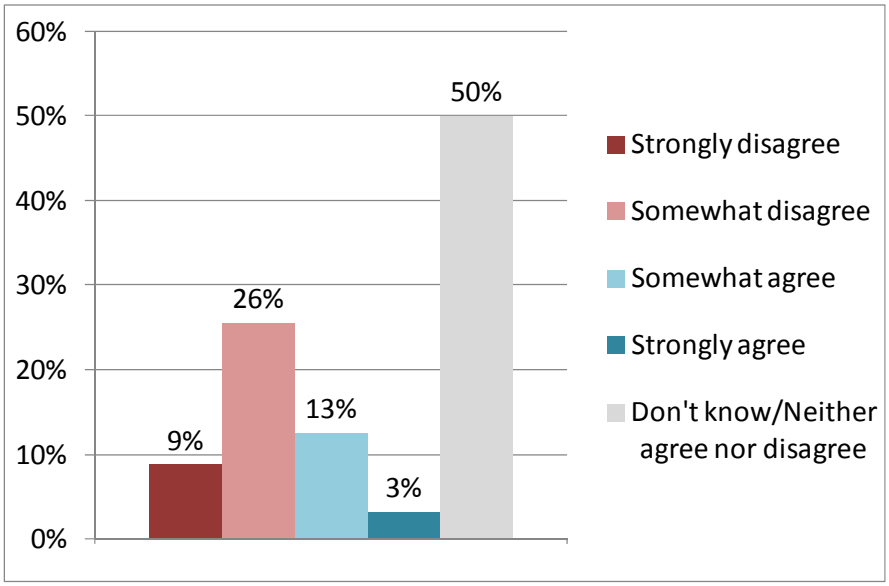
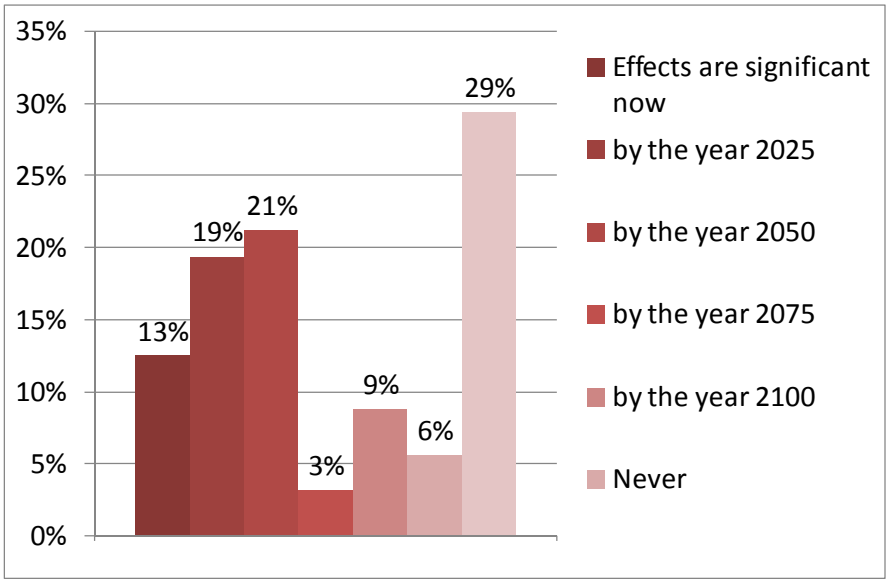


Figure 3.
When do you believe the effects of sea-level rise will significantly impact the county, if ever? *n=377*



protect them (47.9%).

- For built communities, including low-density residential areas and high-density commercial and residential areas, county residents say they most prefer maintaining and restoring natural areas (respectively 86%/87.3%), followed by retreating inland (72.9%/71.2%) and designing and retrofitting buildings to be more flood resilient (58.9%/63.2%) .
- The least popular strategy to protect against coastal flooding is building walls and other structural barriers along the shore, though hardened defenses are supported by just under half for low-density resident areas (45.1%), and by just over half of respondents for high-density commercial and residential areas (52.6%).

Key findings, Citizens' Discussion of coastal flooding and sea-level rise

On April 28th, 40 county residents spent a day learning about coastal flooding and sea-level rise, and discussing the issue with fellow community members. By large margins, the Citizens' Discussion participants became less concerned about the immediacy of the risk both to their own properties and the timing of when impacts would become significant, but more convinced coastal flooding was an increasing problem for the county. About one-third of the 40 participants were from areas of the county most likely to be directly affected, either having homes on the waterfront, or within one block of the water (32.5%).

- Participants became more convinced that coastal flooding has become more of a problem in the county in recent years (+30 pct pts) after attending the Citizens' Discussion event.
- Perceptions of the risk from sea-level rise to their own homes declined (no risk, +29.5 pct pts), as did perceptions of risk to their neighborhoods (no or very little risk , +22.4 pct pts).
- After the discussion, participants were more likely to say that sea-level rise would significantly impact the county later in the century, e.g. not until 2050 to 2100 (+22.5 pct pts).
- The Citizens' Discussion increased individuals' subject knowledge in some areas. Participants were significantly more likely to correctly identify half of observed sea-level rise as due to land subsidence (+22.5 pct pts), and that scientists do not expect the rate of sea-level rise to stay the same over the next 100 years (+25.5 pct pts).
- Some of participants' preferences for response strategies also changed. Participants became more opposed to building walls and other structural barriers to hold back waters in publicly owned natural areas (+14.1 pct pts), and more opposed to retreating inland from high-density commercial and residential areas (+17.4 pct pts).

Conclusions

The long-term, incremental nature of sea-level rise makes its impacts less easily identifiable, but no less real. This study demonstrates that coastal flooding and other impacts from the rising waters of the Chesapeake Bay are of concern to residents, but that they are uncertain of the dimensions of the problem in terms of its risks, and response options and time frames. The Citizens' Discussion contributed to residents' learning about these issues, in terms of their knowledge, risk perceptions and policy preferences. Significantly, it also increased participants' sense of political self-efficacy. This suggests the utility of community discussions on difficult long-term policy issues not only in facilitating their public consideration, but increasing citizens' beliefs in their ability to participate in local policy decisions.

More in-depth analysis, a description of the research methodology, and tables with complete response frequencies to each survey question can be found in later sections of the report. A toolkit of materials from the initiative – including an online impacts visualization and educational materials – is publicly available at www.FutureCoast.info.

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INTRODUCTION

Background

Much of the land along Anne Arundel County's shorelines quickly gains in elevation as it rises from the waters of the Chesapeake Bay, shielding inland areas from encroaching waters[1]. Even so, with hundreds of miles of waterfront, the county faces considerable exposure to coastal flooding and sea-level rise. Under conditions of moderate rates of relative sea-level rise[2], more than 5 square miles of the county could be submerged by 2050[3]. By 2100 that number more than doubles, with potential impacts of $1.5 billion to buildings alone both from periodic flooding and permanent inundation[4]. Other possible county consequences from sea-level rise include coastal erosion, higher storm surges, damage to public infrastructure such as roads and utilities, loss or harm to private water supply wells and septic systems, and threats to archeological sites and the area's natural ecology[5].

Local governments have long taken active roles in coastal planning[6]. As communities develop strategies to protect themselves from the effects of rising coastal waters, they must call upon not only highly scientific and technical assessments of area vulnerabilities, but the values and priorities of their citizens. The data in this report were collected to answer two primary questions for the purposes of informing this, and potentially other, public engagement efforts on coastal flooding and sea-level rise:

1) What are the risk perceptions and policy preferences of Anne Arundel County residents regarding coastal flooding and sea-level rise?
2) How might perceptions and preferences change after in-depth conversations with other community members about the science, impacts and policy of sea-level rise?

The study consists of two components. We first conducted a survey of residents from randomly selected Anne Arundel County households (see Survey Methodology, p. 19). Second, we invited survey participants to also attend a daylong Citizens' Discussion on coastal flooding and sea-level rise on April 28th in Severna Park, Maryland, in which follow-up questions – many identical to the first survey – were given in order to evaluate changes possibly resulting from the experience. Survey participants were given $10 gift cards from Starbucks, iTunes and Safeway as incentives; discussion attendees received $100 VISA gift cards to accommodate transportation and other costs such as babysitting or lost work hours.

The initial countywide survey resulted in a sample of 378 adults age 18 years or older with a margin of error of +/-5 percentage points within a 95% probability. The sample size of the Citizens'

Discussion participants who took both the pre- and post-surveys was 40. Data from both samples is included in this report. The countywide survey sample is older, more educated and less racially diverse compared to 2010 U.S. Census data and American Community Survey estimates from 2006-2010. The sample of participants in the Citizens' Discussion at Severna Park High School was more diverse in terms of income and race than that of the county, and more heavily female. In both samples, approximately one third of participants either live on the water or within one block, just over half are not in a floodplain, and another 20% are not sure whether they are at risk from flooding.

We report first on data from the countywide survey of Anne Arundel County residents, followed by the results of the data from the April 28th Citizens' Discussion participants and a review of the research methodology.

ANNE ARUNDEL COASTAL FLOODING AND SEA-LEVEL RISE SURVEY

The questionnaire distributed to Anne Arundel County residents addressed four primary topics: risk perceptions of coastal flooding and sea-level rise, subject knowledge, local policy preferences, and perceived political efficacy. The results are detailed in each of the sections below.

Risk perceptions

In order to characterize the risk that residents perceive from coastal flooding and sea-level rise to them and their communities, we asked them whether rising waters are a problem for the county, and if so, is it one that local governments have already successfully addressed through current policies?

While most county residents identify coastal flooding and sea-level rise as problems that are occurring and of some or high risk to the county, they are unsure how quickly impacts will manifest locally, and whether local government policies are up to the task of addressing them long term.

The majority of survey participants (60.4%) say that sea-level rise is occurring and that coastal flooding has become more of a problem in recent years (54.3%), but that it is a higher risk to the county than it is to their neighborhoods or their homes and property. Almost four-fifths say that the county is either at some (46.0%) or high risk (32.8%) from sea-level rise over the next 40 years. County residents perceive their neighborhoods to be at lower risk (very little, 35.8%; some, 29.4%), with their own home or property at no (29.2%) or very little risk (38.6%).

The largest percentage of residents do not know, or have no opinion, whether their local government's policies are adequate for addressing coastal flooding long term (50.0%). Just over a third (34.3%) say policies are inadequate with the remaining (15.7%) saying that they are sufficient to the task.

The largest percentage (29.4%) similarly does not know when the effects of sea-level rise will significantly impact the county, if ever. Very few residents think that it will never have significant impacts (5.6%), or that those impacts will occur in the second half of the century (12.0%). More than one in five say that effects will manifest by 2050 (21.2%), with approximately the same number saying it will occur by 2025 (19.4%), and another 12.5% saying that the effects are already significant.

From a list of nine potential areas of impact from sea-level rise, residents say they are most concerned about the effects of shoreline erosion (64.6%), followed by private property damage or loss (59.3%), habitat loss (54.8%), and public infrastructure damage or loss (52.6%). Less than a

third of residents say they are concerned about permanently flooded areas in the county resulting from sea-level rise (30.4%).

Individuals' risk perceptions can be strongly linked to their direct experiences of a hazard or their physical proximity to a threat, so it is important to assess those factors. In this sample of survey respondents, more than three-quarters of respondents said they had never personally experienced flooding of their home or property. More than a quarter (28.6%) said they live either on the water or within one block. Almost one in five respondents (19.0%) was not sure of their flood risk exposure, stating that they did not know whether they live in a floodplain.

Knowledge about sea-level rise

Sea-level rise – both the science and policy implications – has received increasing amount of public attention over the past few years, yet it remains a subject that is removed from the day-to-day of most people's lives, particularly for those who live inland. The subject is complicated by a number of dimensions: it is a component of glacial cycles that occur over periods of tens of thousands of years; it is global phenomenon, but it manifests differently at smaller scales; and it is affected by recent anthropogenic warming – a politically charged topic in the United States.

Of these three dimensions that make sea-level rise difficult to comprehend, Anne Arundel County residents are most uncertain about: 1) the local geological dynamics of sea-level rise, and 2) how recent trends compare to the last time glaciers retreated toward the poles 125,000 years ago. More than half are unsure of the contribution of subsidence to relative sea-level rise, e.g. that about half of the observed sea-level rise in the region is due to sinking land (26.0% neither disagree nor agree, 32.4% don't know). Large percentages are similarly unclear that global sea levels indeed have been higher than they are today (15.0% neither disagree nor agree, 25.5% don't know).

In contrast, Anne Arundel County residents are most certain that 1) sea-level rise is caused in part by climate change, and 2) that the rate of sea-level rise will not stay the same the next 100 years. Almost two-thirds of residents say that climate change is one of the causes of observed changes in sea-level rise (63.4%), and a majority also correctly identify that scientists do not expect sea-level rise to stay the same the next 100 years (51.2%). Yet only slightly more than one-third (36.9%) correctly link rising waters to non-natural processes. The seeming contradiction in the results is likely explained by the use of the term climate change to both represent natural climatological changes, and those arising from human emissions of greenhouse gases. Thus believing climate change to be a cause of sea-level rise does not necessarily imply believing human global warming to be a factor.

