Environmental Justice Impacts of Rising Sea Levels in the San Francisco Bay Area

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Abstract With average temperatures expected to continue climbing due to global warming, sea levels are also expected to rise. This will lead to inundation in low-lying coastal regions, accelerated erosion on the coasts, higher flood levels, and increased intensity and frequency of extreme storm events. Recent research estimates mean sea levels to increase 0.5 to 1.4 meters by 2100, dramatically altering coastlines worldwide. The San Francisco Bay Area is a highly developed, urban region with a large and diverse population. No research has yet been done to determine the impacts of rising sea levels on this population at the local level. The purpose of this research was to determine if rising sea levels will create any environmental justice concerns by disproportionately impacting minorities and people of lower income. Using GIS, I overlaid Census 2000 data with digital models predicting a one meter increase in mean sea level. Seven of nine counties and 37 of 70 cities demonstrated higher proportions of minorities in impacted regions, significant at a 95% level. Seven cities also demonstrated a population with a lower income in areas predicted to be impacted by inundation. The results of this research should be used by law and policymakers to prepare for future scenarios and prevent any potential injustices.

Introduction

Rising sea levels pose a potential crisis for the world population in the coming century. Inundation of low-lying coastal areas, acceleration of erosion, elevated flood levels, and increases in frequency and intensity of storm events are some of the expected consequences of an increase in sea levels. Average sea levels increased globally during the twentieth century, rising at an average rate of 0.18 cm per year from 1961 to 2003 (IPCC 2008). Global temperatures also experienced an increase over the last few decades, with 11 of the 12 warmest years on record occurring since 1994 (IPCC 2008). The Intergovernmental Panel on Climate Change (IPCC) predicts an increase in global average temperatures ranging from 1.8 and 4.0°C by the year 2100. Additionally, there is strong reason to believe that this trend of rising sea levels will continue throughout the twenty-first century. As temperatures increase, ice melts at the poles and adds more water to the oceans, causing water levels to rise. Recent research demonstrates that there is a high correlation between the rate of sea level rise and temperature (Rahmstorf 2007). When this correlation is applied to IPCC temperature scenarios, the study estimated a 50 to 140 cm increase in sea levels by the end of the century (Rahmstorf 2007). This estimate gives a rough idea of the potential influence climate change will have on sea levels in the coming century.

This amount of sea level rise would have a catastrophic impact on low-lying, coastal areas. Globally, coastlines would be completely transformed from their present state. Many coastal ecosystems such as wetlands and mangrove forests would likely be damaged or lost due to increasing sea levels (Nicholls 1999). Furthermore, coasts will be affected by increasing rates of erosion and coastal and river floodplains will be inundated (IPCC 2008). There has been much research done into predicting how and where rising sea levels will affect the landscape; however, it is also important to consider who will be impacted by these changes.

The effects of climate change, such as rising sea levels, will dramatically influence the landscape and the global population. It is expected that developing countries will suffer more from global climate change than developed countries (IPCC 2008, Hoerner 2008). Rising temperatures are expected to be accompanied by an increase in heat related deaths, malnutrition, and infectious diseases. These problems are experienced universally, but are more closely related to developing countries. Also, many small island nations, mostly undeveloped, are at risk to rising sea levels and some, such as the Polynesian nation of Tuvalu, are in danger of disappearing. Finally, people in developing countries will be less prepared for the health and environmental risks associated with climate change. These are examples of environmental inequalities on a global scale, making it clear that the changing climate will disproportionately impact some people more than others.

Inequalities will also occur at smaller geographic scales, including in developed countries. Coastal regions at risk to flooding and erosion include residential areas, industrial and commercial zones, and ports, creating not only health and safety problems, but also economic concerns. Any structures in these regions will most certainly suffer damages or destruction. Within these regions disturbed by rising sea levels, certain groups of people are expected to suffer greater than others, especially poor communities (IPCC 2008). People in poor communities are less able to react quickly or prepare for natural disasters and are thus more likely to suffer greatly (Page 2007). In order to make policies to avoid these types of injustices, one must examine the possible impacts on a local or regional scale (Ikeme 2003). Global or country level analysis is inadequate because it is too broad to suitably deal with the diversity of individual populations. Analysis on smaller geographic levels would more accurately account for such range in diversity.

