How Does Sea Level Rise Affect Members of the Marin Academy Community?

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Abstract

Coastal cities and regions across the world have begun to see the impacts of sea level rise. According to a 2013 study by the Pacific Institute, global sea level averages have risen 1.6 inches as global temperatures have also risen 1°F over the course of the last century. (2) Before creating adaptations to protect vulnerable populations, research needs to be conducted to investigate why and where people may be at risk and how to specifically protect them from sea level rise. In order to conduct this research, I decided to conduct a survey based on scientific research on how sea level rise affects residents of the Marin Academy Community for my science symposium. The goal of this experiment is to raise awareness for the fact that sea level rise is real and will affect many members of the Marin Academy Community. My research question is: How does sea level rise affect members of the Marin Academy Community? To answer this question, I conducted a survey broken down into two sections: a demographic section and an "inhabitants"/"personal experience section. I adopted several questions from the US Census for the demographic section. To create the inhabitants section, I included scientific reports such as the 2017 Marin County Sea Level Rise Vulnerability Assessment to generate questions that use the current non-subjective information. Questions in this section were designed to bring in a variety of fields of knowledge and language to help those not familiar with the science behind sea level rise. The survey was broken down into two sections, a demographics section (11 questions) and a concerns section (9 questions). The demographics section asked the participants for non-subjective information. Questions in this section were designed to collect information on participants housing, employment, economic, ethnicity, mode of transportation to school, and if they had been impacted by flooding while commuting or not from Marin Academy’s campus. Many of the demographic questions were adapted from US Census Bureau questions (particularly questions on economic status, and ethnicity). The second section of the survey asked participants questions regarding their concern on certain impacts of sea level rise (impacts over certain time periods, economic status, use of open space, transportation, health, and daily life). I chose to ask questions about the impacts of sea level rise that have been most prevalent in the scientific and policy making communities. Using reports like the 2017 Marin County Sea Level Rise Vulnerability Assessment, I tried to replicate topics and language used in reports like these to measure the most relevant information to Marin County and the Bay Area in my survey. The survey was conducted online and distributed to Marin Academy, with the majority targeted to the students of my science class, the MARC program, Alex Wasthoff, Cory Bytof, Kevin Reese, and my fellow students in MARC for their valuable feedback. 

Background

Sea level rise poses many threats to the Bay Area’s residents, businesses, eco-systems, and economy. Sea level rise will intensify existing coastal flooding, King Tides, and watershed flooding, which all already pose big threats for the Bay Area. A 1.0 meter sea level rise situation is predicted to cost $49 billion in coastal flooding damages and put 220,000 people at risk of a 100-year flood. And with 1.4 meters of sea level rise, estimations show that up to 270,000 people may be vulnerable to a 100 year flood and damages amount to $62 billion. (1) There is great reason to be concerned about these potential impacts, as 2009 report by the California Energy Commission’s Public Interest Energy Research (PIER) Climate Change Research Program projects a potential rise in california sea levels from 1.0 meter to as high as 1.4 meter rise. (2) Before making any adaptations though to protect vulnerable populations, more must be done to actually understand the communities that need to be helped. Adaptations must be made on a case by case basis, requiring more research into the demographics of affected people and their concerns. In order to further such research, I set out with this project to understand how people at Marin Academy are affected by sea level rise. I simplified my question for a 2-year research project, which was how does sea level rise effect residents of Marin County. Through this science symposium I intended to test out my methods for my 2-year study, as well as provide meaningful results that the school can use, especially around transportation concerns.

Methods

I created a survey, which targeted Marin Academy teachers/faculty, students, and parents members as the intended participants. No participants emails or names were collected, as I predicted anonymizing the results would increase confidence of participants to complete the survey. Wanting a short survey, I created a 20 question multiple choice survey, which took between one to two minutes to complete. The survey was broken down into two section, a demographics section (11 questions) and a concerns section (9 questions). The demographics section asked the participants for non-subjective information. Questions in this section were designed to collect information on participants housing, employment, economic, ethnicity, mode of transportation to school, and if they had been impacted by flooding while commuting to or from Marin Academy’s campus. Many of the demographic questions were adapted from US Census Bureau questions (particularly questions on economic status, and ethnicity). The second section of the survey asked participants questions regarding their concern on certain impacts of sea level rise (impacts over certain time periods, economic status, use of open space, transportation, health, and daily life). I chose to ask questions about the impacts of sea level rise that have been most prevalent in the scientific and policy making communities. Using reports like the 2017 Marin County Sea Level Rise Vulnerability Assessment, I tried to replicate topics and language used in reports like these to measure the most relevant information to Marin County and the Bay Area in my survey.