Policy preferences for coastal adaptation

For the past few decades, three primary approaches to coastal adaptation in response to sea-level rise have been presented as options to communities: retreat, accommodation, and protection[8]. Retreat refers to moving community inhabitants inland as waters submerge coastal lands and structures; accommodation encompasses a wide variety of tools that facilitate continued occupation of vulnerable areas, such as the elevation of buildings; and protection is the use of either built or natural structures to defend vulnerable areas from flooding and inundation.

The selection of which strategy – or combination of strategies – to employ is dependent on a large range of considerations, including the extent of predicted impacts of sea-level rise on the area, economic costs and benefits, and community priorities and values. This survey asked Anne Arundel residents to assess their preferences for coastal adaptation strategies in three types of areas representative of the county: publicly owned natural areas, low-density residential areas of primarily single family homes, and high-density commercial and residential areas. In order to remove one of the contextual considerations, we asked them to assume that the cost for the taxpayer was the same for each.

The majority of residents support local government efforts to limit the impacts of coastal flooding in all three types of areas. When respondents can equally rate all options, protection of publicly owned natural areas is the most strongly supported (76.2%), followed by high-density commercial and residential areas (66.8%) and low-density residential areas of primarily single family homes (63%). When asked to choose only one area which should be to be governments' top priority however, high-density commercial and residential areas edge out publicly owned natural areas (44.2% vs. 38.0%). Only 17.7% of residents report that low-density residential areas should be the top concern.

In recent years Anne Arundel County and the City of Annapolis have begun to evaluate regional vulnerabilities and potential adaptive strategies. In most cases, local policies are still in their early stages, and detailed cost/benefit information for projected impacts and potential responses are not available. The policy preference questions asked in this survey thus are a broad brush attempt to evaluate one type of contextual consideration – the characteristics of three types of areas in the county – on citizens' attitudes toward the primary ways that communities are expected to adapt to rising seas.

Local governments have a wide assortment of policy tools available to them: regulations, spending, tax and market incentives, and planning[9]. The attitudes of residents toward adaptation strategies are also influenced by their attitudes toward the types of government actions – and use of policy tools –

that might be taken to protect the county from coastal flooding and sea-level rise impacts. Thus we also asked which categories of tools are most preferred by county residents. The majority of all respondents are supportive of the use of each type of policy tool to limit the impacts of coastal flooding due to sea-level rise. Long-range planning is the most supported (81.9%), followed by regulatory changes (72.5%), and tax incentives to property owners to reduce their risk (67.2%). Use of government spending is the least supported (51.7%).

More specific information about the adaptation policy preferences of Anne Arundel County residents are described below each of three types of areas within the county.

Publicly owned natural areas

We posed three potential strategies for flood protection of publicly owned natural areas to survey respondents: 1) buy adjacent lands to enable natural areas to move inland (an ecological version of retreat); 2) maintain beaches and wetlands against rising seas (accommodate higher waters and erosion for example through beach nourishment or elevation of wetlands); and 3) build walls and other structural barriers along the shore to hold back coastal waters (protection through structural defenses). County residents are most strongly supportive of maintaining beaches and wetlands against rising waters (73.3%), followed by buying adjacent lands (62.5%), and building walls and other structural barriers (47.9%).

In open-ended responses to why they did not like any of the strategies, county residents frequently mention concerns about costs and that it is preferable to let "nature take its course."

Built areas: Low-density residential areas and high-density commercial and residential areas

Four strategies for flood protection of built areas were presented to survey respondents for both low-density residential areas and high-density commercial and residential areas. These included: 1) retreat inland over time, restricting new building in areas likely to flood, and moving or abandoning existing structures; 2) main and restore natural areas such as wetlands and beaches as buffers against coastal flooding; 3) design and retrofit buildings to be more flood resilient, including elevating them and/or the land; and 4) build walls and other structural barriers along the shore to hold back coastal waters. The four strategies are variants of retreat, accommodate, and protect (using both natural and structural means).

For both types of built communities, low-density and high-density, county residents say they most

strongly prefer maintaining and restoring natural areas (respectively 86%/87.3%), followed by retreating inland (72.9%/71.2%) and designing and retrofitting buildings to be more flood resilient (58.9%/63.2%). The least popular strategy is building walls and other structural barriers along the shore. Structural defenses are supported by less than a majority for low-density resident areas (45.1%), but by the majority of residents for high-density commercial and residential areas (52.6%).

In open-ended responses as to why they do not like any of the strategies, county residents cite concerns about costs, but also argue that these problems are not ones that government should be addressing.

Perceived citizen political efficacy

Public engagement efforts by definition strive to increase the civic involvement of citizens. "Political efficacy" is measured in this study due to its association with higher levels of political participation[10]. The term refers to belief in having the necessary skills for successful political participation (internal efficacy), and the capability to alter political outcomes (external efficacy). Political efficacy exists at the level of both individuals and groups: self-efficacy is an individual's perception of their own capabilities, and collective efficacy is an assessment of a group's capacity[11].

Anne Arundel County residents possess higher levels of political collective efficacy than of self-efficacy. More than three-quarters reply favorably to three questions which measure perceptions of community political organizational ability and effectiveness: that citizens can have an impact on local government policies (82.1%), can work together successfully to promote important local policy issues (75.7%), and can cooperate to evaluate information and make important local community decisions (75.1%). Just under half of respondents also agree that "local elected officials will respond to the needs of citizens" (49%).

While the majority of respondents (58.8%) say that they have the ability to talk about and participate in local public policy discussions, other measures of individuals' political self-efficacy are markedly lower. Only a quarter say they think that "local public officials care a lot what people like me think" (26.8%), almost two in five say "public policy issues are so complex that someone like me couldn't understand them" (39.1%), and they are equally split on whether people like themselves have any say in what local government does (43% yes; 43.6% no).

Conclusions

In some areas of the country, politicians have been reluctant to take actions on coastal flooding and sea-level rise out of concern for little citizen support. In Anne Arundel County, not only are residents widely convinced that sea-level rise is occurring, they also recognize the rate of sea-level rise is not likely to remain the same in coming decades. Residents show broad support for a number of types of policy tools that could be implemented on this issue, and a range of strategies for different areas. Structural barriers are the least favored option among citizens, which falls in line with already promulgated Maryland state goals, for example through of the state's 2008 Living Shorelines Act. While there are some hints of contention on this issue from those who are unconvinced that governments should play a role in the risks that property owners choose to undertake in building close to the shore, or that the costs of taking action are prohibitive (see comments sections in Appendices), these do not appear to be predominant viewpoints.

ENGAGING THE PUBLIC: A CITIZENS' DISCUSSION

The "Citizens' Discussion" component of the Future Coast initiative was conducted at Severna Park High School in Severna Park, Maryland, on April 28, 2012 from 10 a.m. to 4:30 p.m. Participants were invited to the discussion to learn about sea-level rise and local policy responses, question expert panelists, and discuss solutions in small groups of fellow citizens. The 40 participants were a subset of those survey participants who took the countywide coastal flooding and sea-level rise survey, and responded to the event invitation. At the end of the daylong deliberative session they took a slightly modified form of the original countywide survey. For additional details about the event agenda and research protocol, see Study Methodology, p. 19.

The data presented here is an evaluation of responses to both the countywide survey and the post-event questionnaire. Statistically significant differences in the distribution of the means between the pre- and post-survey measures are noted[12], as well as some instances of non-significant, yet large, differences that may be useful in interpreting the data.

Risk perceptions

Large, statistically significant, shifts in risk perceptions of the Citizens' Discussion participants characterized the results of the pre- and post-event survey comparison. Participants became less concerned about immediate risks from coastal flooding and sea-level rise – both geographically and temporally – but more likely to identify increased problems of coastal flooding as occurring within the county. This represents a more moderated perspective on local coastal flooding and sea-level rise risks, but perhaps one that is also more accurate given the relatively narrow width of shore along the county that is affected, and the large percentages of county residents who are not directly exposed to the hazard.

Participants became more convinced that coastal flooding has become an increased problem in the county in recent years (+30 pct pts), but also that their own home or property was at no risk (+29.5 pct pts), and that their neighborhood was at no or very little risk (+22.4 pct pts). Higher percentages of respondents also said that the effects of sea-level rise would not significantly impact the county until 2050 to 2100 (+22.5 pct pts).

While the mean of the response frequency distribution did not change significantly, there also was an 18.7 percentage point increase in those who strongly agreed that sea-level rise is occurring.

Knowledge about sea-level rise

After the event, Citizens' Discussion participants became significantly more likely to correctly identify half of observed sea-level rise as due to land subsidence (+22.5 pct pts), and that scientists do not expect the rate of sea-level rise to stay the same over the next 100 years (+25.5 pct pts).

Though not statistically significant, the number of participants who strongly agreed that climate change was one of the causes of observed changes in sea-level rise increased by 21.0 percentage points, and there was an increase in 9.9 percentage points in those who accurately identified that current sea-level rise is not entirely the result of natural cyclical processes.

Policy preferences for coastal adaptation

Event participants became significantly more opposed to building walls and other structural barriers to hold back waters from publicly owned natural areas (+14.1 pct pts), and also more opposed to retreating inland from high-density commercial and residential areas (+17.4 pct pts).

In the post-event survey, respondents described why certain strategies were preferable to others for Anne Arundel County. The most comments in support of an adaptation strategy were for maintaining beaches and wetlands against rising seas. The most comments against a strategy were for building walls and other structural barriers along the shore to hold back coastal waters. All individuals' statements are located with the pre- and post-survey data in Appendix B.

Perceived citizen political efficacy

After the Citizens' Discussion event, participants were more likely to say that they were capable of understanding local public policy issues than before the daylong experience. This effect was statistically significant.

Conclusions

Even with this small sample size, there is evidence of a number of statistically significant changes in participants' knowledge, attitudes, risk perceptions and policy preferences. Residents gained information about sea-level rise and coastal flooding, and adjusted their risk perceptions – potentially more in line with probable environmental conditions over the next few decades. Perhaps one of the most important gains is that citizens said they felt more able to understand local policy issues. As communities grapple with difficult problems such as sea-level rise and coastal flooding,

their success will be in large part based on the social capital created by their citizens. Citizens' political efficacy contributes to a community's social capital, and thus its long-term resilience.

STUDY METHODOLOGY

Data from two related studies are included in this report: 1) a mail survey of a random sample of Anne Arundel County households; and 2) an online post-survey of participants in the April 28th Citizens' Discussion who had also taken the original countywide survey. The methodological approach for both are described below, followed by an analysis of survey sample bias.

The research was conducted under George Mason University Human Subjects Review Board approval (#7998).

Anne Arundel County survey

A survey of randomly selected Anne Arundel County residents was fielded between March 28 and June 19, 2012 and resulted in completed surveys from 378 adult residents (age 18 years or older). This represents a return rate of 4% calculated on a base number of 9,582 surveys mailed to deliverable addresses (Table 1).

ASDE Survey Sampler provided the random sample of 10,019 addresses within the county. The sample address file, matched with phone numbers for 5,286 of the households, was used to contact participants. In order to maintain random selection within households, each initial survey was addressed to "resident" of the city listed as their mailing address, and instructions were given for the adult with the most recent birthday to complete the questionnaire.

Three survey modalities were available to participants over the course of the three months. Most returned the survey by mail (59%), with smaller numbers taking it online (36.8%) and by phone (4.2%). Participants were contacted up to three times as described below.

- (March 28) Invitation to take the countywide survey and participate in the April 28th Citizens' Discussion at Severna Park High School (cover letter, Citizens' Discussion invitation and RSVP form with proffer of $50 VISA gift card for attendance, survey, business reply mail envelope);

- (April 19) Postcard reminding participants to take survey, providing web address (www.FutureCoast.info) to take it online, and increasing incentives for both the initial survey ($10 gift card for Safeway, iTunes or Starbucks) and attendance at the Citizens' Discussion ($100 VISA gift card)

- (April 25-June 8) Phone recruitment of participants with offers to re-mail a copy of the survey, a web address to take the survey online, or the ability to take it by phone.

Citizens' Discussion post-event survey

In the weeks prior to the April 28th Citizens' Discussion, those participants who had responded that they would attend were also contacted by email, mail and/or phone based on information provided in their RSVP to give them event logistical information and review materials, and remind them of the date. Review materials included an "Issue Book" with information about the science, local impacts and policy options regarding coastal flooding and sea-level rise, and access to online maps visualizing potential flooding and inundation impacts to the county across different rates of sea-level rise from 2012 to 2100. (These tools are available at www.FutureCoast.info.)

The goal of the Citizens' Discussion was to promote consideration of an issue impacting the community and expression of a wide range of residents' views. As opposed to other types of small group deliberation, there was no requirement that everyone come to a consensus decision.