Despite the importance, little research has been done to examine the potential for climate change-related environmental justice issues at local levels. According to the United States Environmental Protection Agency (US EPA), "Environmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies," (US EPA 2009). The case of Hurricane Katrina illustrates the necessity of researching environmental inequality issues in developed countries. Prior to the hurricane, certain areas of New Orleans were built below sea level, putting them at a high risk of flooding, especially considering their location behind levees. As a result of city planning and de-facto residential segregation, these neighborhoods contained a large number of minorities, especially African Americans, and people of low-income (Elliot 2006). When the hurricane hit and the levees failed, the greatest suffering was experienced by these groups. Due to circumstances outside of their control, these people were in a disproportionately vulnerable position. In order to prevent such injustices from being repeated, research must be done to not only predict what disasters are possible, but who will be affected by them. Once research has been done, city planners and policy makers can make more educated and fair decisions. This early prediction approach must be taken with climate change, considering the possibility for large scale catastrophes. Inundation caused by rising sea levels could have a similar impact on a community, perhaps affecting some socioeconomic groups more than others.

Recently Pacific Institute research was published analyzing the impacts of sea level rise on the California coast (Cooley 2009). This extensive research examines the populations and infrastructure that will be adversely impacted by rising sea levels and also estimates the costs of protecting and maintaining the coasts. The analysis of population focused on race and income, with counties being the minimum geographic unit. The results showed that there is a potential for environmental justice issues, especially in the San Francisco Bay Area. However, the researchers suggest further analysis at smaller spatial scales, such as within cities, in order to create more specific results.

The question my research seeks to answer is, will inundation due to rising sea levels create any environmental justice issues for cities within the Bay Area? The Bay Area is a highly developed, urbanized region with diverse populations and has roughly one thousand miles of coastline at risk to rising sea levels, making it an interesting study subject (Cooley 2009). The results of the project will help determine not only who is at risk, but whether or not measures need to be taken to prevent injustices like those of Hurricane Katrina. I had two hypotheses for this project. First, I hypothesized that minorities and communities of color will be negatively affected by flooding more than whites. Second, I hypothesized that persons of lower incomes will be more affected than the affluent. I created these hypotheses for three reasons. First, oftentimes poor and minority communities are more at risk to natural disasters than the affluent, as described previously. Secondly, race and income are two strong factors in determining the residential organization of a population (Blenda 1979, Iceland 2006). This means that these will be driving forces in a spatial analysis. Finally, the affluent tend to live in the hills and farther away from the water, whereas poorer regions are often near the coasts, where they are more susceptible to inundation (Miller 1990).

In order to test these hypotheses, I used GIS to examine the demographic characteristics of regions impacted by flooding and then compare those with unaffected areas. One major assumption that I made is that there will be no change in the trends of the population over the next century. This is unlikely, considering populations are fluid and shift constantly. However, it is impossible to precisely predict these demographic shifts, and therefore the most current data must be used in this research. Thus, the results of this project will not predict the precise effects of sea level rise and the populations impacted. Instead, it will suggest the possible outcome of sea level rise if the population remains static or if action is not taken. Ultimately, despite the limiting factors of the research, it is very important to get a sense of who will be affected by the consequences of rising sea levels. Doing so will help policy and lawmakers make more educated decisions in future planning.

Methods

The objective of my research is to determine what socioeconomic groups are most at risk to inundation from rising sea levels. This required the acquisition of two types of data: spatial demographic data and spatial models of predicted inundation. These two datasets were overlaid and examined using geographic information systems techniques I will describe later. I focused my research on the San Francisco Bay Area, specifically within San Francisco, Marin, Sonoma, Napa, Solano, Contra Costa, Alameda, Santa Clara, and San Mateo counties. This is an ideal location due to the region's extensive coastline, urban setting, and diverse populations.

Figure 1: San Francisco Bay Area with areas inundated by a 1 meter increase in sea level rise in dark blue.

To perform this research, I analyzed all cities, designated by the U.S. Census, within these nine counties that contained populations that would be impacted by sea level rise. Analysis was performed at multiple levels: first at the regional level, next at the county level, and finally at the city level. This allowed me to answer questions on the broader level for the population of the entire region, and also to perform more in-depth analysis on smaller populations at the local level.

