

**DELAWARE RESIDENTS' OPINIONS ON
CLIMATE CHANGE AND SEA LEVEL RISE**

Discussion of Survey Results and Messaging Implications

Produced by Responsive Management

**for the Delaware Department of Natural
Resources and Environmental Control**

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INTRODUCTION

It seems unlikely that legislators and fish and wildlife agency professionals will be spurred to action to combat climate change and sea level rise without a solid groundswell of concern from the public; in this regard, constituent knowledge about the threat of climate change and support for solutions are critical to driving government entities and other agencies toward proactive measures. With the need for a coordinated response to climate change growing more urgent by the day, the Delaware Department of Natural Resources and Environmental Control (DNREC) commissioned a study in December of last year to determine Delaware residents' opinions on climate change and sea level rise.

The study, conducted by Responsive Management, entailed a scientific telephone survey of 1,505 Delaware residents 18 years old and older; results from the survey had a sampling error of plus or minus 2.52 percentage points. The researchers selected telephones as the preferred sampling medium because of the almost universal ownership of telephones, which helped to ensure that all households with telephones had an equal chance of being called to participate in the survey (both landlines and cell phones were included to reflect the exact proportions of their ownership in Delaware households). Additionally, telephone surveys, relative to mail or Internet surveys, allow for more scientific sampling and data collection and provide higher quality data. The researchers developed the sample and implemented the survey to ensure that the overall results would be reflective of the Delaware population of residents ages 18 years and older.

The survey examined Delaware residents' basic knowledge and awareness of climate change and sea level rise; opinions on whether climate change and sea level rise are happening; attitudes toward climate change and sea level rise in terms of their importance as issues of concern, as well as their importance as threats specifically; perceptions of the efficacy of taking action to mitigate climate change; and opinions on management strategies and actions pertaining to climate change.

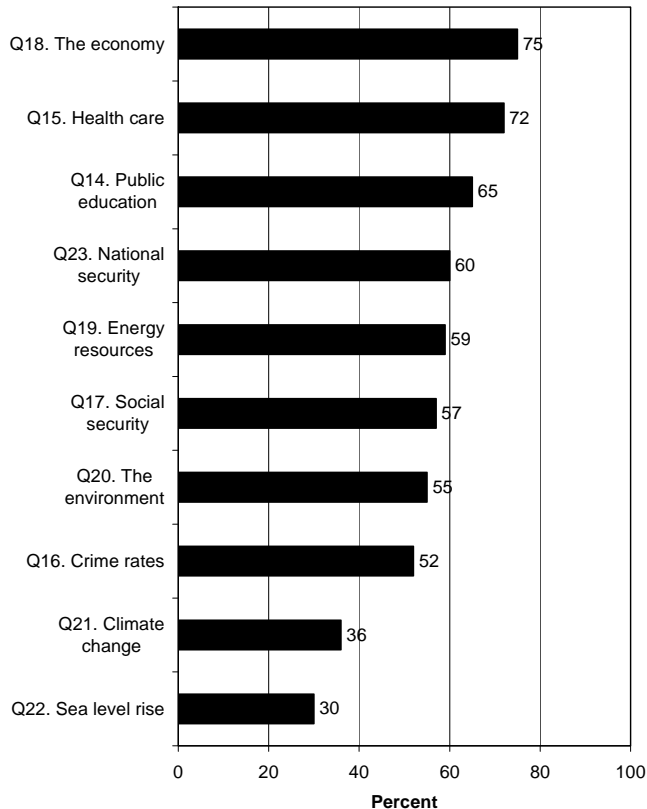
To examine differences in responses between groups (e.g., coastal versus non-coastal residents, males versus females), the researchers ran crosstabulations of survey questions; statistical tests were then run to determine where differences in responses were significant. In addition to the analyses of crosstabulations, a nonparametric analysis examined how various responses to questions in the survey related to attitudinal and demographic characteristics. These analyses produced a number of insights into the survey data and helped to categorize opinions common to various discrete groups of respondents within the survey sample.

