Supplementary Materials:

Key Beliefs and Attitudes for Sea Level Rise Policy

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| **Box S1.** Sea level rise survey use by governments in the U.S. Mid-Atlantic  In **Hampton Roads**, **Virginia,** public and private sources funded the research with the express intention of informing policy and management decisions at the local, regional, and state level. Findings from the 2016 Hampton Roads Residents’ Perceptions of Sea Level Rise and Flooding Adaptation Survey were shared with residents at presentations for civic league and homeowners’ associations, with local and regional policymakers through presentations to city government staff, and at a regional planning meeting.  The **Anne Arundel County, Maryland**, survey served as a component of a broader project that assessed the use of community outreach, deliberation, and localized SLR projections in local decision-making (Akerlof et al. 2016).  The **Maryland** state survey was funded as a component of research products for the 2012-2016 Climate Communication Consortium of Maryland, which included state agencies, local governments, non-profits, and universities (Akerlof and Maibach 2014). The 2014 SLR survey module was developed in collaboration with the state’s Department of Natural Resources. The survey methodology included regional sub-samples to detect geographic differences relevant to communication programs and strategies of local governments.  The 2014 **Delaware** survey was a re-deployment of one conducted in 2009 for the state and its Sea Grant program. Natural resource agency staff worked with an academic team and public opinion consultants to re-draft the survey to include questions relating to climate change. The intent of the collaborative study was to inform public policy with data on public opinion, but survey measures were also developed to inform state communication. For example, respondents were asked to self-identify as either “coastal” or “non-coastal” to assess differences in these audiences in knowledge and information needs.  .Akerlof, Karen L., and E. W. Maibach. 2014. “Adapting to Climate Change & Sea Level Rise: A Maryland Statewide Survey, Fall 2014.” Fairfax, VA: Center for Climate Change Communication, George Mason University.  Akerlof, Karen L., Katherine E. Rowan, Todd La Porte, Brian K. Batten, Howard Ernst, and Dann M. Sklarew. 2016. “Risky Business: Engaging the Public on Sea Level Rise and Inundation.” *Environmental Science & Policy* 66 (December): 314–23. |

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| **Box S2.** Missing data treatment and evaluation of sample bias  **Missing data** were found to affect less than four percent of the variables: sea level rise belief certainty, 1.15%; issue prioritization, 1.86%; and attitudes toward sea level rise policies, between 3.0%–3.9%. Missing survey data for these variables were substituted using hot deck imputation, a strategy for handling missing data that is widely employed by government statistics agencies, survey organizations, and academic researchers (Andridge and Little 2010). In hot deck imputation, respondents matched on a set of variables to the case with the missing value are randomly sorted; the missing value is replaced with that of the nearest neighbor (Myers 2011). This single imputation technique is distinct from multiple imputation (Rubin 1996). The matched variables were gender, age and education, for which there was no missing data but expected differences on attitudinal and belief measures.  **Sample bias** can be assessed by comparing sample characteristics to those of the population, testing for differences between early and late waves of responders and extrapolation of linear trends over time, and contrasting the characteristics of respondents to non-respondents on variables of research relevance. We performed two tests for bias. We compared the sample to known Census distributions for the state and Gallup reports of political ideology frequencies, and split 20% of the sample into early and late responders on the primary variable of interests—issue prioritization and attitude toward SLR policy—to test for differences between the groups. We do not have data on non-respondents, but late survey responders can be assumed to resemble non-respondents and function as a proxy. Testing for mean differences between the first 10% of responders (*n* = 227) and last 10% (*n* = 227), we find no statistically significant difference in the variables (z-scores, issue prioritization, *M*first10% = −0.09; *M*last10% = 0.07; *t*(444) = −1.76, *p* = 0.08; SLR policy attitudes, *M*first10% = 3.58; *M*last10% = 3.71; *t*(452) = −1.71, *p* = 0.09). Compared to U.S. Census distributions for Maryland, the final sample is slightly older, more female, and better educated (see table below). The differences in sample characteristics from the known population values suggest at possible bias in the regression estimates, but the finding that there appears to be insignificant differences between respondents and a proxy for non-respondents on the primary variable of interest implies that these are likely to be limited.  Andridge, Rebecca R., and Roderick J. A. Little. 2010. “A Review of Hot Deck Imputation for Survey Non-Response.” *International Statistical Review* 78 (1): 40–64. https://doi.org/10.1111/j.1751-5823.2010.00103.x.  Myers, Teresa A. 2011. “Goodbye, Listwise Deletion: Presenting Hot Deck Imputation as an Easy and Effective Tool for Handling Missing Data.” *Communication Methods and Measures* 5 (4): 297–310. https://doi.org/10.1080/19312458.2011.624490.  Rubin, Donald B. 1996. “Multiple Imputation after 18+ Years.” *Journal of the American Statistical Association* 91 (434): 473–89. https://doi.org/10.1080/01621459.1996.10476908. |