Demographic data was acquired online from the United States Census Bureau from the 2000 Census, the most recent data available. Based on my hypotheses, I mainly focused my study on two types of demographic data: racial data and economic data. I used city block data for the racial analysis and block group data for the income analysis; block groups are a collection of neighboring blocks, containing populations of roughly equal size. These were the best resolutions available for each type of data. The racial data was collected as counts and analyzed as proportions of the total population. Specifically, I examined the proportion of whites in affected areas versus unaffected areas; this was to directly address my first hypothesis that minorities and communities of color will be more impacted than whites. Median household income (MHI) was the main economic data analyzed. By taking the mean of the MHI over affected block groups and comparing it to that of the entire population, I could address my second hypothesis. The models predicting the effects of rising sea levels, as seen in Figure 1, were obtained from the San Francisco Bay Conservation and Development Commission (SFBCDC). These demonstrate where inundation from a one meter increase in sea level rise would occur. Predictions for a one meter increase in sea levels were used because this is a rough estimate for the change to be expected by the end of the century (Rahmstorf 2007). There are many sea level rise estimates available; however, I was informed that Rahmstorf's models are considered the best predictions presently. My mentors, Tim Doherty and Leslie Lacko, are spatial analysts at the SFBCDC and agreed to allow me to use these models for my research.

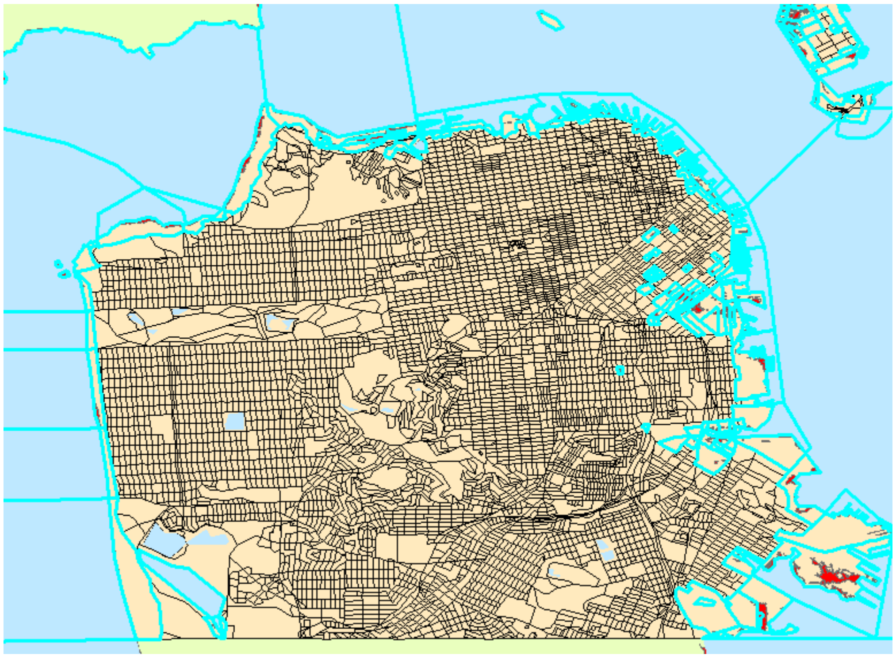

Figure 2: Example of spatial analysis. San Francisco block data overlaid with sea level rise prediction in red. Inundation predictions are in red. All blocks that intersect these predictions are outlined in light blue. These blocks were analyzed as impacted areas.

I used ArcGIS to organize and assist in analysis of the data (ArcGIS 9.3, ESRI, Redlands, CA, USA). For each city being analyzed, I input the census data and then overlaid it with the inundation hazard maps. Using the 'select by location' tool in ArcMap, I selected all blocks that intersect with the area predicted to be affected by flooding (Figure 2). All blocks that intersected one of these areas was determined an impacted area, even if only part of the block is affected. Although the resolution of block and block group data is the best available for each dataset, it is not perfect, thus limiting my results. Once the affected area was selected, I could determine the socioeconomic information for this region. I then repeated this procedure for the unaffected area, and once I had the socioeconomic data for this region, I compared the demographics of the impacted area with the unaffected area. For the racial analysis, I performed a two proportion test of significance, comparing the percentages of the white populations for the two regions. In comparing the white population proportion, I defined all others to be considered a minority race (although whites are not always the majority in the region, I followed this definition to properly address my hypothesis). Therefore, a decrease in the white proportion corresponds to an increase in the minority proportion. If I were to find that the percent white is lower for impacted areas at a significant level (p less than 0.05) I could determine that minorities will be more affected than whites, confirming my first hypothesis. I also examined individual races to determine if one race is significantly more at risk. For the economic data, I found the mean of the MHI for the impacted block groups. Using a z-test for population means, I could determine if there are any differences in MHI. If I were to find that the mean is lower in impacted areas at a significant level (p less than 0.05), I could conclude that people of lower income will be more affected by rising sea levels, confirming my second hypothesis.