PERCEPTIONS OF IMPORTANT ENVIRONMENTAL ISSUES

An initial finding from the survey helps to contextualize concern about climate change and sea level rise among a broad range of other issues the country faces: presented with a list of 10 issues, only about a third of Delaware residents said they were *very* concerned about climate change and sea level rise. The economy (75%) and health care (72%) top the list, as ranked by the percentage who said they were *very* concerned about the issues. (The timing of the survey—December 2009—may have some effect on these results,

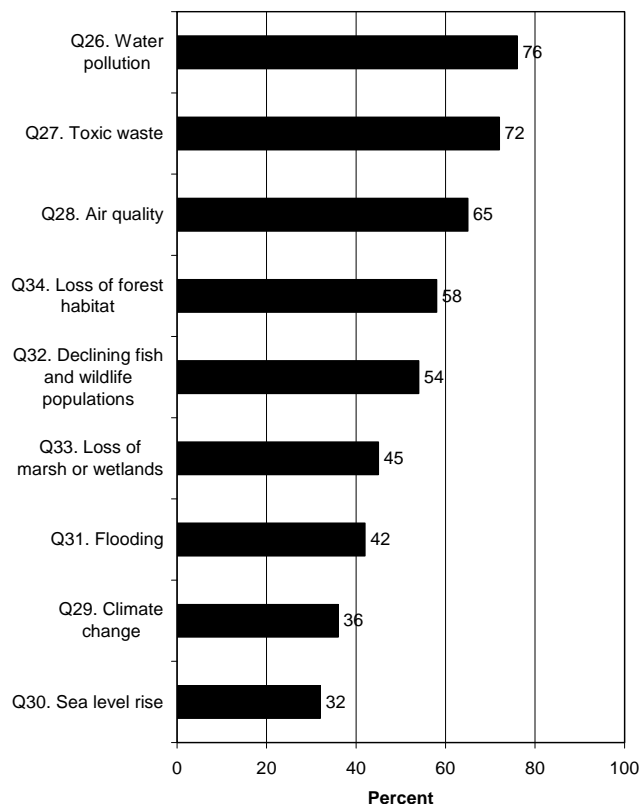
coming during one of the deepest recessions in decades and during the time Congress was debating and taking action on health care.) Public education (65%), national security (60%), energy resources (59%), social security (57%), the environment (55%), and crime rates (52%) follow, while climate change (36%) and sea level rise (30%) occupy the bottom of the ranking.

Q14-23. Percent who are very concerned about the following issues that the country faces.



Even when climate change and sea level rise are presented in a list of *environmental* issues (as opposed to the broader list of general issues), concern about them remains fairly low—once again, climate change and sea level rise occupy the bottom of the ranking, with far more Delaware residents being *very* concerned about water pollution (76%), toxic waste (72%), air quality (65%), loss of forest habitat (58%), declining fish and wildlife populations (54%), loss of marsh or wetlands (45%), and flooding (42%).

Q26-34. Percent who are very concerned about the following environmental issues in Delaware.



Interestingly, though, the ranking of environmental issues shows that substantial percentages of Delaware residents—and in some cases, large majorities—are *very* concerned about issues either directly or indirectly related to climate change and sea level rise. For example, saltwater intrusion due to sea level rise can affect the salinity levels in surface water, ground water, and fresh water supplies, thereby leading to a form of water pollution—an issue about which more than three-quarters of Delaware residents said they were *very* concerned.

(Note that water pollution consistently appears to be an issue of concern in Delaware: a 2009 survey of Delaware residents conducted by Responsive Management regarding the strategic direction of DNREC’s Division of Fish and Wildlife asked respondents in an open-ended question about the most important fish or wildlife issue facing Delaware, and the top answers were pollution in general and clean water/water pollution. A graph of this data is included at the end of the paper.)

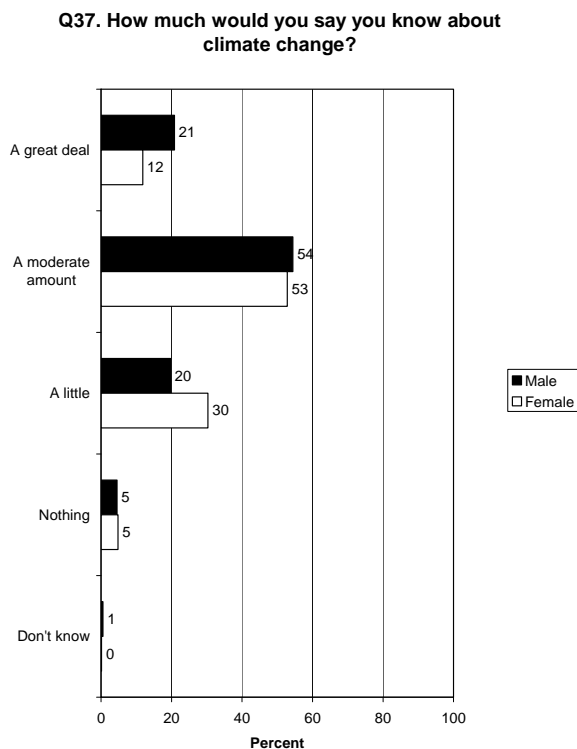
Further, individual environmental issues that ranked higher in concern than climate change and sea level rise, such as loss of forest habitat, declining fish and wildlife populations, loss of marsh or wetlands, and flooding, may in fact all be exacerbated