During the event registration, participants were randomly assigned to small groups for the purposes of discussion and use of the online coastal flooding and sea-level rise viewer. Trained facilitators, many of them from George Mason University's School for Conflict Analysis and Resolution, lead these discussions. They worked to ensure that all participants in the group discussions had an opportunity to voice their views, that the briefing materials were reviewed, and that the groups generated questions pertinent to their discussions to put to the expert panelists during plenary periods.

The panelists included Don Boesch, a professor of marine science and president of the University of Maryland Center for Environmental Science, and also a resident of Anne Arundel County; Zoë Johnson, program manager for Climate Change Policy at the Office for a Sustainable Future, Maryland Department of Natural Resources; Jessica Grannis, author of the *Adaptation Tool Kit: Sea-Level Rise and Coastal Land Use* published in 2011 by the Georgetown Climate Center, and staff attorney and adjunct professor at the Harrison Institute for Public Law; Frank Biba, chief of environmental programs in the Department of Neighborhood and Environmental Programs for the City of Annapolis; and Brian Batten, senior coastal scientist at Dewberry, the engineering firm responsible for development of the Future Coast coastal flooding and sea-level rise viewer.

A $100 VISA gift card thank-you was given to all participants when they completed the post-survey in order to facilitate the attendance of people who might not otherwise been able to attend the more

than six-hour session due to costs such as babysitting or travel expenses. Lunch and snacks were served during the day.

Information about the countywide survey and the April 28th Citizens' Discussion was also released to media to alert county residents that they might receive the questionnaire and event invitation in the mail. Cover letters with a press release and project website information were emailed to approximately 40 state and county media outlets on March 27, 2012. Coverage included a story in the *Capital Gazette*, a radio segment with Barbara Cox on "Talk With ..." on 1430 WNAV, and wire services pick-up by Associated Press and USA Today.

Questionnaire design

The questionnaire was developed by the study team and reviewed by an advisory panel of experts on the science and policy of sea-level rise and coastal flooding. Most of the items were written specifically for this research project. The 41 questions addressed risk perceptions of coastal flooding and sea-level rise, topic knowledge, policy preferences for three types of coastal areas within the county, and political efficacy. Two of the scales in the survey were developed by Dan Kahan and colleagues with The Cultural Cognition Project at Yale Law School (http://www.culturalcognition.net/). The items were included in order to evaluate the relationship between cultural worldview and sea-level rise perceptions and policy preferences, and will be a part in the final study report in Fall 2012.

Prior to fielding, the survey was tested online with 20 respondents from Amazon's Mechanical Turk who self-identified as adult residents of coastal counties in the eastern United States. The pre-testing was conducted in order to identify problems with instrument wording and evaluate the survey length (10-15 minutes).

The post-survey delivered to participants in the April 28th Citizens' Discussion included many of the same items as in the countywide pre-survey in order to evaluate changes in residents' perceptions and preferences. The post-survey featured more open-ended questions about the reasoning behind participant policy preferences and a section assessing the Citizens' Discussion event components. The evaluative data will be included in the final project report to be made available to the public in Fall 2012.

Completion results

The sample for the countywide survey was comprised of 378 completed questionnaires by adult

residents of Anne Arundel County. Based on U.S. Census Bureau 2010 population data for the number of adult Anne Arundel residents (412,595), this results in a margin of error of +/- 5 percentage points within a 95% probability. The response rate of 4% was calculated by dividing 378 over the final valid address mailing number (initial mailing to 10,019 addresses minus 437 non-deliverable addresses).

Table 1 | Completion statistics, county survey

10,019	Initial mail quantity
437	Non-deliverable addresses
9,582	Valid address base mailing number
378	Completed surveys
4%	Return rate
5%	Margin of error within 95% probability

The sample for the April 28th Citizens' Discussion event was a subset of 41 participants in the countywide survey. Post-survey data from one participant was dropped due to missing pre-survey data, leaving a final sample size of 40.

Sample demographic profile and analysis for bias

County Survey

In comparison to 2010 U.S. Census data and American Community Survey estimates from 2006-2010, the final countywide sample of adult Anne Arundel residents is older, more educated, and less racially diverse (Table 2). The largest disparity is in distribution of educational attainment, followed by age and race. The survey likely over-represents those who have attained college degrees, are 45 years of age or greater, and are white. Those with incomes between $50,000 to $149,999 are also over-represented. This reflects typical response patterns for survey research.

To investigate the extent to which the sample's demographic profile might bias response frequencies, we created two separate weights and compared the questionnaire response frequencies to the unweighted sample. The first weights were developed from 2010 Census data for race, sex and age, and the second from U.S. Census Bureau American Community Survey estimates from 2006-2010 for educational distribution. An analysis of differences between the unweighted and weighted data response frequencies demonstrated little, if any, effect on the interpretation of the data. The largest differences in response frequencies occurred in the data weighted for education;

the most any one response varied by only 8 percentage points. Weighting the data by race, sex and age resulted in changes in response frequencies of less than five percentage points.

In evaluating non-response by zip code for the Anne Arundel County survey, we compared the distribution of the initial random sample to that of the final sample (Table 3). Thirty-one zip codes were included in the initial random sample of Anne Arundel County household addresses. Twenty-eight remained in the final sample with maximum differences in sample representation of 5 percentage points. Glen Burnie (21061) and Pasadena (21122) had the highest percentage of addresses in the original sample, and were under-represented by the largest difference in percentage points between the original and final sample (-5.2 and -3.8 respectively). Arnold (21012), Annapolis (21401), Edgewater (21037) and Severna Park (21146) were over-represented in the final sample by 2-to-3 percentage points. Those areas over-represented in the final sample tended to be shoreline counties, while under-represented areas were more likely to be inland.

In sum, just over one-quarter of participants said their homes were either waterfront (10.3%) or within one block of water (18.3%). Just over half said their homes were not located in a floodplain (53.2%), and another 19.0% said they did not know whether they were in a floodplain.

The distribution of the sample by party affiliation was 26.8% Republican, 35.7% Democrat, 30.0% Independent and 7.6% other/no party. Self-reported political affiliation cannot be directly compared to voter registration records by party, but precinct data in February 2012 indicated 36.6% of registered voters identified as Republican and 43.3% as Democrat[13]. Only 20.2% were either of another or no party. This compares to 37.6% of the sample that were either Independent or affiliated with another or no party.

April 28th Citizens' Discussion participants

The sample of participants in the Citizens' Discussion at Severna Park High School was more diverse in terms of income and race than that of the county, and more heavily female (Table 4). The largest differences between the event participants and county's overall demographic distribution were in levels of educational attainment and gender. Forty percent of the participants had completed a graduate or professional degree, and two-thirds of the discussion participants were women. Residents with household incomes of less than $25,000 a year and between $50,000 and $99,999 were over-represented at the event on April 28th compared to U.S. Census Bureau American Community Survey estimates of population demographics for Anne Arundel County. Residents with household incomes of $100,000 or more were under-represented compared to county percentages.

African Americans and residents identifying as "other" racial categories attended in higher proportions compared to countywide representation (~ 4 percentage points each), while whites and Asians attended in lower proportions (-6.1 and -4.4 percentage points respectively).

Participants were also older than the general county population with higher proportions in categories of age 55 and above.

The largest proportions of event participants were from shoreline counties, and areas close to the Citizens' Discussion location: Severna Park (21146), Pasadena (21122) and Annapolis (21401) (Table 5). Approximately one-third (32.5%) of participants said that they either were in waterfront homes or within one block of the water. More than half said they did not live in a floodplain (55%), and another 20% said they did not know whether they lived in floodplain. This distribution is very similar to that of the countywide survey.

Participants were most likely to claim affiliation with the Democratic party (37.5%), followed by those who identify as Independents (32.5%), Republicans (20.0%), and other/no party (10.0%).

Table 2 | Sample demographic profile, Anne Arundel County survey

	Sample %*	Census %**	Sample % - Census % %
Gender	2010 Census Data (age 18+)		
Male	45.9	49.4	-3.5
Female	52.5	50.6	1.9
Age			
18 to 24 years	1.9	11.8	-10
25 to 34 years	12.3	17.4	-5
35 to 44 years	15.5	18.4	-3
45 to 54 years	21.8	20.9	1
55 to 64 years	25.3	16.1	9
65 to 74 years	15.5	8.9	7
75 + years	7.6	6.5	1
Race			
White	86.7	77.9	8.8
Black or African American	8.4	16.9	-8.5
Asian	1.6	4.4	-2.8
Other	3.3	4	-0.7
Ethnicity			
Hispanic or Latino	2.8	6.1	-3.3
Education level	American Community Survey Estimates (age 25 +)		
Less than high school	1.1	10	-8.90
High school graduate or GED	6.1	26.20	-20.10
Some college	16.4	21.10	-4.70
2-year associate's degree	10.0	7.00	3.00
4-year bachelor's degree	31.4	20.90	10.50
Completed a graduate or professional degree	35.0	14.80	20.20
Household income	American Community Survey Estimates		
Less than $25,000	6.4	10.6	-4.2
$25,000 - $49,999	14.0	15.9	-1.9
$50,000 -$74,999	18.5	17.8	0.7
$75,000 -$99,999	17.6	15.3	2.3
$100,000-$149,999	27.2	21.8	5.4
$150,000 +	16.2	18.5	-2.3

*Based on sample of Anne Arundel County adults, n=378.

**Based on population of adults 18 years old or greater, 2010 Census data, N = 412,595.

Table 3 | Sample geographic distribution by zip code, Anne Arundel County survey

Zip code *	% Final Sample	% Initial Sample of Mail Addresses	Difference
21061 Glen Burnie	6.1	11.3	-5.2
21122 Pasadena	7.8	11.6	-3.8
21144 Severn	4.5	5.9	-1.4
21060 Glen Burnie	5.3	6.5	-1.1
21090 Linthicum Heights	1.1	2.0	-0.9
20724 Laurel	2.7	3.4	-0.7
20755 Fort George G	.8	1.4	-0.6
21108 Millersville	2.7	3.3	-0.6
21403 Eastport	5.9	6.4	-0.5
20711 Lothian	.8	1.3	-0.5
21076 Hanover	2.4	2.8	-0.4
20778 West River	0	.4	-0.4
20751 Deale	.3	.5	-0.2
21402 Naval Academy	0	.2	-0.2
21226 Curtis Bay	1.3	1.5	-0.2
21054 Gambrills	1.9	2.0	-0.1
21077 Harmans	0	.1	-0.1
20779 Tracys Landing	.3	.2	0.0
21113 Odenton	6.4	6.4	0.1
20758 Friendship	.3	.1	0.1
20776 Harwood	.8	.5	0.3
21140 Riva	1.1	.7	0.4
20764 Shady Side	1.3	.8	0.5
20733 Churchton	1.3	.5	0.8
21032 Crownsville	2.7	1.7	0.9
21114 Crofton	6.1	5.0	1.1
21035 Davidsonville	3.2	1.4	1.8
21146 Severna Park	7.2	5.0	2.2
21037 Edgewater	6.4	4.2	2.2
21401 Annapolis	12.0	8.9	3.1
21012 Arnold	7.2	4.1	3.1

*Household addresses were randomly selected from deliverable mail addresses in the county with no geographic subsampling by zip code. As a result, not all zip codes for the county were represented in the initial sample.

Table 4 | Demographic profile, Citizens' Discussion participants

	Participant %*	Census %**	Participant % - Census % %
Gender	2010 Census Data (age 18+)		
Male	33.3	49.4	-16.1
Female	66.7	50.6	16.1
Age			
18 to 24 years	0	11.8	-11.8
25 to 34 years	10.5	17.4	-6.9
35 to 44 years	15.8	18.4	-2.6
45 to 54 years	18.4	20.9	-2.5
55 to 64 years	28.9	16.1	12.8
65 to 74 years	13.2	8.9	4.3
75 + years	13.2	6.5	6.7
Race			
White	71.8	77.9	-6.1
Black or African American	20.5	16.9	3.6
Asian	0	4.4	-4.4
Other	7.7	4	3.7
Ethnicity			
Hispanic or Latino	2.5	6.1	-3.6
Education level	American Community Survey Estimates (age 25 +)		
Less than high school	0.0	10	-10.0
High school graduate or GED	2.5	26.2	-23.7
Some college	25.0	21.1	3.9
2-year associate's degree	5.0	7.0	-2.0
4-year bachelor's degree	27.5	20.9	6.6
Completed a graduate or professional degree	40.0	14.8	25.2
Household income	American Community Survey Estimates		
Less than $25,000	23.1	10.6	12.5
$25,000 - $49,999	15.4	15.9	-0.5
$50,000 -$74,999	20.5	17.8	2.7
$75,000 -$99,999	25.6	15.3	10.3
$100,000-$149,999	7.7	21.8	-14.1
$150,000 +	7.7	18.5	-10.8

*Based on 40 participants in April 28, 2012 Citizens' Discussion at Severna Park High School.