Results

Roughly 331,315 Bay Area residents live in areas at risk to flooding from a one meter increase in sea levels. I found that 56% of the impacted population was white, compared to 58% of the population living in unaffected areas, a difference which is significant at the 95% level ($p<0.0001$). I also found that the percentages of African-Americans and Hispanics were slightly lower in impacted areas compared to unaffected areas, 7% and 18% to 8% and 19%, respectively. For the entire region, I found that Asian-Americans were impacted the most by inundation, consisting of 21% of the area impacted by flooding against 19% of the unaffected population ($p<0.0001$). Analysis of income did not produce statistically significant results at the regional level, but the MHI of the impacted population was roughly $3,000 less than that of the total population.

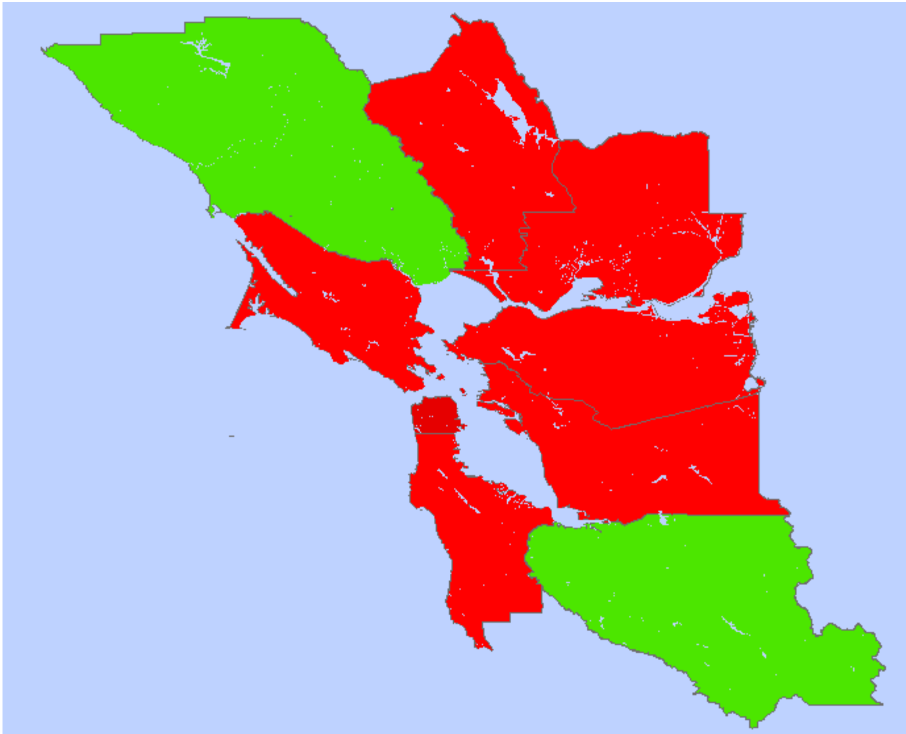

Figure 3: Results from racial analysis of counties. Green counties demonstrated a higher percentage of whites in impacted areas and red counties demonstrated a lower percentage of whites in impacted areas.

Of the nine counties in the Bay Area, San Mateo (116,603), Alameda (77,249), and Marin (69,078) counties had the largest populations affected by inundation. I found a lower proportion of whites in impacted regions for seven of the counties. Only in Santa Clara and Sonoma counties were the percentages of whites higher in inundated areas. For all counties except Sonoma, the analysis produced significant results ($p<0.05$). Notably, Contra Costa County demonstrated a significantly lower percentage of whites in affected areas (50%) than in unaffected areas (66%). Solano County also displayed a noticeably significant difference between those living in inundated regions and those not, with whites making up 57% of the unaffected population compared to 46% of the impacted population. In San Francisco County, 8% of the unaffected population is African-American compared to 25% of the affected population. Also, in Alameda County, 20% of the unaffected population is Asian against 37% of the population in impacted areas. Analysis of income again revealed no statistically significant results, but six of the nine counties (all except Napa, San Francisco, and Santa Clara) demonstrated lower mean MHI's in impacted regions.