through the effects of climate change and sea level rise. Indeed, the loss or diminishment of coastal wetland ecosystems (endangering both habitat and wildlife populations) and the increased vulnerability of coastal areas to flooding during storms are among the acknowledged effects of climate change and sea level rise.¹

In this sense, results from the surveys suggest that Delaware residents tend to be very concerned about the *effects* of climate change and sea level rise, even if the specific phrases *climate change* and *sea level rise* by themselves appear to elicit negligible levels of concern.

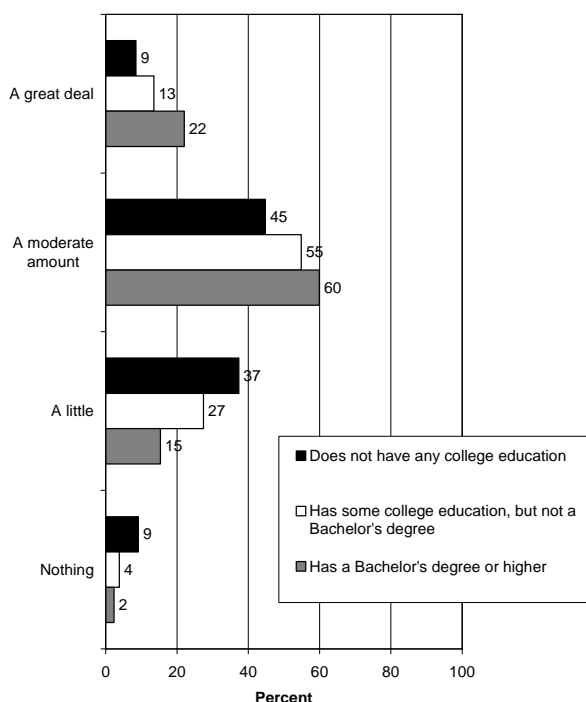
KNOWLEDGE AND AWARENESS OF CLIMATE CHANGE AND SEA LEVEL RISE

Despite the perception that concern over climate change is somewhat lacking among Delaware residents, self-professed knowledge among residents about the issue appears more encouraging: almost three-quarters of Delaware residents (70%) say they know *a great deal* or *a moderate amount* about climate change, while 30% say that they know *a little* or *nothing*. Additionally, the nonparametric analysis found that men are more likely than women to claim to know *a great deal* about climate change, and more educated people (i.e., those with at least a Bachelor's degree) claim to know more about climate change compared to those with less education.



¹ "Coastal Zones and Sea Level Rise," U.S. Environmental Protection Agency, 8 September 2009, <http://www.epa.gov/climatechange/effects/coastal/>.

Q37. How much would you say you know about climate change?



On the other hand, self-professed knowledge about sea level rise is lower than about climate change: 40% of Delaware residents say that they know *a great deal* or a *moderate amount*, while 59% say that they know *a little* or *nothing*.

The research also suggests the primary media used by Delaware residents for information or news on environmental issues. Among all respondents, the newspaper is the leading source of information (52% get their information about the environment that way), followed by television (44%), the Internet (excluding the DNREC site) (30%), and magazines (14%). Crosstabulations of this survey data help to illustrate a basic difference in the way different age groups rely on various types of media for information or news about the environment: older people are far more likely to consult a newspaper, while younger people show a greater propensity for the Internet as a source of news and information. Though fairly expected, this remains a pertinent finding in terms of its applications to outreach campaigns and information dissemination.

Additionally, about half of all Delaware residents say that there is not enough information available on sea level rise, and the survey helped to identify areas in which Delaware residents would like additional information on this topic. Asked to name topics related to sea level rise on which they wanted additional information, residents named sea level rise in general (33% want more information on this), actions that can be taken to reduce impacts of sea level rise (26%), current or potential impacts of sea level rise (24%), how

sea level rise relates to climate change/global warming (23%), how to protect property from sea level rise (19%), and funding needs to address sea level rise in Delaware (18%).