**Based on population of adults 18 years old or greater, 2010 Census data, N = 412,595.

Table 5 | Geographic distribution by zip code, Citizens' Discussion participants

Zip code	% Participants*
21146 Severna Park	15.0
21122 Pasadena	12.5
21401 Annapolis	10.0
21060 Glen Burnie	7.5
21061 Glen Burnie	7.5
21076 Hanover	7.5
21114 Crofton	7.5
21032 Crownsville	5.0
21054 Gambrills	5.0
21113 Odenton	5.0
21403 Eastport	5.0
20724 Laurel	2.5
20764 Shady Side	2.5
20776 Harwood	2.5
21012 Arnold	2.5
21226 Curtis Bay	2.5

*Based on 40 participants in April 28, 2012 Citizens' Discussion at Severna Park High School.

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[2] The sea-level rise scenarios presented in the Future Coast Anne Arundel visualization of potential flooding and inundation impacts represent the historical rate, a 1.9-foot rise as recommended by the state for planning purposes (low acceleration), and a 3.4-feet rise in line with the state's higher range by 2100 (moderate acceleration). The scenarios also account for land subsidence. The term "relative sea-level rise" refers to a change in sea levels relative to land elevations.

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[12] P values below .05 are considered statistically significant Significance was evaluated using dependent measures *t*-tests. "Don't know" values were treated as non-scale and not included in tests of statistical significance.

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APPENDIX A

ANNE ARUNDEL COUNTY SURVEY DATA

1. In your opinion, has coastal flooding become more or less of a problem in the county in recent years?

Much more	9.6%
Somewhat more	44.7%
No change	28.7%
Somewhat less	2.4%
Much less	.5%
Don't know	14.1%

n=376

2. Would you agree or disagree that your local government's policies are adequate for addressing coastal flooding over the long term (e.g., over a decade or more)?

Strongly disagree	8.8%
Somewhat disagree	25.5%
Neither agree nor disagree	21.8%
Somewhat agree	12.5%
Strongly agree	3.2%
Don't know	28.2%

n=376

3. Have you ever experienced flooding of your home or property?

No	76.3%
Yes	22.4%
Don't know	1.3%

n=375

4. Sea-level rise is an issue some coastal communities have been discussing recently. Sea-level rise refers to increases in the average height of water relative to the land over the course of the year. What do you think? Do you agree or disagree that sea-level rise is occurring?

Strongly disagree	7.7%
Somewhat disagree	10.1%
Neither agree nor disagree	11.6%
Somewhat agree	31.0%
Strongly agree	29.4%
Don't know	10.3%

n=378

5. When do you believe the effects of sea-level rise will significantly impact the county, if ever?

Effects are significant now	12.5%
by the year 2025	19.4%
by the year 2050	21.2%
by the year 2075	3.2%
by the year 2100	8.8%
Never	5.6%
Don't know	29.4%

n=377

6. Which impacts from sea-level rise, if any, are you most concerned about within the county? (Check ONE or MORE)

a. Private property damage or loss	59.3%
b. Public infrastructure damage or loss	52.6%
c. Habitat loss	54.8%
d. Erosion of shoreline	64.6%
e. Increased frequency and severity of flooding	47.9%
f. Permanently flooded areas (inundation)	30.4%
g. Loss or contamination of freshwater wells	43.7%
h. Problems with stormwater drainage	49.5%
i. Loss or damage of sewage and septic treatment systems	46.3%
j. Not concerned about any impacts	7.9%
k. Don’t know	2.9%

n=378

7. Local governments have different types of policy tools they can use. How much do you support or oppose their use of these types to limit the impacts of coastal flooding due to sea-level rise?

	Strongly support	Somewhat support	Neither support nor oppose	Somewhat oppose	Strongly oppose	Don't know
a. Long-range planning that takes sea-level rise into account (n=375)	53.6%	28.3%	8.0%	2.7%	4.3%	3.2%
b. Changes to regulations, such as zoning laws in coastal areas (n=374)	41.2%	31.3%	10.7%	6.4%	5.3%	5.1%
c. Use of government spending, such as buying coastal lands and new infrastructure (n=373)	21.4%	30.3%	17.7%	13.4%	12.1%	5.1%
d. Providing tax incentives to property owners to take actions that reduce flood risk (n=375)	31.7%	35.5%	13.6%	8.8%	8.0%	2.4%

8. Based on what you know about sea-level rise do you agree or disagree with each of these statements?

	Strongly disagree	Somewhat disagree	Neither disagree nor agree	Somewhat agree	Strongly agree	Don't know
a. About half of observed sea-level rise in the region is due to sinking land. **[TRUE]** (n=373)	11.0%	14.7%	26.0%	13.7%	2.1%	32.4%
b. Most scientists expect the rate of sea-level rise to stay the same the next 100 years. **[FALSE]** (n=375)	19.5%	31.7%	13.9%	8.8%	5.1%	21.1%
c. Global sea levels have never been higher than they are today. **[FALSE]** (n=373)	18.2%	11.0%	15.0%	20.9%	9.4%	25.5%
d. Climate change is one of the causes of observed changes in sea-level rise. **[TRUE]** (n=372)	8.9%	9.9%	8.6%	34.4%	29.0%	9.1%
e. Current sea-level rise is entirely the result of natural cyclical processes. **[FALSE]** (n=374)	14.2%	22.7%	17.1%	23.3%	9.1%	13.6%

9. Experiences with flooding vary based on where you live. Which of these characteristics apply to your home or property in Anne Arundel County? (Check ONE or MORE)

a. Waterfront	10.3%
b. Not waterfront but within 1 block of water	18.3%
c. Community access to the water from a beach/dock/boat ramp	25.4%
d. Located in floodplain	10.1%
e. Not located in floodplain	53.2%
f. Unknown whether in floodplain	19.0%
g. Second home, or vacation home	2.1%

10. How would you describe the risk of more severe flooding from sea-level rise over the next 40 years to …

	No risk	Very little risk	Some risk	High risk	Don't know
a. the county generally (n=372)	3.5%	10.2%	46.0%	32.8%	7.5%
b. your neighborhood (n=374)	19.5%	35.8%	29.4%	9.4%	5.9%
c. your home or property (n=373)	29.2%	38.6%	19.3%	6.2%	6.7%

11. In this survey, we highlight three different types of areas in the county. How much would you support or oppose local government efforts to limit the impacts of coastal flooding in these areas?

	Strongly support	Somewhat support	Neither support nor oppose	Somewhat oppose	Strongly oppose
a. Publicly owned natural areas, such as parks and wildlife sanctuaries (n=373)	44.8%	31.4%	12.9%	4.8%	6.2%
b. Low-density residential areas of primarily single family homes (n=373)	28.4%	34.6%	19.8%	9.1%	8.0%
c. High-density commercial and residential areas (n=371)	31.5%	35.3%	16.2%	8.6%	8.4%

	Publicly owned natural areas, such as parks and wildlife sanctuaries	Low-density residential areas of primarily single family homes	High-density commercial and residential areas
12. Which of these areas should be governments' top priority? (n=355)	38.0%	17.7%	44.2%
13. Which should be their second priority? (n=346)	26.3%	46.8%	26.9%

14. If you are opposed to efforts to limit coastal flooding impacts in all three areas, why?

1. *because sea levels have already been much higher than they currently are*
2. *better to discourage bldg. in flood plain*
3. *cost to taxpayers*
4. *cost too much nature takes its course*
5. *costs and results*
6. *depends on how funds are spent to limit*

7. *don't want govt. to be involved*
8. *Government efforts to halt nature are often ineffective and many times have unintended consequences that create worse problems*
9. *Government should be shrunk to the point where it has no impact on these issues*
10. *Government solves nothing. They use new laws to line their pockets.*
11. *high risk don't build there*
12. *I am not opposed at all. We need to do something as flooding and erosion will damage all living things.*
13. *I am perfectly capable of deciding what I do with my property.*
14. *I don't see the big issue with it right now.*
15. *I would prefer to let nature take its course. We should not be using taxpayer money to help those who took the chance to build their homes so close to the water that they are at risk. That was their choice.*
16. *I'm not opposed, but I chose high density residential areas over low density because people who buy property near the shore line should understand they are doing so at risk of flooding*
17. *if it can be prevented, why not?*
18. *insurance don't cover flood why should citizens*
19. *It depends what types of efforts are pursued. I am in favor of setbacks, limiting future development in hazardous areas, educating homeowners about risks, and providing incentives to relocate or fortify where necessary. I'm not in favor of flood insurance that allows rebuilding in high hazard zones.*
20. *it is all natural no problem*
21. *it pours good money into a gobus political program*
22. *It's natural, nothing we can do*
23. *let nature take its course*
24. *money better spent in ther areas*
25. *natural occurrence of climate over time*
26. *Nature does things much better than man. People can move if that is what is best for them.*
27. *not sure public money should be used to protect individual properties!*
28. *owners of commercial properties should make own plans now*
29. *private prop. should pay their own way*
30. *Risk is a decision you have to live with!*
31. *should infringe on the rights of property owners*
32. *The cost effectiveness of all government action must be taken into consideration. I don't trust our government - local, state, or federal - to spend our tax money wisely.*
33. *The county government does not have the money. And I'm not privy to the science that is suggesting the necessity of action.*
34. *this is not an issue worthy of wasting tax money on*
35. *Too expensive. Government not good at solving problems--invariably they create more.*
36. *too much money*
37. *we should also address the correct reason for the cause*

15. How much would you support or oppose each of the following flood protection strategies for publicly-owned natural areas in the county, assuming the cost for the taxpayer was the same for each?

	Strongly support	Somewhat support	Neither support nor oppose	Somewhat oppose	Strongly oppose
a. Buy adjacent lands to enable natural areas to move inland (n=373)	29.0%	33.5%	20.1%	8.6%	8.8%
b. Maintain beaches and wetlands against rising seas (n=374)	34.8%	38.5%	12.3%	8.6%	5.9%
c. Build walls and other structural barriers along the shore to hold back coastal waters (n=372)	19.1%	28.8%	16.7%	19.4%	16.1%

	Buy adjacent lands to enable natural areas to move inland	Maintain beaches and wetlands against rising seas	Build walls and other structural barriers along the shore to hold back coastal waters
16. Which of these strategies do you most support? (n=345)	34.2%	46.1%	19.7%
17. Which is your second preference? (n=333)	29.1%	45.0%	25.8%

18. If you do not like any of the three strategies above, why?

1. *a dyking system for AA county is impossible*
2. *all three cost too much*
3. *Barriers divert water, we need absorption*
4. *barriers most always cause more trouble than they help*
5. *Better uses of government money*
6. *better ways to spend money*
7. *Bldg walls & other structural barriers is unnatural*
8. *build walls and structural barriers. Tell people the risk and if they don't adapt, so it is what it is.*

9. *Building a wall to hold the ocean is a losing battle.*
10. *building dikes and walls does not address the real problem, which is climate change*
11. *building walls & barriers don't seem to have been proven effective*
12. *Building walls & other barriers seems like a fight with nature, we'd lose.*
13. *Building walls and sea barriers has the potential to disrupt ecosystem. Careful study is needed to determine impacts before building these structures.*
14. *Building walls will not solve the problem in the long run.*
15. *Buying adjacent lands doesn't seem to actually solve the problem/mitigate the threat of flooding, it just displaces the problem.*
16. *cost to taxpayers*
17. *Strategy C. --- expensive and problematical*
18. *cost to taxpayers*
19. *cost/benefit*
20. *costs & results*
21. *costs, aesthetics*
22. *county/community can be vocal to the state/fed govt to address root causes correctly*
23. *do not like Strategies B or C at all*
24. *Hardening the shoreline is stupid and the cause of a lot of the problems we currently have*
25. *I don't know the science behind all of this and man cannot control nature.*
26. *I think nature is a stronger force than human engineering.*
27. *if flooding then move. Don't spend money endlessly*
28. *if there is a catastrophic event it will overcome preventive measures*
29. *let nature take its course*
30. *let nature take its course as it has always happened*
31. *Let nature take its course. The natural areas would probably re-establish themselves. If not, definitely buy adjacent lands.*
32. *mother nature will always win- levies fail in new Orleans*
33. *prefer strategies to avoid use of walls in the first place*
34. *prefer strategies to avoid use of walls in the first place*
35. *no cost to taxpayers*
36. *no limit on the costs*
37. *non-existent threat*
38. *None of the above are going to work! Anne Arundel County politicians are too stupid to implement them.*
39. *not high enough priority*
40. *not natural-futile*
41. *opposed to wasting tax money on a non issue*
42. *prefer strategies to avoid use of walls in the first place*
43. *resources need to go to developed areas*
44. *States are broke. There are higher priorities.*

45. *Structures may be necessary to protect existing developed areas, but I suspect there are few publicly owned natural areas that would benefit long term from the construction of sea walls or other barriers.*
46. *The government should not be making these decisions & taxpayers should not pay for them. People who live near the water should be responsible.*
47. *The top priority should be to prevent sea level rise by reducing carbon dioxide emissions. Second should be to reduce development in these areas, since grading and development contributes to coast al flooding. Purchasing parklands is good but it doesn't really address the underlying problem, and we shouldn't be jumping straight to adaptation. We should be starting with prevention.*
48. *There are better things to spend $ on.*
49. *think Katrina-think govt.*
50. *this is a huge issue a single country trying to do something is like putting a band aid*
51. *too much taxes*
52. *walls & barriers must always be maintained*
53. *Walls and other barriers will not protect against Mother Nature.*
54. *walls are unnatural*
55. *waste of resources*
56. *Waste of taxpayer money. Let people/companies who bought land in flood areas bear the risk of flooding. No need to bail out people, they should have insurance to cover as well.*
57. *we can't change what's "happening"*
58. *Your questions are too inexact. Efforts to "maintain" or to build walls may work or fail. It entirely depends upon whether the area will flood once every ten years or once every ten weeks.*

19. How much would you support or oppose each of the following flood protection strategies for low-density residential areas in the county, assuming the cost for the taxpayer was the same for each?