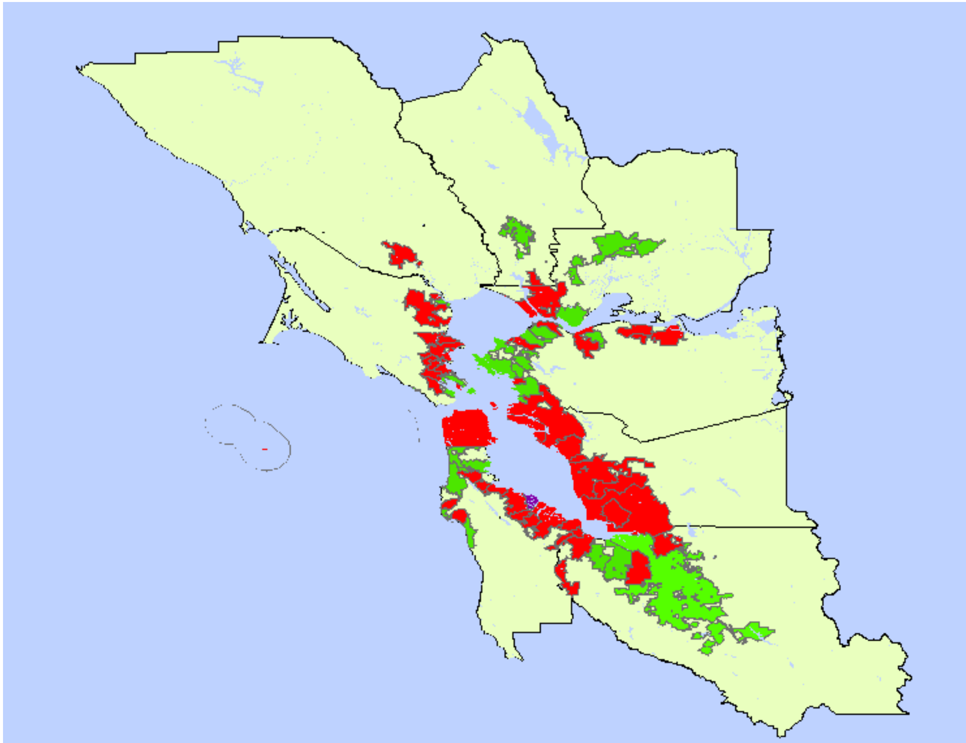

Figure 4: Results from racial analysis of cities. Green cities demonstrated a higher percentage of whites in impacted areas and red cities demonstrated a lower percentage of whites in impacted areas. Foster City is in purple.

I found that 70 cities within the nine Bay Area counties contained populations that would be impacted by a one meter increase in sea level rise. San Mateo (42,436), Foster City (29,518), Alameda (26,459), and Union City (24,500) had the largest number of citizens affected. In fact, the entire population of Foster City is at risk to inundation. Forty-two of these cities demonstrated a lower proportion of whites in affected areas than in unaffected areas. Of those 42 cities, 37 returned statistically significant results in the racial analysis. Some cities showed noticeable differences between the impacted population and the unaffected population. Thirty-seven percent of the impacted population is white in Menlo Park compared to 73% white in unaffected areas of the same city. Meanwhile, 50% of the affected population is Hispanic or Latino against 16% in the unaffected areas. Emeryville seems to show the most differences between the affected and unaffected regions; in the affected region, 57% of the population is white, 6% is African-American, and 32% is Asian, but in the unaffected region, 34% is white, 37% is African-American, and 17% is Asian, all noticeable disparities. The income analysis provided seven results significant at the 95% level. Belmont, Berkeley, Crockett, Hercules, Martinez, South San Francisco, and Sunnyvale demonstrated significantly lower mean MHI's in impacted regions than in unaffected regions. For example, the mean MHI for impacted block groups in Belmont is nearly $20,000 less than that of the unaffected block groups. Additionally, a total of 45 of the 70 cities analyzed displayed a lower mean MHI in impacted areas than in unaffected areas. For more detailed results, please refer to the appendix.