OPINION ON CLIMATE CHANGE AND WHETHER CLIMATE CHANGE IS HAPPENING

Most Delaware residents are convinced that climate change and sea level rise are happening: the large majority (70%) are *completely* or *mostly* convinced that climate change is happening, while 63% are *completely* or *mostly* convinced that sea levels are rising. The nonparametric analysis found that women, compared to men, are more likely to be convinced that climate change is happening. Similarly, residents in the higher education group (i.e., those with at least a Bachelor's degree), relative to those with less education, are more likely to be *completely* convinced that climate change is happening.

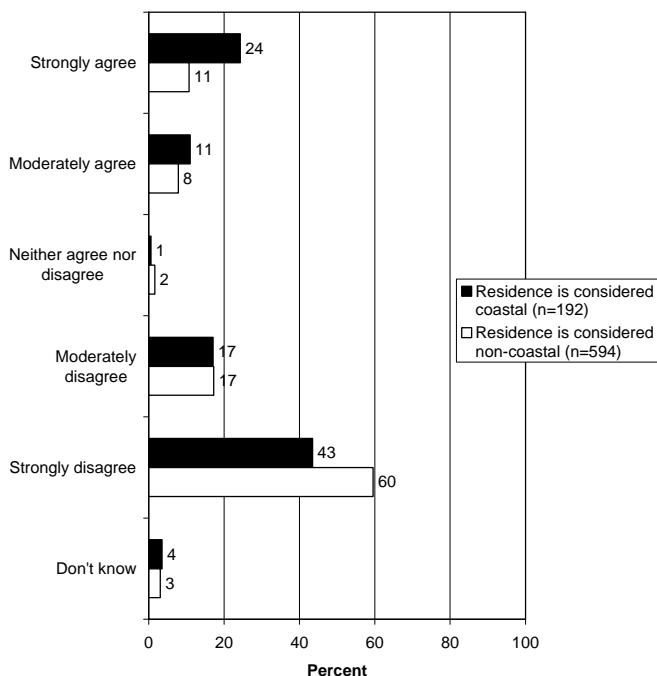
Delaware residents are split regarding their perceptions of what most *scientists* think regarding climate change, with 42% saying that most scientists think climate change is happening, and 42% saying that there is a lot of disagreement among scientists about whether climate change is happening. Only 5% think that most scientists think that climate change is *not* happening.

In general, there is solid agreement among Delaware residents not only that climate change is happening but that there exists a need for research-based proactive measures—this is evidenced by the large majorities of respondents who *strongly* or *moderately* agree with the following: that scientists are right that climate change is occurring (79%), that climate change is contributing to the rise in sea levels (75%), that the state of Delaware needs to conduct more research to identify the impacts of sea level rise in Delaware (73%), and that the state of Delaware needs to conduct more research to identify the impacts of climate change in Delaware (71%). These findings may be especially encouraging in terms of what they suggest about public support behind future planning initiatives addressing sea level rise and climate change.

Interestingly, about a fifth of residents (22%) think that they have *personally experienced* the impacts of sea level rise; crosstabulations of this data show that coastal residents, relative to non-coastal residents, are more likely to *strongly* agree that they have experienced the impacts of sea level rise. Though nowhere near a majority of the sample, the percentage of Delaware residents who can personally attest to the effects of sea level rise is nonetheless striking. This finding may also have some bearing on outreach or information campaigns: audiences apathetic to the claims made by government agencies or nonprofit organizations regarding sea level rise may nevertheless be receptive to or interested in testimony from those living on Delaware's coasts regarding the impacts from rises in sea levels.

(Note that this data does *not* suggest that all coastal residents in Delaware strongly agree that they have personally experienced the impacts of sea level rise; rather, it suggests that coastal residents, relative to non-coastal residents, are *more likely* to strongly agree that they have experienced the impacts of sea level rise.)

**Q99. Do you agree or disagree with this statement:
You have personally experienced the impacts of
sea level rise.**



Delaware residents as a whole are generally well-informed regarding basic knowledge of climate change. There are differences of opinion regarding the *causes* of climate change, although more residents think that climate change is caused mostly by human activities (43%) than think it is caused mostly by natural changes in the environment (26%). Meanwhile, slightly more than a quarter of residents (27%) think it is caused about equally by human activities and by natural changes in the environment. A question about the terms “climate change” and “global warming” asked residents whether the terms are the same thing, whether they are different but related things, or whether they are unrelated things, and the majority of Delaware residents (66%) say that they are different but related things (DNREC considers them to be different but related).