**Table S1.** Covariance matrix for the path analysis

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| --- | --- | --- | --- | --- | --- | --- |
|  | **Female** | **Age** | **Education** | | **Income** | **Political ideology** |
| **Female** | 0.238936242 | -0.054969306 | | -0.022996171 | -0.064144508 | 0.061564515 |
| **Age** | -0.054969306 | 0.964289938 | | -0.190206321 | -0.177056331 | -0.107525199 |
| **Education** | -0.022996171 | -0.190206321 | | 1.021183769 | 0.52628021 | 0.237312083 |
| **Income** | -0.064144508 | -0.177056331 | | 0.52628021 | 1.015383133 | 0.078636423 |
| **Political ideology** | 0.061564515 | -0.107525199 | | 0.237312083 | 0.078636423 | 0.962231462 |
| **Attitudes-Consequences** | 0.052049242 | -0.069630004 | | 0.111391074 | 0.032681825 | 0.183448501 |
| **Belief certainty** | 0.016279988 | -0.016087432 | | 0.1162102 | 0.027030946 | 0.233610161 |
| **Interaction (Consequences x certainty)** | -0.026479706 | 0.056096347 | | 0.06639608 | 0.022687825 | 0.004021912 |
| **Issue priority** | 0.058320011 | 0.016513077 | | -0.033956079 | -0.080915564 | 0.18265004 |
| **Policy support** | 0.075742095 | 0.013393705 | | 0.101224249 | 0.010911939 | 0.278424028 |

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| --- | --- | --- | --- | --- | --- |
|  | **Attitudes-Consequences** | **Belief certainty** | **Interaction (Consequences x certainty)** | **Issue priority** | **Policy support** |
| **Female** | 0.052049242 | 0.016279988 | -0.026479706 | 0.058320011 | 0.075742095 |
| **Age** | -0.069630004 | -0.016087432 | 0.056096347 | 0.016513077 | 0.013393705 |
| **Education** | 0.111391074 | 0.1162102 | 0.06639608 | -0.033956079 | 0.101224249 |
| **Income** | 0.032681825 | 0.027030946 | 0.022687825 | -0.080915564 | 0.010911939 |
| **Political ideology** | 0.183448501 | 0.233610161 | 0.004021912 | 0.18265004 | 0.278424028 |
| **Attitudes-Consequences** | 0.996812845 | 0.403935786 | -0.009097636 | 0.323642283 | 0.43009324 |
| **Belief certainty** | 0.403935786 | 0.927931564 | 0.040261118 | 0.249838636 | 0.336545739 |
| **Interaction (Consequences x certainty)** | -0.009097636 | 0.040261118 | 0.948390394 | -0.047665222 | -0.103843823 |
| **Issue priority** | 0.323642283 | 0.249838636 | -0.047665222 | 0.911757485 | 0.436815559 |
| **Policy support** | 0.43009324 | 0.336545739 | -0.103843823 | 0.436815559 | 0.971221178 |