Discussion

My research shows that within the San Francisco Bay Area, rising sea levels are a major environmental justice concern. In seven of nine counties and 37 of 70 cities, minorities and communities of color are disproportionately impacted by rising sea levels. Although the differences between the populations are generally rather small, sometimes within two percent of the total population, the analysis shows that these differences would be highly unlikely if the population were distributed evenly. Also, seven of 70 cities demonstrated significantly lower MHI's in impacted regions. Although few results were statistically significant, there is a general trend (six of nine counties and 42 of 70 cities) showing that people living in areas where flooding is expected have a lower income than the population average. These results confirm my two hypotheses that minorities will be adversely impacted more than whites and that the income of those affected will be lower than those who are not directly impacted. The research clearly demonstrates that there are general inequalities at both the county and city scale.

Recent research by the Pacific Institute (PI) in Oakland, CA (Cooley 2009) supports my findings. Although this research used slightly different methods to examine the impacts of future flood levels, the results are relatively close. Where my research predicts roughly 330,000 people to be directly affected, PI estimates roughly 220,000 people impacted by a one meter increase in mean sea levels. Due to limitations mentioned previously, my methods are slightly more conservative those of this project, which accounts for the difference in numbers. Both projects also found racial inequalities in impacted areas of seven of the nine Bay Area counties and estimates for the number of people affected being relatively close, with my predictions again being slightly more conservative than those of PI. However, the PI project spanned the entire state of California, with counties being the smallest geographic unit examined. I continued this research to the city level to determine environmental justice concerns at the local level. This further analysis demonstrated where specifically at risk populations currently live.

The racial and economic differences between inundated areas and unaffected areas demonstrate that there is some segregation in the Bay Area. This is not uncommon, as race and income are two shared factors in residential organization (Blenda 1979, Iceland 2007, Miller 1990). However, it is important to question what makes these low-lying coastal communities different from the others. There are a few explanatory factors that contribute to these differences, namely real estate value. Some coastal regions sit on bayfill, thus lowering their values. Many other coastal regions in the area are highly industrialized; this marginalizes the land for residential use and therefore it does not hold high property values (Miller 1990). However, this is not always the case. Historically in the Bay Area, land at higher elevations with spanning views of the region hold the highest values. Many coastal regions, such as those in Marin, San Francisco, and San Mateo Counties have high values for their views of the Pacific Ocean. This could explain why people affected by flooding in San Francisco and San Mateo Counties had a higher average income than those unaffected, thus making property value a confounding factor as well as an explanatory one.

Vulnerability is another important topic when discussing this field. The IPCC defines vulnerability to climate change as, “the degree to which these systems are susceptible to, and unable to cope with, adverse impacts,” (Schneider 2007). For example, those who do not own a car, are unable to buy insurance, or speak English are more vulnerable in the event of a disaster (Cooley 2009). Additionally, people of lower income and minorities are often highly vulnerable due to these inherent traits. Furthermore, the MHI of an African-American or Latino household was $15,000 less than white households in California (Census 2000). This demonstrates that not only are minority and lower income populations disproportionately at risk, but also these communities are likely to be highly vulnerable to disasters.

Although the impacts of Hurricane Katrina occurred on a much shorter temporal scale, it serves as an interesting case study for this type of disaster. Not only were those at risk to flooding mostly minorities and people of low income, they were also extremely vulnerable. Among many other things, ownership of a car played a factor in the injustices associated with Hurricane Katrina. Roughly 55% of those who did not evacuate before the disaster did not have a car or other mode of transportation (Brodie 2006). Today, roughly 8,000 households in the San Francisco Bay Area do not have a vehicle (Cooley 2009). In order to prevent such injustices from repeating themselves, it is important that actions are taken to provide equal protection for all. This project and other recent research provide geospatial knowledge demonstrating what populations are currently at risk. This knowledge will certainly assist policymakers and lawmakers in their decisions concerning how to react to rising sea levels and a changing climate. This research could also be used as a regulation tool in the planning process to determine if protection will be equally distributed or if affluent communities receive preferential treatment over low-income or minority communities, thus creating an environmental justice issue. Further examination and research should be performed examining the approaches taken by city and regional governments to protect these at risk populations. Also, research should be done to determine where evacuees could relocate once sea levels reach this point; this would help researchers and policymakers better understand the population at risk.