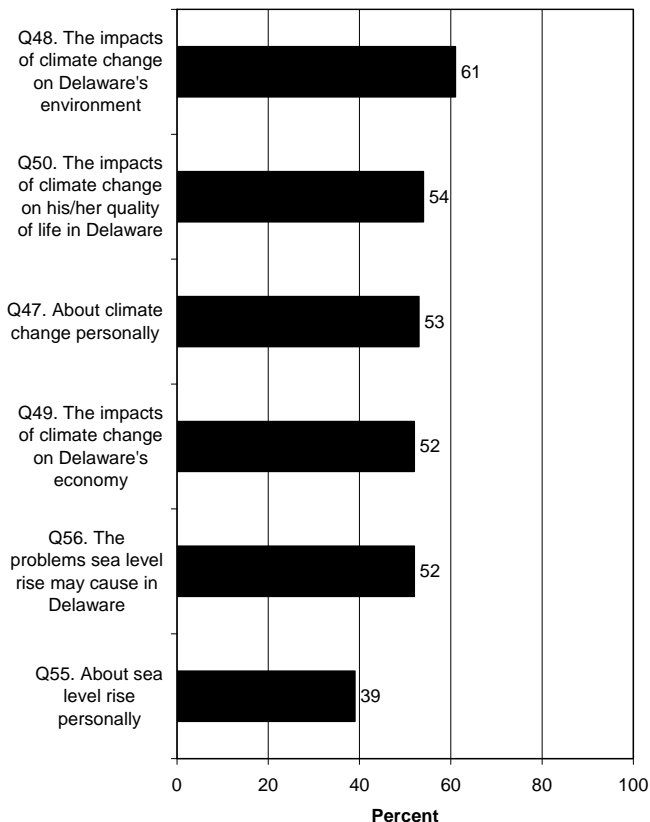
PERCEPTIONS OF CLIMATE CHANGE AS A THREAT

The survey measured Delaware residents’ opinions on climate change as a threat specifically, in addition to how they felt about it as an issue of more general concern. Most residents (77%) consider climate change to be a threat, describing it as a *very* serious threat (38%) or a *somewhat* serious threat (39%). At the same time, about a fifth of residents (21%) consider it to be a *not very serious* or *not at all serious threat*. The nonparametric analysis found that women are more likely than men to think that climate change is a *very* or *somewhat* serious threat.

The survey questions measuring the perceptions of climate change as a threat revealed a distinction between those who consider climate change/sea level rise to be fairly distant threats that could potentially affect many things, and those who consider climate change/sea level rise to be more imminent and direct threats to the respondents personally. This distinction is demonstrated in six statements that addressed residents' concerns about the ability for climate change and sea level rise to affect various things; the data suggest that Delaware residents generally show greater levels of worry about the impacts of climate change on Delaware's environment, its quality of life, and its economy, than they do about the impacts of climate change on them personally. Worry about sea level rise follows a similar pattern.

The most concern, in the ranking by the percentage worrying *a great deal* or *a moderate amount*, is regarding the impact of climate change on Delaware's environment (61%). Four items follow, grouped together: worry about the impact on the respondent's own quality of life in Delaware (54%), worry about climate change personally (53%), worry about the impacts of climate change on Delaware's economy (52%), and worry about the problems sea level rise may cause (52%). At the bottom, just 39% said that they worry *a great deal* or *a moderate amount* about sea level rise personally.

Q47-50, 55-56. Percent who worry a great deal or a moderate amount about the following issues concerning climate change and sea level rise.