	Strongly support	Somewhat support	Neither support nor oppose	Somewhat oppose	Strongly oppose
a. Retreat inland over time, restricting new building in areas likely to flood, and moving or abandoning existing structures (n=370)	34.3%	38.6%	13.8%	7.6%	5.7%
b. Maintain and restore natural areas such as wetlands and beaches as buffers against coastal flooding (n=370)	49.5%	36.5%	8.4%	2.7%	3.0%
c. Design and retrofit buildings to be more flood resilient, including elevating them and/or the land (n=369)	22.0%	36.9%	19.5%	13.3%	8.4%
d. Build walls and other structural barriers along the shore to hold back coastal waters (n=364)	15.4%	29.7%	16.2%	20.3%	18.4%

	Retreat inland over time, restricting new building in areas likely to flood, and moving or abandoning existing structures	Maintain and restore natural areas such as wetlands and beaches as buffers against coastal flooding	Design and retrofit buildings to be more flood resilient, including elevating them and/or the land	Build walls and other structural barriers along the shore to hold back coastal waters
20. Which of these strategies do you most support? (n=354)	32.2%	48.3%	7.6%	11.9%
21. Which is your second preference? (n=343)	28.3%	35.3%	23.9%	12.5%
22. Which is your third preference? (n=324)	32.2%	48.3%	7.6%	21.6%

23. If you do not like any of the four strategies above, why?

1. *all are responsibility of property owners not government*
2. *All artificial means will fail in the long run.*
3. *Barriers divert water*
4. *better things to spend $ on*
5. *black hole for money*
6. *building dikes does not address the real problem*
7. *Building walls and sea barriers has the potential to disrupt ecosystem. Carefull study is needed to determine impacts before building these structures.*
8. *Building walls seems ineffective.*
9. *Buildings in the flooding area should be lost. No tax payer money should be used for people in waterfront property. They purchased a home with a known risk. I do no support any use of my funds for their luxurious lifestyle*
10. *cost to taxpayers*
11. *cost/benefit*
12. *County does not have the money.*
13. *Strategy D - expense & feasibility*
14. *depending on cost & reasonable outcome*
15. *do not try to fight nature- you lose*
16. *does not address root cause*
17. *government should not buy land*
18. *govt. incompetence*
19. *I am not sure of how effective building walls would be*
20. *I do not have a problem with the four strategies.*
21. *I don't know enough about the ramifications to make an informed choice.*
22. *I support restricting building in areas likely to flood the most... but because you tied to retreat, it is not a clear answer.... but really that should be a top priority. The new development in the floodplain is clearly making the problem worse. New homes built on hills, drain into the lots of older homes that are not built on hills and those homes flood. Their only mistake was being here first.*
23. *I would not support taxes to preserve mansions but low income areas yes*
24. *If a building has to be retrofitted, who bears the cost? Possibly, it should not have been built initially. Building walls and structural barriers may be a waste of time since I think the events are cyclic and eventually the barriers may end up being a hazard.*
25. *If people are stupid enough to build in a "flood plain" d to them absorb the full cost of any insurance, any liability, and any damage to their personal property + decisions*
26. *If we simply move inland, where will it end? We can only do that so many times before we have the same problems*
27. *levies or barriers will not win against mother nature-hurricanes- expensive*

28. *look at the dikes along the Mississippi river*
29. *Lots of taxpayer money will be wasted to enrich politically connected environmental groups at no net improvement.*
30. *need more info to make a determination*
31. *need specific knowledge of that residential area*
32. *no hard structures, coastlines are naturally and constantly in flux*
33. *no tax dollars should be wasted on non issue*
34. *no threat*
35. *not govt's problem*
36. *not natural-futile over time*
37. *not your job*
38. *options should be based on science, not public opinion*
39. *other than a, govt shouldn't need to do this, landowners should*
40. *Price tag.*
41. *private land owners don't want govt help in good times and don't deserve it in bad time*
42. *question effectiveness of building walls and structural barriers*
43. *should be at home owner's costs*
44. *Structural barriers are likely to have negative (or secondary) impacts to adjacent properties or communities and are not likely going to serve as long term solutions should sea level continue to rise over time.*
45. *Structural barriers may be folly*
46. *structures too close to water should be removed*
47. *too expensive*
48. *ugly and as they will fail, wasteful*
49. *wall & barriers expensive and won't work*
50. *walls & barriers doesn't work long term*
51. *Walls, etc, will not hold back coastal waters in the long run.*
52. *wasteful strategy*
53. *would rather there is no bldg. in flood plains or need for walls because of bldg.*

24. How much would you support or oppose each of the following flood protection strategies for high-density commercial and residential areas in the county, assuming the cost for the taxpayer was the same for each?

	Strongly support	Somewhat support	Neither support nor oppose	Somewhat oppose	Strongly oppose
a. Retreat inland over time, restricting new building in areas likely to flood, and moving or abandoning existing structures (n=368)	32.6%	38.6%	17.1%	5.4%	6.3%
b. Maintain and restore natural areas such as wetlands and beaches as buffers against coastal flooding (n=369)	46.6%	40.7%	7.9%	2.2%	2.7%
c. Design and retrofit buildings to be more flood resilient, including elevating them and/or the land (n=365)	22.7%	40.5%	15.9%	12.3%	8.5%
d. Build walls and other structural barriers along the shore to hold back coastal waters (n=365)	18.6%	34.0%	13.4%	17.5%	16.4%

	Retreat inland over time, restricting new building in areas likely to flood, and moving or abandoning existing structure	Maintain and restore natural areas such as wetlands and beaches as buffers against coastal flooding	Design and retrofit buildings to be more flood resilient, including elevating them and/or the land	Build walls and other structural barriers along the shore to hold back coastal waters
25. Which of these strategies do you most support? (n=354)	29.9%	46.3%	7.6%	16.1%
26. Which is your second preference? (n=346)	26.3%	34.4%	27.2%	12.1%
27. Which is your third preference? (n=326)	18.1%	14.4%	44.8%	22.7%

28. If you do not like any of the four strategies above, why?

1. *Strategies C + D -- would rather no building in flood areas.*
2. *$$$ down the drain.*
3. *again, not sure how effective building walls would be*
4. *all are responsibility of property owners not government*
5. *Also, why build walls to hold back coastal waters. The results are inevitable, and we cannot hold back the sea forever*
6. *better things to spend $ on*
7. *building dikes does not address the real problem*
8. *Building walls is probably not cost effective over the long run*
9. *Building walls seems ineffective and possibly harmful to the environment.*
10. *can't stop nature forever*
11. *cost to taxpayers*
12. *Strategy D -- Would be a temporary fix only.*
13. *Strategy D - cost and poor long term effectiveness*
14. *Strategy D - too expensive*
15. *demolish buildings that are unstable*
16. *does not address root cause*
17. *don't waste tax money on this*
18. *I don't like the idea of bailing out businesses and residents who chose to build so close to the water.*
19. *If a building has to be retrofitted, who bears the cost? Possibly, it should not have been built initially. Building walls and structural barriers may be a waste of time since I think the events are cyclic and eventually the barriers may end up being a hazard. Problem with high density is transportation infrastructure to support the people in high density areas. It seems to me if flooding does occur, more intense damage is likely to occur. And if the decision to build is made and approved, what should the building codes be? Should property taxes be higher to support the area for private and business use? In public areas, all should support, but should individuals NOT in the high density area support the people actually using it or living there or profiting there.*
20. *local govt. has already plowed county over with asphalt*
21. *look at the dikes and levies along the Mississippi*
22. *Money.*
23. *not governments job don't spend the money*
24. *not governments job read the constitution*
25. *not govt's problem*
26. *Property cannot be stolen at taxpayer expense.*
27. *Protection and retrofitting will be necessary to maintain uses in certain areas (e.g., Hampton Roads military facilities, port of Baltimore), and I assume this will apply eventually to our county, perhaps first in downtown Annapolis and at the Naval Academy.*

28. *taxpayers need to support schools, hospitals & needy-not business & waterfront owners*
29. *The costs will not be the same so why pretend?*
30. *too expensive*
31. *ugly and as they will fail, wasteful walls & barriers are high maintenance*
32. *wasteful strategy*
33. *waterfront people build on the water & then gate off*
34. *With high density Strategies A&B seem difficult*

29. The following questions ask you how you feel generally about public policy questions. Please tell us how strongly you agree or disagree with the following statements.

	Strongly disagree	Somewhat disagree	Neither disagree nor agree	Somewhat agree	Strongly agree
a. Most local public policy issues are so complex that someone like me can't understand them. (n=374)	29.4%	19.8%	11.8%	27.3%	11.8%
b. People like me do not have any say in what local government does. (n=374)	16.3%	26.7%	13.4%	31.6%	12.0%
c. I have the ability to talk about and participate in local public policy discussions. (n=374)	7.2%	12.6%	21.4%	42.8%	16.0%
d. Local public officials care a lot what people like me think. (n=373)	20.6%	26.0%	26.5%	21.7%	5.1%

30. The following questions ask what impact citizens can have in influencing local government policies. Please tell us how strongly you agree or disagree with the following statements.

	Strongly disagree	Somewhat disagree	Neither disagree nor agree	Somewhat agree	Strongly agree
a. Organized citizens can have an impact on the policies of local government. (n=374)	2.4%	7.2%	8.3%	55.9%	26.2%
b. Local elected officials will respond to the needs of citizens. (n=373)	7.8%	24.9%	18.2%	45.0%	4.0%
c. As citizens, we can successfully work together to promote important local policy issues. (n=374)	2.4%	9.6%	12.3%	53.5%	22.2%
d. We can cooperate as citizens to evaluate information and make important decisions that affect our local communities. (n=374)	3.2%	8.3%	13.4%	52.1%	23.0%

APPENDIX B

CITIZENS' DISCUSSION DATA

1. In your opinion, has coastal flooding become more or less of a problem in the county in recent years?

	Much more	Somewhat more	No change	Somewhat less	Much less	Don't know
Pre-survey (n=40)	15.0%	45.0%	25.0%	5.0%	0.0%	10.0%
Post-survey (n=40)	27.5%	62.5%	5.0%	2.5%	0.0%	2.5%
Δ Post – Pre	12.5%	17.5%	-20.0%	-2.5%	0.0%	-7.5%

p<.01[1]

2. Would you agree or disagree that your local government's policies are adequate for addressing coastal flooding over the long term (e.g., over a decade or more)?

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree	Don't know
Pre-survey (n=39)	12.8%	33.3%	15.4%	12.8%	2.6%	23.1%
Post-survey (n=39)	20.5%	41.0%	10.3%	10.3%	7.7%	10.3%
Δ Post – Pre	7.7%	7.7%	-5.1%	-2.6%	5.1%	-12.8%

4. Sea-level rise is an issue some coastal communities have been discussing recently. Sea-level rise refers to increases in the average height of water relative to the land over the course of the year. What do you think? Do you agree or disagree that sea-level rise is occurring?

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree	Don't know
Pre-survey (n=40)	10.0%	5.0%	7.5%	40.0%	30.0%	7.5%
Post-survey (n=39)	10.3%	5.1%	0.0%	33.3%	48.7%	2.6%
Δ Post – Pre	0.3%	0.1%	-7.5%	-6.7%	18.7%	-4.9%

5. When do you believe the effects of sea-level rise will significantly impact the county, if ever?

	Effects are significant now	by the year 2025	by the year 2050	by the year 2075	by the year 2100	Never	Don't know
Pre-survey (n=40)	22.5%	15.0%	32.5%	2.5%	0.0%	2.5%	25.0%
Post-survey (n=40)	20.0%	5.0%	37.5%	7.5%	12.5%	2.5%	15.0%
Δ Post – Pre	-2.5%	-10.0%	5.0%	5.0%	12.5%	0.0%	-10.0%

p<.01

[1] The "p value" designates significant differences between the mean of the participant responses before and after the Citizens' Discussion event. P values below .05 are considered statistically significant. Significance was evaluated using dependent measures *t*-tests. "Don't know" values were treated as non-scale and not included in tests of statistical significance.