In summary, this study has concluded that there are significant racial and economic differences between the population that lives in areas at risk to inundation and the rest of the population within the Bay Area. However, this region is not the only one that will be affected by rising sea levels; millions of people worldwide are at risk to inundation from sea level rise. As the results demonstrate, an analysis at large geographic scales can not properly explain the effects of inundation on the populations of individual cities. This project sets the framework for future research to be performed in other regions, preparing cities and local governments for the changes that will come along with sea level rise. Doing so will increase knowledge and awareness, not only amongst city planners and policy makers, but also with the public, potentially preventing any social injustices that would result from inundation due to sea level rise.

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Appendix

Table 1: Data for racial analysis at block level. Results comparing percentage of whites in affected and unaffected regions.

County Name	City Name	Population Affected	% Affected White	% Unaffected White	P-value
Alameda		**77,249**	**41%**	**49%**	**<0.0001**
	Alameda	26,459	55%	58%	<0.0001
	Albany	2,287	46%	64%	<0.0001
	Berkeley	57	67%	59%	0.1190
	Emeryville	2,497	57%	34%	<0.0001
	Fremont	890	29%	47%	<0.0001
	Hayward	5,457	42%	44%	0.0044
	Newark	2,724	49%	52%	0.0002
	Oakland	6,762	39%	32%	<0.0001
	San Leandro	7,535	45%	50%	<0.0001
	San Lorenzo	2,188	57%	61%	<0.0001
	Union City	24,500	22%	36%	<0.0001
Contra Costa		**13,319**	**50%**	**66%**	**<0.0001**
	Bay Point	414	40%	47%	0.0032
	Bayview-Montalvin	656	44%	44%	0.4840
	Crockett	833	39%	79%	<0.0001
	El Cerrito	24	67%	57%	0.1736
	Hercules	951	41%	32%	<0.0001
	Martinez	328	80%	81%	0.2709
	Pacheco	313	94%	81%	<0.0001
	Pinole	1,237	50%	54%	0.0030
	Pittsburg	2,912	42%	44%	0.0075
	Port Costa	71	94%	90%	0.1190
	Richmond	4,051	50%	33%	<0.0001
	Rodeo	1,796	51%	48%	0.0294
	Vine Hill	1,149	77%	77%	0.4960
Marin		**69,078**	**77%**	**87%**	**<0.0001**
	Belvedere	1,576	97%	98%	0.0838
	Black Point-Green Point	1,259	92%	87%	0.0005
	Corte Madera	5,829	85%	90%	<0.0001
	Kentfield	2,463	92%	93%	0.0102
	Larkspur	4,365	90%	93%	<0.0001
	Mill Valley	3,756	85%	93%	<0.0001
	Muir Beach	206	93%	90%	0.1762
	Novato	13,213	81%	84%	<0.0001
	Ross	178	83%	92%	<0.0001
	San Rafael	24,249	64%	86%	<0.0001
	Santa Venetia	3,021	77%	85%	<0.0001
	Sausalito	1,121	92%	86%	<0.0001
	Strawberry	1,461	87%	85%	0.0436
	Tamalpais-Homestead Valley	5,370	76%	88%	<0.0001
	Tiburon	3,884	91%	90%	0.0048

Napa		**1,226**	**76%**	**80%**	**<0.0001**
	American Canyon	2	0%	60%	0.0427
	Napa	124	81%	80%	0.4522
San Francisco		**5,514**	**47%**	**50%**	**<0.0001**
	San Francisco	5,514	47%	50%	<0.0001
San Mateo		**116,603**	**56%**	**60%**	**<0.0001**
	Belmont	3,902	64%	76%	<0.0001
	Burlingame	1,913	67%	77%	<0.0001
	Daly City	841	30%	26%	0.0102
	East Palo Alto	9,917	24%	30%	<0.0001
	El Granada	361	65%	85%	<0.0001
	Foster City	29,518	59%	X	X
	Half Moon Bay	322	92%	77%	<0.0001
	Menlo Park	6,598	37%	73%	<0.0001
	Millbrae	2,432	60%	63%	0.0012
	Montara	32	78%	89%	0.0192
	Moss Beach	253	91%	89%	0.1922
	Pacifica	1,768	82%	65%	<0.0001
	Redwood City	19,826	59%	74%	<0.0001
	San Bruno	2,251	43%	58%	<0.0001
	San Carlos	1,631	78%	84%	<0.0001
	San Mateo	42,436	60%	71%	<0.0001
	South San Francisco	542	51%	43%	<0.0002
Santa Clara		**36,436**	**55%**	**54%**	**<0.0001**
	Milpitas	5,243	27%	32%	<0.0001
	Mountain View	1,069	69%	63%	<0.0002
	Palo Alto	11,750	69%	78%	<0.0001
	San Jose	8,842	49%	48%	0.1210
	Santa Clara	7,807	43%	56%	<0.0001
	Sunnyvale	5,793	71%	52%	<0.0001
Solano		**11,255**	**46%**	**57%**	**<0.0001**
	Benicia	1,768	88%	78%	<0.0001
	Fairfield	45	98%	57%	<0.0001
	Suisun City	1,263	46%	45%	0.3446
	Vallejo	7,887	36%	36%	0.1660
Sonoma		**635**	**84%**	**82%**	**0.0643**
	Petaluma	193	84%	85%	0.4960
Total		**331,315**	**56%**	**58%**	**<0.0001**