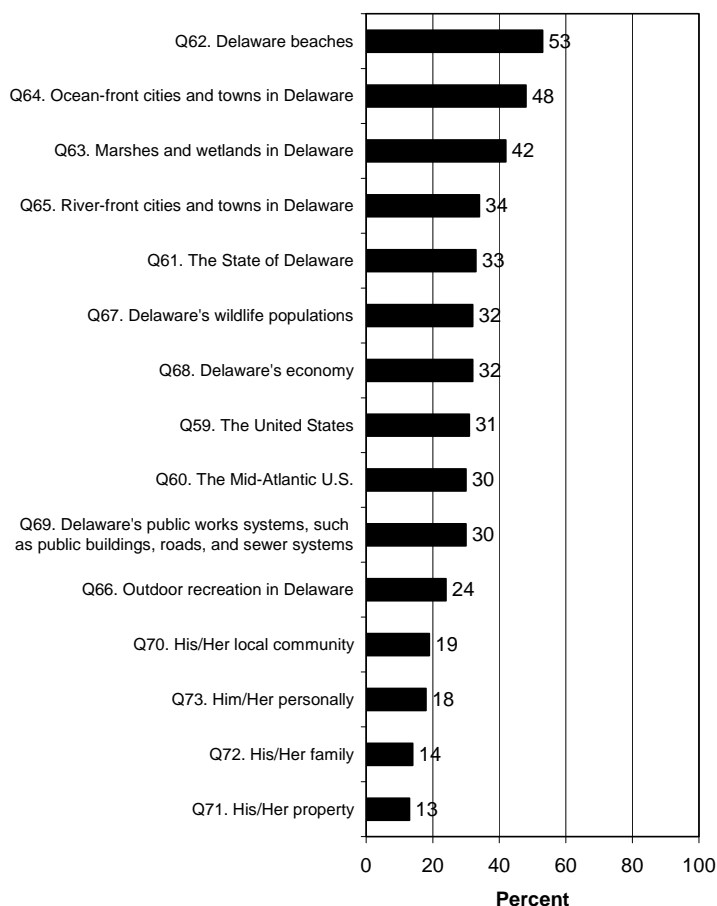
Crosstabulations of earlier questions from the survey suggest that greater levels of self-professed knowledge about climate change and sea level rise are positively correlated with greater levels of worry: those who said they know *a great deal* or *moderate amount* about climate change, compared to those who said they know *a little* or *nothing*, are more likely to worry about climate change *a great deal* or *moderate amount*. Similarly, those who said they know *a great deal* or *moderate amount* about sea level rise, compared to those who said they know *a little* or *nothing*, are more likely to worry about sea level rise *a great deal* or *moderate amount*. Further, coastal residents are more likely than non-coastal residents to worry *a great deal* or *moderate amount* about the problems sea level rise may cause in Delaware. This again underscores the potential for future messages on sea level rise to somehow make use of the opinions and experiences of coastal residents, who may be in a unique position to verify the reality of sea level rise.

A later set of questions in the survey asked residents to indicate how much sea level rise is a threat to various locations (e.g., beaches, ocean-front towns, the state as a whole) or various other things (e.g., wildlife, the economy, public works systems). The results again show that sea level rise is more commonly perceived as a threat to any number of locations and things, *other than* to the respondent personally. Again, the pattern seems to suggest the perception that sea level rise is a looming problem on the horizon, but not something that represents an immediate threat to residents personally.

In looking at the ranking by the percentage saying that sea level rise is a *very serious threat*, three items stand out at the top: Delaware's beaches (53% say sea level rise is a *very serious* threat to this), ocean-front cities and towns in Delaware (48%), and marshes and wetlands in Delaware (42%). A middle tier consists of seven items, each with from 30% to 34% saying sea level rise is a *very serious* threat: river-front cities and towns in Delaware (34%), the state of Delaware as a whole (33%), Delaware's wildlife populations (32%), Delaware's economy (32%), the United States as a whole (31%), the Mid-Atlantic states (30%), and Delaware's public works (30%).

There are five items in a bottom tier of items not considered by many to be greatly threatened by sea level rise: outdoor recreation in Delaware (24%), the respondent's local community (19%), the respondent personally (18%), the respondent's family (14%), and the respondent's property (13%).

Q59-73. Percent who think sea level rise is a very serious threat to the following.



Crosstabulations of this data appear to suggest that for coastal residents, the threat of sea level rise represents a more imminent threat: coastal residents are more likely to think that sea level rise is a *very serious* threat to river-front cities and towns in Delaware, outdoor recreation in Delaware, their local community, their property, their family, and *them personally*.

A later question tested residents' opinions on when they thought sea level rise would start to have impacts on the area in which they live in Delaware: 5 years, 10 years, 25 years, 50 years, or 100 years, or if they thought that sea levels are not rising. Answers were spread fairly evenly among the possible responses. For instance, 14% think sea level rise is having an impact now, and 11% think it will have an impact in 100 years. The most common response is 25 years (17%). At the same time, however, coastal residents, relative to non-coastal residents, were again more likely to say that sea level rise is having impacts now. Non-coastal residents, on the other hand, were more likely to pick a date in the future when saying when they thought sea level rise would start to have

impacts on the area in which they live. Finally, men, compared to women, were more likely to think that sea level rise would start to have impacts in the distant future (rather than the near future or now) or to never have impacts.