Results

Using reports like the 2017 Marin County Sea Level Rise Vulnerability Assessment to generate questions that use the current non-subjective information. Questions in this section were designed to bring in a variety of fields of knowledge and language to help those not familiar with the science behind sea level rise. The survey was broken down into two sections, a demographics section (11 questions) and a concerns section (9 questions). The demographics section asked the participants for non-subjective information. Questions in this section were designed to collect information on participants housing, employment, economic, ethnicity, mode of transportation to school, and if they had been impacted by flooding while commuting or not from Marin Academy’s campus. Many of the demographic questions were adapted from US Census Bureau questions (particularly questions on economic status, and ethnicity). The second section of the survey asked participants questions regarding their concern on certain impacts of sea level rise (impacts over certain time periods, economic status, use of open space, transportation, health, and daily life). I chose to ask questions about the impacts of sea level rise that have been most prevalent in the scientific and policy making communities. Using reports like the 2017 Marin County Sea Level Rise Vulnerability Assessment, I tried to replicate topics and language used in reports like these to measure the most relevant information to Marin County and the Bay Area in my survey.

Discussion

In Figure #1 indicate that people walking/biking, carpooling, following by people driving themselves to Marin Academy were most affected by flooding while commuting. 66.67% of bikers/walkers were affected at least once, and 71.11% said that flooding has been a continual disruption to their commutes. 65.00% of carpoolers were impacted at least once and 10% also said flooding was continually disruptive. Lastly, 59.99% people who drove themselves were affected at least once and 16.67% more than once / continually disrupted by flooding while commuting. This data from Figure #1 suggests that Marin Academy should distribute more attention to other modes of transportation, not just the bus, while reassessing transportation. An overwhelming 87.5% of bus riders indicated that they had never been impacted by flooding while commuting. Bus riders in Figure #2 expressed little concern in the survey for the concern that sea level rise will ever impacted regular transportation (only 25% said they were concerned), whereas an average of 69.38% of all bikers/walkers, self-drivers, carpoolers, and people who were driven by a parent/friend said they concerned. Figure #2 reinforces the significance of Figure #1, that MA needs to greatly broaden the its assessment of transportation beyond addressing the inefficient bus system to include community members whose commutes are impacted by flooding and will continue as sea level rise makes coastal flooding more frequent. Figure #3 shows participants living in specific areas who answered (no, yes, more than once, and continual) to if they had ever been impacted by flooding while commuting. This figure suggests that Marin Academy members commuting from San Francisco, South Marin, Sonoma are most impacted by flooding while commuting to MA. However there were only 3 people who said they lived in Sonoma County. Despite all 3 said flooding was a continual disruption to their commute, there is too little data to accurately represent this data point and it will be esulated from the discussion. 75% of people who commuted from San Francisco were impacted by flooding at least once, 37.5% of them said that they had been impacted continually by flooding. Likewise, 62.5% of survey participants from South Marin were impacted by flooding at least once, 25% continually. The data in Figure #3 tells us that a greater focus on addressing delays and obstacles MA students, parents, or faculty & staff face commuting from San Francisco and South Marin (Sausalito, Mill Valley, Belvedere, or Tiburon). Figure #4 shows which mode of transportation was most common for people living in different areas. The school were to address concerns of MA members in Southern Marin and SF it may want to look into carpooling students, as carpooling was the main mode of transportation in both Southern Marin and San Francisco. Figure #4 shows that 50% of survey participants from San Francisco carpool to school and 56.25% from Southern Marin. Sonoma county’s participants trend of having a high amount of participants impacted by flooding (100%) and a high amount carpooling to school (66.67%). Despite a small sample size for Sonoma, the school may want to still consider the carpooling situation in Sonoma, addition to South Marin and San Francisco. Perhaps no tandies for carpools?

Works Cited:
3) Ibid

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