6. Which impacts from sea-level rise, if any, are you most concerned about within the county? (Check ONE or MORE)

	Pre-survey (n=40)	Post-survey (n=40)	Δ Post – Pre
a. Private property damage or loss	72.5%	62.5%	-10.0%
b. Public infrastructure damage or loss	67.5%	67.5%	0.0%
c. Habitat loss	55.0%	75.0%	20.0%
d. Erosion of shoreline	75.0%	67.5%	-7.5%
e. Increased frequency and severity of flooding	60.0%	65.0%	5.0%
f. Permanently flooded areas (inundation)	30.0%	45.0%	15.0%
g. Loss or contamination of freshwater wells	50.0%	60.0%	10.0%
h. Problems with storm water drainage	65.0%	60.0%	-5.0%
i. Loss or damage of sewage and septic treatment systems	60.0%	67.5%	7.5%
j. Not concerned about any impacts	5.0%	2.5%	-2.5%
k. Don't know	2.5%	0.0%	-2.5%

7. Local governments have different types of policy tools they can use. How much do you support or oppose their use of these types to limit the impacts of coastal flooding due to sea-level rise?

	Strongly support	Somewhat support	Neither support nor oppose	Somewhat oppose	Strongly oppose	Don't know
a. Long-range planning that takes sea-level rise into account						
Pre-survey (n=40)	67.5%	17.5%	5.0%	2.5%	2.5%	5.0%
Post-survey (n=40)	70.0%	22.5%	5.0%	0.0%	2.5%	0.0%
Δ Post – Pre	2.5%	5.0%	0.0%	-2.5%	0.0%	-5.0%
b. Changes to regulations, such as zoning laws in coastal areas						
Pre-survey (n=40)	55.0%	25.0%	7.5%	5.0%	2.5%	5.0%
Post-survey (n=37)	64.9%	27.0%	2.7%	2.7%	2.7%	0.0%
Δ Post – Pre	9.9%	2.0%	-4.8%	-2.3%	0.2%	-5.0%
c. Use of government spending, such as buying coastal lands and new infrastructure						
Pre-survey (n=39)	38.5%	20.5%	20.5%	10.3%	2.6%	7.7%
Post-survey (n=38)	42.1%	42.1%	2.6%	7.9%	5.3%	0.0%
Δ Post – Pre	3.6%	21.6%	-17.9%	-2.4%	2.7%	-7.7%
d. Providing tax incentives to property owners to take actions that reduce flood risk						
Pre-survey (n=40)	40.0%	32.5%	15.0%	2.5%	7.5%	2.5%
Post-survey (n=38)	57.9%	23.7%	13.2%	2.6%	2.6%	0.0%
Δ Post – Pre	17.9%	-8.8%	-1.8%	0.1%	-4.9%	-2.5%

8. Based on what you know about sea-level rise do you agree or disagree with each of these statements?

	Strongly disagree	Somewhat disagree	Neither disagree nor agree	Somewhat agree	Strongly agree	Don't know
a. About half of observed sea-level rise in the region is due to sinking land. [TRUE]						
Pre-survey (n=40)	12.5%	15.0%	17.5%	22.5%	2.5%	30.0%
Post-survey (n=40)	7.5%	5.0%	30.0%	30.0%	17.5%	10.0%
Δ Post – Pre	-5.0%	-10.0%	12.5%	7.5%	15.0%	-20.0%
p<.05						
b. Most scientists expect the rate of sea-level rise to stay the same the next 100 years. [FALSE]						
Pre-survey (n=40)	32.5%	15.0%	15.0%	15.0%	5.0%	17.5%
Post-survey (n=40)	45.0%	27.5%	7.5%	7.5%	2.5%	10.0%
Δ Post – Pre	12.5%	12.5%	-7.5%	-7.5%	-2.5%	-7.5%
p<.05						
c. Global sea levels have never been higher than they are today. [FALSE]						
Pre-survey (n=40)	27.5%	10.0%	5.0%	22.5%	10.0%	25.0%
Post-survey (n=39)	23.1%	5.1%	20.5%	17.9%	17.9%	15.4%
Δ Post – Pre	-4.4%	-4.9%	15.5%	-4.6%	7.9%	-9.6%
d. Climate change is one of the causes of observed changes in sea-level rise. [TRUE]						
Pre-survey (n=39)	5.1%	7.7%	15.4%	30.8%	38.5%	2.6%
Post-survey (n=37)	13.5%	0.0%	8.1%	18.9%	59.5%	0.0%
Δ Post – Pre	8.4%	-7.7%	-7.3%	-11.9%	21.0%	-2.6%
e. Current sea-level rise is entirely the result of natural cyclical processes. [FALSE]						
Pre-survey (n=40)	12.5%	25.0%	17.5%	25.0%	12.5%	7.5%
Post-survey (n=38)	23.7%	23.7%	10.5%	26.3%	13.2%	2.6%
Δ Post – Pre	11.2%	-1.3%	-7.0%	1.3%	0.7%	-4.9%

9. Experiences with flooding vary based on where you live. Which of these characteristics apply to your home or property in Anne Arundel County? (Check ONE or MORE)

a. Waterfront	17.5%
b. Not waterfront but within 1 block of water	15.0%
c. Community access to the water from a beach/dock/boat ramp	12.5%
d. Located in floodplain	10.0%
e. Not located in floodplain	55.0%
f. Unknown whether in floodplain	20.0%
g. Second home, or vacation home	0.0%

n=40

10. How would you describe the risk of more severe flooding from sea-level rise over the next 40 years to …

	No risk	Very little risk	Some risk	High risk	Don't know
a. the county generally					
Pre-survey (n=39)	0.0%	2.6%	56.4%	38.5%	2.6%
Post-survey (n=39)	5.1%	12.8%	20.5%	56.4%	5.1%
Δ Post – Pre	5.1%	10.3%	-35.9%	17.9%	2.6%
b. your neighborhood					
Pre-survey (n=39)	12.8%	33.3%	30.8%	17.9%	5.1%
Post-survey (n=35)	31.4%	37.1%	20.0%	8.6%	2.9%
Δ Post – Pre p<.01	18.6%	3.8%	-10.8%	-9.4%	-2.3%
c. your home or property					
Pre-survey (n=39)	20.5%	33.3%	28.2%	10.3%	7.7%
Post-survey (n=36)	50.0%	25.0%	11.1%	11.1%	2.8%
Δ Post – Pre p<.01	29.5%	-8.3%	-17.1%	0.9%	-4.9%

11. In this survey, we highlight three different types of areas in the county. How much would you support or oppose local government efforts to limit the impacts of coastal flooding in these areas?

	Strongly support	Somewhat support	Neither support nor oppose	Somewhat oppose	Strongly oppose
a. Publicly owned natural areas, such as parks and wildlife sanctuaries					
Pre-survey (n=40)	55.0%	27.5%	10.0%	5.0%	2.5%
Post-survey (n=39)	64.1%	23.1%	5.1%	5.1%	2.6%
Δ Post – Pre	9.1%	-4.4%	-4.9%	0.1%	0.1%
b. Low-density residential areas of primarily single family homes					
Pre-survey (n=40)	37.5%	30.0%	25.0%	5.0%	2.5%
Post-survey (n=39)	35.9%	33.3%	12.8%	10.3%	7.7%
Δ Post – Pre	-1.6%	3.3%	-12.2%	5.3%	5.2%
c. High-density commercial and residential areas					
Pre-survey (n=40)	37.5%	37.5%	7.5%	7.5%	10.0%
Post-survey (n=40)	42.5%	32.5%	7.5%	10.0%	7.5%
Δ Post – Pre	5.0%	-5.0%	0.0%	2.5%	-2.5%

	Publicly owned natural areas, such as parks and wildlife sanctuaries	Low-density residential areas of primarily single family homes	High-density commercial and residential areas
12. Which of these areas should be governments' top priority?			
Pre-survey (n=38)	39.5%	23.7%	36.8%
Post-survey (n=39)	46.2%	20.5%	33.3%
Δ Post – Pre	6.7%	-3.2%	-3.5%
13. Which should be their second priority?			
Pre-survey (n=37)	35.1%	43.2%	21.6%
Post-survey (n=39)	33.3%	30.8%	35.9%
Δ Post – Pre	-1.8%	-12.5%	14.3%

(Open-ended post-survey follow-up question)

14. If you are opposed to efforts to limit coastal flooding impacts in all three areas, why?

1. *It is going to happen, therefore money (Gov't) is a waste of money.*
2. *Need objective metrics to best defend decisions to spend money and other resources .*
3. *Not the governments business.*
4. *Some responsibility should be on the homeowner if living in a waterfront single family home.*

15. How much would you support or oppose each of the following flood protection strategies for publicly-owned natural areas in the county, assuming the cost for the taxpayer was the same for each?

	Strongly support	Somewhat support	Neither support nor oppose	Somewhat oppose	Strongly oppose
a. Buy adjacent lands to enable natural areas to move inland					
Pre-survey (n=40)	52.5%	32.5%	7.5%	5.0%	2.5%
Post-survey (n=40)	50.0%	32.5%	12.5%	2.5%	2.5%
Δ Post – Pre	-2.5%	0.0%	5.0%	-2.5%	0.0%
b. Maintain beaches and wetlands against rising seas					
Pre-survey (n=40)	42.5%	35.0%	10.0%	7.5%	5.0%
Post-survey (n=38)	50.0%	39.5%	5.3%	2.6%	2.6%
Δ Post – Pre	7.5%	4.5%	-4.7%	-4.9%	-2.4%
c. Build walls and other structural barriers along the shore to hold back coastal waters					
Pre-survey (n=39)	28.2%	20.5%	12.8%	23.1%	15.4%
Post-survey (n=38)	21.1%	21.1%	5.3%	26.3%	26.3%
Δ Post – Pre	-7.2%	0.5%	-7.6%	3.2%	10.9%

p<.05

	Buy adjacent lands to enable natural areas to move inland	Maintain beaches and wetlands against rising seas	Build walls and other structural barriers along the shore to hold back coastal waters
16. Which of these strategies do you most support?			
Pre-survey (n=38)	42.1%	42.1%	15.8%
Post-survey (n=40)	40.0%	40.0%	17.5%
Δ Post – Pre	-2.1%	-2.1%	1.7%
17. Which is your second preference?			
Pre-survey (n=36)	30.6%	52.8%	16.7%
Post-survey (n=38)	50.0%	42.1%	7.9%
Δ Post – Pre	19.4%	-10.7%	-8.8%

(Post-survey follow-up to question 16, "Which of these strategies do you most support?")

Why would this strategy work best in Anne Arundel County?

Buy adjacent lands to enable natural areas to move inland:

1. *I find it to be more of a long-term solution that might be more cost effective than the other choices.*
2. *It could allow water to flow and migrate more naturally.*
3. *It would work if we had the allocated funds*
4. *Its the only long-term solution, and over the long term will be the most cost effective and be the best environmental choice.*
5. *so much coastline*
6. *THERE IS LAND FOR WETLANDS TO MOVE INLAND*
7. *This would be the easiest to do.*
8. *This would provide publicly owned lands to replace those lost to SLR for the enjoyment of the county citizens for the long term*
9. *To maintain natural areas. Otherwise you lose them.*

Maintain beaches and wetlands against rising seas:

10. *Allows the nature to its course of action without interfering with natural landscape*
11. *Anne Arundel County already supports living shorelines. It is a proactive approach if implemented in a timely manner.*
12. *Both maintaining wetlands and beaches as well as purchasing adjacent lands are more practive practices than building barriers which also tend to be a more short-term action rather than a good solution.*
13. *I support natural alternatives for ecological reasons. Wetlands are filtering system that needs to be protected and improved from the damages made to it over the past.*
14. *I think private property owners are going to want to live near water, no matter what. Public opinion will support option B the most, as building walls may make eyesores and buying adjacent areas seems politically unpalatable*
15. *its close to the Chesapeake bay*
16. *keep it natural as possible*
17. *long term sustainability*
18. *more affordable and visible to the overall population.*
19. *Most effective long term solution when emissions are reduced also.*
20. *The abundance of land areas for residential, commercial use beyond beaches and wetlands*
21. *too expensive to buy land related to option1, would be a lot of resistance for any type of walls*
22. *Walls and structural barriers are, at best, a short term solution to a very long term problem. Also, the use of barriers would tend to destroy the natural wetlands support of the infrastructure of the bay - ie, nursery habitat for juvenile species, natural cleanser of pollutants and natural buffer against flooding and erosion. Introducing additional wetlands and rebuilding/rehabing existing wetlands would tend to both support the bay restoration and protect the land from additional floor damage.*
23. *Really believe we need a thoughtful combination of all three.*

Build walls and other structural barriers along the shore to hold back coastal waters:

24. *It would prevent coastal flooding*
25. *Less flooding on beaches and wetlands*
26. *limited amount of beaches here in Anne Arundel County, but have other types of water area need protected (harbors, etc.)*
27. *To help us from the Chesapeake flooding.*

(Post-survey follow-up to questions 16 and 17.)