PERCEPTIONS OF EFFICACY OF TAKING ACTION TO MITIGATE CLIMATE CHANGE

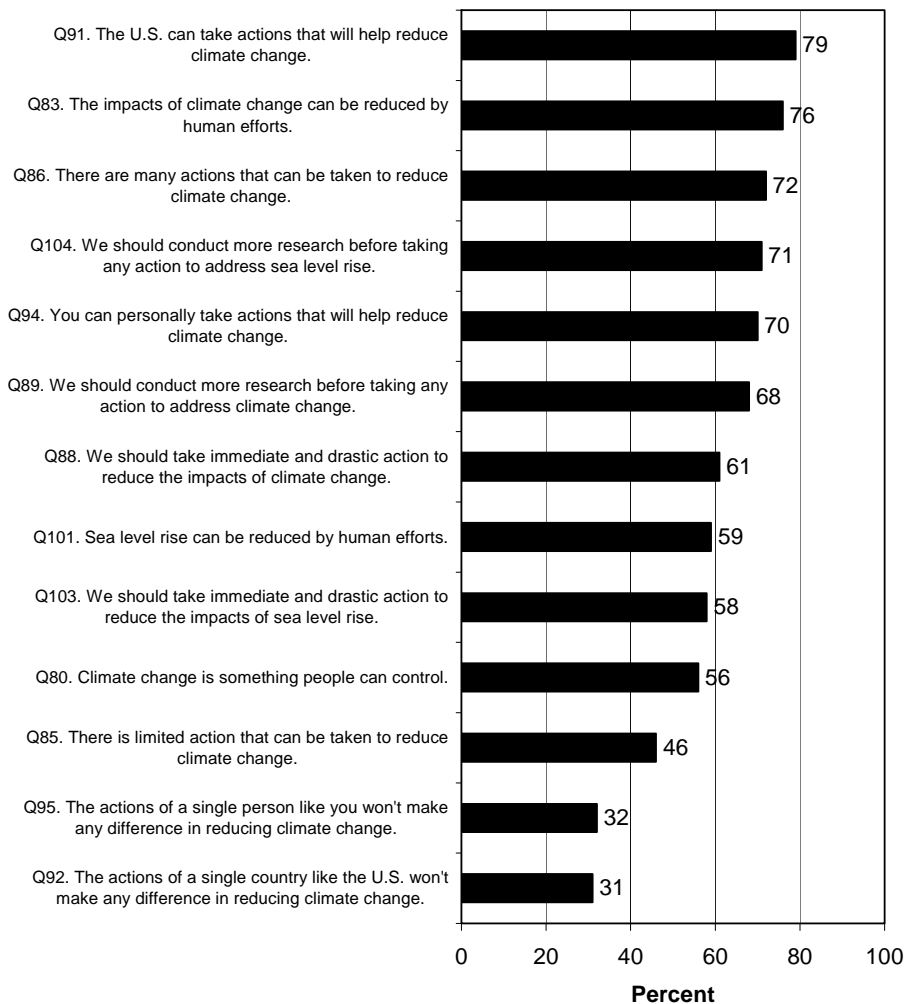
The research explored whether Delaware residents think that human action can affect climate change or mitigate the effects of climate change, and the results generally suggest that people think that human action can mitigate the effects of climate change, but opinion is split regarding whether society should take *immediate* action or whether society should *conduct more research before* taking action.

Large majorities of Delaware residents *strongly* or *moderately* agree that the U.S. can take actions that will help reduce climate change (79%), that the impacts of climate change can be reduced by human efforts (76%), that there are many actions that can be taken to reduce climate change (72%), and that an individual can personally take actions that will help reduce climate change (70%). However, despite thinking that human actions can affect climate change, large majorities think that we (our society) should conduct more research before taking any action to address sea level rise (71%) and that we (our society) should conduct more research before taking any action to address climate change (68%).

Meanwhile, a slight majority of residents, despite other opinions, think that action should be taken now and that action would be efficacious in addressing climate change. From 56% to 61% think that we (our society) should take immediate and drastic action to reduce the impacts of climate change (61%), that sea level rise can be reduced by human efforts (59%), that we (our society) should take immediate and drastic action to reduce the impacts of sea level rise (58%), and that climate change is something people can control (56%).

At the same time, notable percentages of residents are pessimistic about the efficacy of taking action to mitigate climate change. Less than a majority think that there is limited action that can be taken to reduce climate change (46%), that the actions of a single person will not make any difference in reducing climate change (32%), and that the actions of a single country like the U.S. will not make any difference in reducing climate change (31%).