*n*=1891

**Table S2.** Coefficients and correlations of the path analysis model

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| --- | --- | --- | --- | --- |
| **Path analysis coefficients** *(Standardized, except gender)* | | | β | *p* |
| Female | → | Issue priority | 0.06 | \*\* |
| Education | → | Issue priority | -0.07 | \*\* |
| Income | → | Issue priority | -0.06 | \* |
| Political ideology | → | Issue priority | 0.13 | \*\*\* |
| Female | → | Policy support | 0.08 | \*\*\* |
| Age | → | Policy support | 0.07 | \*\*\* |
| Education | → | Policy support | 0.06 | \*\* |
| Political ideology | → | Policy support | 0.13 | \*\*\* |
|  |  |  |  |  |
| **Correlations** |  |  | *r* |  |
| SLR belief certainty | ↔ | Education | 0.10 | \*\*\* |
| SLR belief certainty | ↔ | Political ideology | 0.24 | \*\*\* |
| Attitude toward consequences | ↔ | Female | 0.09 | \*\*\* |
| Attitude toward consequences | ↔ | Age | -0.06 | \*\* |
| Attitude toward consequences | ↔ | Education | 0.09 | \*\*\* |
| Attitude toward consequences | ↔ | Political ideology | 0.18 | \*\*\* |
| SLR belief certainty X Attitude toward consequences |  | Gender | -0.05 | \* |
| SLR belief certainty X Attitude toward consequences |  | Age | 0.06 | \*\* |
| SLR belief certainty X Attitude toward consequences |  | Education | 0.05 | \*\* |
| Political ideology | ↔ | Female | 0.12 | \*\*\* |
| Political ideology | ↔ | Age | -0.11 | \*\*\* |
| Political ideology | ↔ | Education | 0.24 | \*\*\* |
| Political ideology | ↔ | Income | 0.07 | \*\* |
| Female | ↔ | Age | -0.11 | \*\*\* |
| Female | ↔ | Education | -0.05 | \* |
| Female | ↔ | Income | -0.13 | \*\*\* |
| Age | ↔ | Education | -0.19 | \*\*\* |
| Age | ↔ | Income | -0.18 | \*\*\* |
| Education | ↔ | Income | 0.51 | \*\*\* |

\*\*\**p* < .001; \*\**p* <.01; \**p* <.05

**Table S3.** Comparison of Hampton Roads 2016 survey demographics to Census statistics: Sociodemographics

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| --- | --- | --- | --- |
|  | **Census 2010** | **2016  Hampton Roads Adaptation Survey** | ∆ |
| **Gender** |  |  |  |
| Male | 49% | 38% | 11% |
| Female | 51% | 62% | -11% |
| **Age** |  |  |  |
| Under 24 | 15% | 18% | -3% |
| 25 to 34 | 19% | 19% | -1% |
| 35 to 44 | 17% | 16% | 1% |
| 45 to 54 | 20% | 17% | 3% |
| 55 to 64 | 15% | 17% | -3% |
| 65 and over | 15% | 13% | 2% |
| **Race and ethnicity** |  |  |  |
| White | 60% | 69% | -9% |
| Black, African American | 31% | 17% | 15% |
| American Indian, Alaskan Native | 0% | 1% | 0% |
| Asian | 4% | 5% | -2% |
| Native Hawaiian, Pacific Islander | 0% | 1% | -1% |
| Hispanic | 11% | 8% | 3% |
| **Household income** |  |  |  |
| Less than $15,000 | 10% | 9% | 1% |
| $15,000 to $50,000 | 33% | 23% | 10% |
| $50,000 to $75,000 | 21% | 17% | 4% |
| $75,000 to $100,000 | 13% | 17% | -4% |
| $100,000 to $150,000 | 14% | 18% | -4% |
| $150,000 to $200,000 | 5% | 7% | -2% |
| More than $200,000 | 4% | 4% | 0% |

**Table S4.** Comparison of Hampton Roads 2016 survey demographics to Census statistics: Regional distribution

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| --- | --- | --- | --- |
|  | **Census 2010** | **2016**  **Hampton Roads Adaptation Survey** | ∆ |
| Virginia Beach | 26% | 22% | 4% |
| Norfolk | 14% | 38% | -24% |
| Chesapeake | 13% | 9% | 4% |
| Portsmouth | 6% | 7% | -1% |
| Suffolk | 5% | 3% | 2% |
| Newport News | 11% | 6% | 5% |
| Hampton | 8% | 12% | -3% |
| Other | 16% | 3% | 13% |