Why would your least preferred strategy NOT work well in Anne Arundel County?

Buy adjacent lands to enable natural areas to move inland:

1. *Buying adjacent land who be a tremendous cost to taxpayers.*
2. *I don't think the public appetite for buying adjacent lands could be maintained in the long run.*
3. *too expensive*

Maintain beaches and wetlands against rising seas:

4. *coastal flooding is not an issue for certain parts of Anne Arundel County*
5. *Not too many beaches here in Anne Arundel County.*
6. *people like to live on the beaches and historically they have chosen to rebuild after loss*

Build walls and other structural barriers along the shore to hold back coastal waters:

7. *an eye sore, expensive and wouldn't necessarily last*
8. *Barriers can be useful but they tend to be short-term actions as opposed to solutions.*
9. *Building structures seems to be a temporary solution that cost too much money.*
10. *Building wall has a tendency to transfer the problem to another disaster point. Therefore its not a good mitigation strategy*
11. *Cost*
12. *Cost of initial construction and maintenance. Only benefits some people and not the county as a whole. Exception is preserving the history of Annapolis where walls or other engineered structures may be the only solution.*
13. *Expense, resistance to limitation to areas that are accessible, ecological impact could be adverse, beauty compromised.*
14. *I don't think construction of walls and barriers in protected wetlands is environmentally friendly.*
15. *IT COST TOO MUCH AND THE ON GOING MAINTAINENCE*
16. *It is not practical to bulkhead the Anne Arundel County portion of the bay. The barriers will eventually fail. A more permanent and cost effective solution is needed that is environmentally friendly*
17. *It will be cost prohibitive to build walls and other structural barriers are to protect all of the potentially effected land area in the County; be expensive to maintain; and eventually have to be rebuilt; have adverse effect on the environment (no wetlands no fish, no crabs, etc.) which also affects the economy for waterman as well as the recreational and tourism industry.*

18. *It would probably only work well in selected areas, such as Annapolis, which I believe should be fully protected.*
19. *Long term maintenance against a natural process. Not sure if it is strategic (long term) or operational (today's bandage).*
20. *people would see man-made structure as not suitable & unnsture like*
21. *The costs could not be justified by the continual maintenance the structures*
22. *Too much coastland to build structural barriers. Only a limited use of these should be done.*
23. *Too time consuming and costly*
24. *Walls*
25. *walls and other structural barriers are short term solutions, expensive to maintain and can do damage to adjoining shorelines*
26. *Walls and structural barriers are, at best, a short term solution to a very long term problem. Also, the use of barriers would tend to destroy the natural wetlands support of the infrastructure of the bay – i.e., nursery habitat for juvenile species, natural cleanser of pollutants and natural buffer against flooding and erosion.*
27. *Walls are unsightly and expensive to maintain*
28. *Walls etc. cannot stop the natural occurrence of flooding due to global warming. It is cost prohibitive*
29. *Walls have to be maintained or they don't work and they are costly to build properly.*
30. *Walls present so many other problems*

(Post-survey follow-up to questions 16 and 17.)

18. If you do not like any of the three strategies above, why?

1. *The solution should be specific to each scenario. A one-size-fits-all solution does not exist. A combination of all of these methods is needed and needs to be supported by the community in order to be successful.*
2. *The strategy used should fit the problem - there is no one answer to all situations. People should use the best tool no just one or two chosen by people who may not have to live with the consequences.*
3. *They would cost taxpayers money that might not be there. These costs should be borne by the landowner and local government should reduce its impact on the costs.*

19. How much would you support or oppose each of the following flood protection strategies for low-density residential areas in the county, assuming the cost for the taxpayer was the same for each?

	Strongly support	Somewhat support	Neither support nor oppose	Somewhat oppose	Strongly oppose
a. Retreat inland over time, restricting new building in areas likely to flood, and moving or abandoning existing structures					
Pre-survey (n=40)	52.5%	30.0%	5.0%	12.5%	0.0%
Post-survey (n=40)	45.0%	35.0%	5.0%	7.5%	7.5%
Δ Post – Pre	-7.5%	5.0%	0.0%	-5.0%	7.5%
b. Maintain and restore natural areas such as wetlands and beaches as buffers against coastal flooding					
Pre-survey (n=40)	60.0%	35.0%	2.5%	0.0%	2.5%
Post-survey (n=39)	56.4%	35.9%	0.0%	2.6%	5.1%
Δ Post – Pre	-3.6%	0.9%	-2.5%	2.6%	2.6%
c. Design and retrofit buildings to be more flood resilient, including elevating them and/or the land					
Pre-survey (n=40)	27.5%	37.5%	15.0%	15.0%	5.0%
Post-survey (n=39)	38.5%	33.3%	7.7%	10.3%	10.3%
Δ Post – Pre	11.0%	-4.2%	-7.3%	-4.7%	5.3%
d. Build walls and other structural barriers along the shore to hold back coastal waters					
Pre-survey (n=39)	12.8%	33.3%	10.3%	30.8%	12.8%
Post-survey (n=39)	17.9%	23.1%	10.3%	23.1%	25.6%
Δ Post – Pre	5.1%	-10.3%	0.0%	-7.7%	12.8%

	Retreat inland over time, restricting new building in areas likely to flood, and moving or abandoning existing structures	Maintain and restore natural areas such as wetlands and beaches as buffers against coastal flooding	Design and retrofit buildings to be more flood resilient, including elevating them and/or the land	Build walls and other structural barriers along the shore to hold back coastal waters
20. Which of these strategies do you most support?				
Pre-survey (n=38)	34.2%	50.0%	10.5%	5.3%
Post-survey (n=39)	30.8%	51.3%	7.7%	10.3%
Δ Post – Pre	-3.4%	1.3%	-2.8%	5.0%
21. Which is your second preference?				
Pre-survey (n=38)	39.5%	26.3%	18.4%	15.8%
Post-survey (n=36)	27.8%	38.9%	25.0%	8.3%
Δ Post – Pre	-11.7%	12.6%	6.6%	-7.5%
22. Which is your third preference?				
Pre-survey (n=34)	11.8%	14.7%	52.9%	20.6%
Post-survey (n=38)	23.7%	7.9%	47.4%	21.1%
Δ Post – Pre	11.9%	-6.8%	-5.6%	0.5%

(Post-survey follow-up to question 20, “Which of these strategies do you most support?”)

Why would this strategy work best in Anne Arundel County?

Retreat inland over time, restricting new building in areas likely to flood, and moving or abandoning existing structures:

1. *I don't know if this strategy would work best, but it's my preferred option. I suspect most people on the shoreline would like to maintain the status quo. to protect their vested interests, in which case options B, C, D would be equally more preferable to A.*
2. *In certain areas (south county) there are areas that frequently flood with the potential loss of life, this would eliminate the problem.*
3. *It would allow water to flow and migrate naturally.*
4. *Less conflict with populest.*
5. *Long term solution. The others are bandaids to a problem that will not go away and in the end will be more expensive due to maintenance.*
6. *Move impacted people away from the expected problem areas by not allowing new structures. Better enforcement of laws.*
7. *Retreating would create new natural areas as well as providing new residents.*
8. *Seems to be the best and least costly choice. Also does not involve sudden change.*

Maintain and restore natural areas such as wetlands and beaches as buffers against coastal flooding:

9. *because it contains a lot of wetlands*
10. *It is an environmentally friendly and proactive solution. A natural buffer is better long term solution.*
11. *It maintains the integrity of the coastline.*
12. *It will have the most efficacy and be the most cost effective approach*
13. *It's natural*
14. *Large area ie Juglands to protect*
15. *Long term sustainability*
16. *low cost*
17. *people here like nature & this would the least intrusive for them, they want nature to flourish*
18. *protecting wetlands would also protect the land behind it*
19. *Same as before - Wetlands are our filtering system.*
20. *the availability of land use for residential and commercial*
21. *This strategy won't necessarily be appropriate for every situation in Anne Arundel County but I could only choose one.*

Design and retrofit buildings to be more flood resilient, including elevating them and/or the land:

22. *It is unlikely that sea level rise will be eliminated so it is important to establish an environment that will allow humans to exist in the changing environment. Building more resilient and resistant structures would have the same effect as building earthquake resistant structures in active tectonic zones.*
23. *It seems more cost effective than relocating people*
24. *SEEMS TO BE A GOOD COMPROMISE*

Build walls and other structural barriers along the shore to hold back coastal waters:

25. *There are area such as Harbors etc. that need protection.*
26. *To protect us from Chesapeake flooding*

(Post-survey follow-up to questions 20-22.)

Why would your least preferred strategy NOT work well in Anne Arundel County?

Retreat inland over time, restricting new building in areas likely to flood, and moving or abandoning existing structures:

1. *It seems very expensive to move people inland*
2. *its expensive*
3. *Lots of existing waterfront development is already in place.*
4. *RETREAT TO WHERE? AN EMOTIONAL ISSUE FOR THE RETREATER*
5. *Retreating inland reduces the size and beauty of the county.*

Maintain and restore natural areas such as wetlands and beaches as buffers against coastal flooding:

[No comments]

Design and retrofit buildings to be more flood resilient, including elevating them and/or the land:

6. *Anne Arundel County is not at the Atlantic Ocean*
7. *Made not be built correctly in the first place because of builders budget cuts and may required addition cost as if one is rebuilding a new house the correct way (New repairs can be costly as a New Home built for flooding).*
8. *Overall costs.*
9. *Rebuilding and retrofitting would have to be done every so often to keep ahead of the sea level rise.*
10. *Retrofitting may be cost prohibitive. Additionally, as we learn more, the requirements of retrofitting may be increased.*
11. *The historic buildings are in areas that do not support the elevating or retrofitting - and keep their cultural significance.*
12. *too expensive –*

Build walls and other structural barriers along the shore to hold back coastal waters:

13. *Again, a structural barrier is only a temporary fix, not a solution.*
14. *As before expense*
15. *Building structures to hold back water seems to be a more temporary, and expensive undertaking since.*
16. *Building wall will only transfer the problem*
17. *Building permanent walls should be a last resort. It would upset the natural ecosystem and salinity of the bay. Maybe a temporary wall would be a solution to episode flooding.*
18. *Cost of initial construction and maintenance. Only benefits some people and not the county as a whole. Exception is preserving the history of Annapolis where walls or other engineered structures may be the only solution.*
19. *I think building walls and structural barriers might create too many unintended side effects, and potentially be eyesores for the public.*
20. *project cost and who will bear the burden of cost*
21. *Structural approaches are too expensive both in terms of the capital cost as well as the adverse impacts to the environment and as a result of the environmental damage there will be adverse affects for waterman and tourist economies.*
22. *The cost.*
23. *too costly*
24. *Ugly*
25. *Walls and structural barriers are, at best, a short term solution to a very long term problem. Also, the use of barriers would tend to destroy the natural wetlands support of the infrastructure of the bay - ie, nursery habitat for juvenile species, natural cleanser of pollutants and natural buffer against flooding and erosion.*
26. *Walls are costly to build and maintain.*
27. *Walls unsightly*
28. *when people think walls, they would reactive from the start.. no way*

(Post-survey follow-up to questions 20-22.)

23. If you do not like any of the four strategies above, why?

1. *One solution does not fit all, the solution should be evaluated on a case-by-case basis. Some homeowners will not be able to afford the expense to repair or retrofit their properties without government assistance.*
2. *People need a set of tools and to choose the best - not have only one course of action.*

24. How much would you support or oppose each of the following flood protection strategies for high-density commercial and residential areas in the county, assuming the cost for the taxpayer was the same for each?