Q80, 83, 85-86, 88-89, 91-92, 94-95, 98-101, 103-104.
Percent who strongly or moderately agree with the
following statements about climate change and sea
level rise.



Regardless of how many years residents believe it will take for sea level rise to affect their area, residents overwhelmingly think action should be taken to address or reduce the impacts of sea level rise *before impacts occur* (80%) rather than *as impacts begin* (8%) or *after impacts cause problems* (3%). The overwhelming majority of respondents who favor action *before impacts occur* is striking, especially considering the range of different responses to the earlier question asking how many years it would be until sea level rise had impacts on Delaware. It would appear that residents overwhelmingly favor proactive measures, no matter how close or far off the threat of sea level rise actually is. It may be worth noting as well that recent history has provided several major examples of catastrophes that occurred or were made worse due to a lack of planning or a failure to act before impacts occurred (e.g., the 2008 financial crisis, the 2010 Haiti earthquake).

Perhaps Delaware residents are mindful of such lessons in their attitudes toward sea level rise planning.

MANAGEMENT STRATEGIES PERTAINING TO CLIMATE CHANGE

In general, Delaware residents appear to favor cost-effective management strategies to address sea level rise, but they also appear open to projects or actions requiring additional government spending *if* they are convinced of the long-term benefits of such projects.

In looking at the percentage of Delaware residents who *strongly* support the actions/management strategies, two stand out at the top, both relating to building codes: avoiding building new structures in areas at risk from sea level rise (67%), and changing building codes and regulations to reduce risk in flood prone areas (63%). These are the only two actions/management strategies that receive strong support from a majority of Delaware residents.

These are followed by funding research (44%), using dredged material to build up marsh areas at risk (40%), and elevating buildings using *private* funding (40%). About a third of residents strongly support options that require large capital outlays: building dikes, seawalls, and bulkheads (33%), and elevating land surfaces in areas at risk of sea level rise (30%). A further third strongly support the natural option: allowing beaches and wetlands to naturally migrate inland (29%). At the bottom, with little support, are the three potential actions that each include using “government funds” to purchase land at risk of sea level rise (21%), to elevate buildings (18%), and to purchase frequently flooded properties (16%).

Residents were asked whether they support or oppose having their local and state governments spend more money on public construction projects if it meant that the structures could withstand or accommodate sea level rise in Delaware. They were informed before the question that such construction is more *expensive* than construction that cannot withstand or accommodate sea level rise. The results suggest that residents are willing to pay the expense now so that construction will withstand sea level rise: 64% support, and 25% oppose. Again, though not directly comparable to sea level rise, the earthquake in Haiti earlier this year must be acknowledged as a tragic reminder of the potential consequences of a natural disaster on structures erected without the regulation of building codes.

In follow-up to the above question, those who opposed were further informed of the following: “What if you knew that it would save money and be less costly *long-term* for Delaware to construct structures to withstand or accommodate sea level rise?” Of those who opposed previously, 58% still oppose (most of them now *strongly* opposing), but just under a third (32%) now support.

RESPONSIBILITY FOR TAKING ACTION

The survey assessed residents' opinions on entities that could potentially be doing more or doing less to address or reduce the impacts of sea level rise in Delaware. For each entity, the survey asked respondents if they thought the entity should be doing more, about the same, or less than it is currently doing. Among the results of this series of questions as a whole, it is notable that, for each entity, the percentage of residents who say that the entity should be doing more (ranging from 45% up to 66%) far exceeds the percentage who say that the entity should be doing the same or less (ranging from 22% to 29%).

At the top of the ranking by the percentage who say the entity should be doing *more* are corporations and industry (66%) and Delaware citizens (64%)—both at nearly two-thirds. Five entities are in the middle, all with from 56% to 59% receiving the “doing more” response: state government officials, city/town government officials, county government officials, Delaware’s state legislators, and the U.S. Congress. What is striking about this data is the preference given to the private sector and to citizens themselves regarding the entities that should be doing more to reduce the impacts of sea level rise in Delaware. This may point to the potential effectiveness of messages that emphasize personal accountability and responsible practices among businesses and private enterprises. Note further that government entities occupy the bottom of the ranking, suggesting perhaps that many Delaware residents are more receptive to the need for intelligent personal actions than a reliance on government solutions.

Q123-131. Percent who think the following should be doing much or somewhat more to address or reduce the impacts of sea level rise in Delaware.