	Strongly support	Somewhat support	Neither support nor oppose	Somewhat oppose	Strongly oppose
a. Retreat inland over time, restricting new building in areas likely to flood, and moving or abandoning existing structures					
Pre-survey (n=39)	53.8%	35.9%	7.7%	2.6%	0.0%
Post-survey (n=40)	37.5%	32.5%	10.0%	12.5%	7.5%
Δ Post – Pre	-16.3%	-3.4%	2.3%	9.9%	7.5%
p<.01					
b. Maintain and restore natural areas such as wetlands and beaches as buffers against coastal flooding					
Pre-survey (n=39)	61.5%	33.3%	2.6%	0.0%	2.6%
Post-survey (n=37)	56.8%	35.1%	2.7%	0.0%	5.4%
Δ Post – Pre	-4.8%	1.8%	0.1%	0.0%	2.8%
c. Design and retrofit buildings to be more flood resilient, including elevating them and/or the land					
Pre-survey (n=38)	28.9%	44.7%	5.3%	5.3%	15.8%
Post-survey (n=37)	40.5%	27.0%	13.5%	10.8%	8.1%
Δ Post – Pre	11.6%	-17.7%	8.3%	5.5%	-7.7%
d. Build walls and other structural barriers along the shore to hold back coastal waters					
Pre-survey (n=38)	13.2%	36.8%	2.6%	26.3%	21.1%
Post-survey (n=37)	29.7%	21.6%	10.8%	21.6%	16.2%
Δ Post – Pre	16.6%	-15.2%	8.2%	-4.7%	-4.8%

	Retreat inland over time, restricting new building in areas likely to flood, and moving or abandoning existing structures	Maintain and restore natural areas such as wetlands and beaches as buffers against coastal flooding	Design and retrofit buildings to be more flood resilient, including elevating them and/or the land	Build walls and other structural barriers along the shore to hold back coastal waters
25. Which of these strategies do you most support?				
Pre-survey (n=39)	35.9%	43.6%	10.3%	10.3%
Post-survey (n=39)	20.5%	30.8%	17.9%	30.8%
Δ Post – Pre	-15.4%	-12.8%	7.7%	20.5%
26. Which is your second preference?				
Pre-survey (n=39)	41.0%	33.3%	17.9%	7.7%
Post-survey (n=38)	26.3%	39.5%	21.1%	13.2%
Δ Post – Pre	-14.7%	6.1%	3.1%	5.5%
27. Which is your third preference?				
Pre-survey (n=35)	20.0%	11.4%	48.6%	20.0%
Post-survey (n=38)	18.4%	21.1%	34.2%	26.3%
Δ Post – Pre	-1.6%	9.6%	-14.4%	6.3%

(Post-survey follow-up to question 25, “Which of these strategies do you most support?”)

Why would this strategy work best in Anne Arundel County?

Retreat inland over time, restricting new building in areas likely to flood, and moving or abandoning existing structures:

1. *High Density should not be located in flood-prone areas.*
2. *Long term solution. The others are bandaids to a problem that will not go away and in the end will be more expensive due to maintenance.*
3. *Not sure if this would work but if we remove the problem that people create by causing new infrastructures which are nice for the people but hasten the long term problem by removing natural areas and habitats.*
4. *Some land erosion over time can be expected, due to the nature of water. Therefore, making adjustments in life-style seems to be the natural solution to the problem.*
5. *We don't have many high density areas so the time to act is now.*

Maintain and restore natural areas such as wetlands and beaches as buffers against coastal flooding:

6. *a buffer protects the inland*
7. *because of the bay*
8. *It is an environmentally friendly and proactive approach.*
9. *Its the best mitigation strategy*
10. *keep it natural & historical*
11. *low cost and keep natural resources*
12. *Most realistic.*
13. *We already have these areas, they just need to be utilized, not destroyed*

Design and retrofit buildings to be more flood resilient, including elevating them and/or the land:

14. *As noted previously, this will help people to live in the changing environment.*
15. *Businesses might be more agreeable to redesign their property*
16. *High density areas are more difficult to move inland so other solutions should be examined.*
17. *It depends on the location. Most of the existing high density development is already on the shoreline, so maintaining a natural area buffer isn't an option. In these existing locations, the best strategy is retrofitting and design approach. Additionally, in some locations because of the number of land owners involved accompanied by the economic engine that is a downtown (Baltimore Inner Harbor, Annapolis) the only reasonable approach is structural.*
18. *It would make the existing structures less vulnerable. I would prefer moving or abandoning but it would meet too much resistance.*
19. *It would protect the most people.*
20. *MITIGATE LONG TERM COSTS*

Build walls and other structural barriers along the shore to hold back coastal waters:

21. *Anne Arundel had Harbor*
22. *It would protect structures that could not be replaced or rebuilt elsewhere*
23. *Only for commercial/historic area such as City Dock*
24. *this may be only ave., though not the most appealing*
25. *To not get flooding from the Chesapeake*
26. *We need to protect historical buildings as best we can.*
27. *With high density commercial and residential, I think strong protection is the only option, and building structural impediments to sea rise the most obvious and palatable solution.*

(Post-survey follow-up to questions 25-27.)

Why would your least preferred strategy NOT work well in Anne Arundel County?

Retreat inland over time, restricting new building in areas likely to flood, and moving or abandoning existing structures:

1. *cost efficiency*
2. *For high density areas the number of property owners involved and the economic impacts or retreating makes it an unrealistic approach.*
3. *HIGH DENSITY WOULD BE VERY DIFFICULT TO ENGAGE*
4. *It would adversely affect the most people.*
5. *It would be very impractical to displace a large group of people and businesses.*
6. *not all areas are prone to coastal flooding*
7. *Retreating inland over time in these types of areas would, I expect, be received as defeatism from a public policy standpoint. Any of the other options, therefore, would be more preferable to the general voting public, especially those most immediately impacted in the high-density area.*
8. *Retrofit communities*

Maintain and restore natural areas such as wetlands and beaches as buffers against coastal flooding:

9. *Too time consuming and costly*
10. *Most high density areas do not have much natural areas to work with.*

Design and retrofit buildings to be more flood resilient, including elevating them and/or the land:

11. *Cannot affect structure of some historical buildings*
12. *Cost*
13. *expensive, impractical*
14. *It is a cost that would have to be redone every few years to meet the continual rise of sea level*
15. *Many environments are not affected by the problem and essentially, many will be taxed for their perceived non problem*
16. *Total cost*

Build walls and other structural barriers along the shore to hold back coastal waters:

17. *Building permanent walls will upset the ecosystem.*
18. *Building structures (walls, etc...) seems to be a more expensive, less effective solution.*
19. *Cost*
20. *For High Density areas - while permanent walls help to prevent flooding, all it does is shunt it to another area to flood.*
21. *It does not solve the problem*
22. *it is unclear who will bear this economic cost*
23. *Restrict water view and beauty*
24. *Structural barriers are temporary actions, not solutions.*
25. *too costly*
26. *Walls and structural barriers are, at best, a short term solution to a very long term problem. Also, the use of barriers would tend to destroy the natural wetlands support of the infrastructure of the bay - ie, nursery habitat for juvenile species, natural cleanser of pollutants and natural buffer against flooding and erosion.*
27. *Walls are expensive to build and maintain and don't work in the long run.*

(Post-survey follow-up to questions 25-27.)

28. If you do not like any of the four strategies above, why?

1. *A combination of all solutions is needed depending on the situation and risk to the infrastructure.*
2. *Communities should have access to all useful strategies and not relegated to only one or two.*

29. The following questions ask you how you feel generally about public policy questions. Please tell us how strongly you agree or disagree with the following statements.

	Strongly disagree	Somewhat disagree	Neither disagree nor agree	Somewhat agree	Strongly agree
a. Most local public policy issues are so complex that someone like me can't understand them.					
Pre-survey (n=40)	25.0%	22.5%	2.5%	42.5%	7.5%
Post-survey (n=38)	34.2%	21.1%	10.5%	31.6%	2.6%
Δ Post – Pre	9.2%	-1.4%	8.0%	-10.9%	-4.9%
p<.05					
b. People like me do not have any say in what local government does.					
Pre-survey (n=40)	25.0%	22.5%	12.5%	22.5%	17.5%
Post-survey (n=39)	30.8%	20.5%	15.4%	28.2%	5.1%
Δ Post – Pre	5.8%	-2.0%	2.9%	5.7%	-12.4%
c. I have the ability to talk about and participate in local public policy discussions.					
Pre-survey (n=39)	12.8%	7.7%	20.5%	33.3%	25.6%
Post-survey (n=38)	13.2%	10.5%	7.9%	26.3%	42.1%
Δ Post – Pre	0.3%	2.8%	-12.6%	-7.0%	16.5%
d. Local public officials care a lot what people like me think.					
Pre-survey (n=39)	23.1%	10.3%	25.6%	33.3%	7.7%
Post-survey (n=37)	27.0%	24.3%	10.8%	35.1%	2.7%
Δ Post – Pre	4.0%	14.1%	-14.8%	1.8%	-5.0%

30. The following questions ask what impact citizens can have in influencing local government policies. Please tell us how strongly you agree or disagree with the following statements.

	Strongly disagree	Somewhat disagree	Neither disagree nor agree	Somewhat agree	Strongly agree
a. Organized citizens can have an impact on the policies of local government.					
Pre-survey (n=39)	5.1%	0.0%	5.1%	61.5%	28.2%
Post-survey (n=40)	7.5%	5.0%	5.0%	45.0%	37.5%
Δ Post – Pre	2.4%	5.0%	-0.1%	-16.5%	9.3%
b. Local elected officials will respond to the needs of citizens.					
Pre-survey (n=38)	15.8%	15.8%	21.1%	42.1%	5.3%
Post-survey (n=39)	7.7%	17.9%	10.3%	53.8%	10.3%
Δ Post – Pre	-8.1%	2.2%	-10.8%	11.7%	5.0%
c. As citizens, we can successfully work together to promote important local policy issues.					
Pre-survey (n=40)	2.5%	10.0%	12.5%	42.5%	32.5%
Post-survey (n=39)	0.0%	10.3%	7.7%	41.0%	41.0%
Δ Post – Pre	-2.5%	0.3%	-4.8%	-1.5%	8.5%
d. We can cooperate as citizens to evaluate information and make important decisions that affect our local communities.					
Pre-survey (n=39)	5.1%	7.7%	12.8%	41.0%	33.3%
Post-survey (n=39)	2.6%	5.1%	5.1%	48.7%	38.5%
Δ Post – Pre	-2.6%	-2.6%	-7.7%	7.7%	5.1%

APPENDIX C

KNOWLEDGE QUESTION REFERENCES

8a. About half of observed sea-level rise in the region is due to sinking land. [TRUE]

>For Chesapeake Bay subsidence rate estimates, including Annapolis, see page 25.

Boon, J. D., Brubaker, J. M., & Forrest, D. R. (2010). *Chesapeake Bay land subsidence and sea level change: An evaluation of past and present trends and future outlook.* Virginia Institute of Marine Science, Gloucester Point, VA.

8b. Most scientists expect the rate of sea-level rise to stay the same the next 100 years. [FALSE]

>"Sea level is projected to rise at an even greater rate in this century." Page 409.

Bindoff, N. L., Willebrand, J., Artale, V. Cazenave, A., Gregory, J., Gulev, S., Hanawa, K., Le Quéré, C., Levitus, S., Nojiri, Y., Shum, C.K., Talley, L.D., & Unnikrishnan, A. (2007). *Observations: Oceanic Climate Change and Sea Level. In* S. Solomon, D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor & H.L. Miller (Eds.), *Climate change 2007: The physical science basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press.

>"Results of climate model studies suggest sea-level rise in the twenty-first century will significantly exceed rates over the past century." Page 11.

CCSP. (2009). *Coastal sensitivity to sea-level rise: A focus on the mid-Atlantic region. A report by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research.* J. G. Titus (Coordinating Lead Author), K. E. Anderson, D. R. Cahoon, D. B. Gesch, S. K. Gill, B. T. Gutierrez, E. R. Thieler, & S. J. Williams (Lead Authors). U.S. Environmental Protection Agency, Washington, D.C.

8c. Global sea levels have never been higher than they are today. [FALSE]

>"The last interglacial period, Marine Isotope Stage (MIS) 5e, was characterized by global mean surface temperatures that were at least 2 _C warmer than present. Mean sea level stood 4–6m higher than modern sea level." Page 38.

Rohling, E. J., Grant, K., Hemleben, Ch., Siddall, M., Hoogakker, B. A. A., Bolshaw, M., & Kucera, M. (2008). High rates of sea-level rise during the last interglacial period. *Nature Geoscience 1,* 38 – 42.

8d. Climate change is one of the causes of observed changes in sea-level rise. [TRUE]

>*"Sea-level rise is the combination of the increase in volume of water as a result of global warming and decrease in size of the ocean basins due to mid-ocean ridge spreading." Page 4.*

Maryland Commission on Climate Change. (2008). *Comprehensive strategy for reducing Maryland's vulnerability to climate change, Phase I: Sea level rise and coastal storms*. Report of the Maryland Commission on Climate Change Adaptation and Response Working Group.

8e. Current sea-level rise is entirely the result of natural cyclical processes. [FALSE]

>*"Consensus in the climate science community is that the global climate is changing, mostly due to mankind's increased emissions of greenhouse gases such as carbon dioxide, methane, and nitrous oxide, from burning of fossil fuels and land-use change (measurements show a 25 percent increase in the last century). Warming of the climate system is unequivocal, but the effects of climate change are highly variable across regions and difficult to predict with high confidence based on limited observations over time and space. Two effects of atmospheric warming on coasts, whichare relevant at regional, national, and global scales, are sea-level rise and an increase in major cyclone intensity." Page 11.*

CCSP. (2009). *Coastal sensitivity to sea-level rise: A focus on the mid-Atlantic region. A report by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research.* J. G. Titus (Coordinating Lead Author), K. E. Anderson, D. R. Cahoon, D. B. Gesch, S. K. Gill, B. T. Gutierrez, E. R. Thieler, & S. J. Williams (Lead Authors). U.S. Environmental Protection Agency, Washington, D.C.