Table 2: Data for income analysis at block group level. Results comparing the mean MHI of affected population to mean MHI for entire population. P-values recorded as 'x' could not be calculated due to insufficient sample size (i.e. only 1 block group affected).

County Name	City Name	Affected mean MHI	Population mean MHI	P-value
Alameda		**$55,084.27**	**$58,545.76**	**0.4483**
	Alameda	$59,617.14	$56,752.75	0.4602
	Albany	$44,630.00	$57,810.93	0.1788
	Berkeley	$38,857.00	$55,897.85	0.0006
	Emeryville	$50,159.00	$44,719.00	x
	Fremont	$73,788.50	$80,096.24	0.3821
	Hayward	$56,229.20	$56,839.82	0.4801
	Newark	$71,742.20	$67,186.28	0.2546
	Oakland	$32,411.03	$44,422.06	0.2643
	San Leandro	$61,482.25	$54,518.62	0.3483
	San Lorenzo	$60,376.00	$57,708.18	0.1093
	Union City	$77,819.40	$70,771.19	0.3594
Contra Costa		**$45,430.13**	**$66,711.39**	**0.0869**
	Bay Point	$43,668.33	$49,636.36	0.2611
	Bayview-Montalvin	$52,883.50	$55,464.00	0.4090
	Crockett	$34,926.00	$49,188.00	0.0008
	El Cerrito	$39,545.00	$61,424.33	x
	Hercules	$57,884.50	$73,723.06	0.0150
	Martinez	$41,592.00	$67,561.50	0.0035
	Pacheco	$45,077.00	$49,543.00	0.3859
	Pinole	$60,116.25	$63,926.06	0.2546
	Pittsburg	$49,354.75	$49,610.33	0.4920
	Port Costa	$67,708.00	$67,708.00	x
	Richmond	$38,890.50	$43,222.32	0.4052
	Rodeo	$52,579.75	$60,339.33	0.3229
	Vine Hill	$51,015.75	$53,639.60	0.2005
Marin		**$77,355.04**	**$79,967.97**	**0.4681**
	Belvedere	$111,781.00	$100,230.00	0.3859
	Black Point-Green Point	$99,899.00	$99,899.00	x
	Corte Madera	$74,789.38	$80,282.70	0.3372
	Kentfield	$100,348.33	$116,286.89	0.0885
	Larkspur	$81,154.86	$92,716.83	0.3372
	Mill Valley	$79,626.75	$101,940.53	0.0838
	Muir Beach	$125,000.00	$125,000.00	x
	Novato	$65,830.91	$70,489.82	0.4168
	Ross	$104,232.00	$100,953.50	x
	San Rafael	$66,125.90	$69,239.20	0.4562
	Santa Venetia	$72,535.33	$72,535.33	0.5000
	Sausalito	$80,571.75	$81,290.43	0.4801
	Strawberry	$61,698.00	$81,539.75	0.0409
	Tamalpais-Homestead Valley	$98,294.67	$102,375.00	0.2981
	Tiburon	$101,319.00	$101,319.00	0.5000

Napa		**$63,256.20**	**$54,352.25**	**0.2946**
	American Canyon	$66,185.00	$56,887.00	x
	Napa	$68,998.50	$51,927.63	0.2327
San Francisco		**$65,021.28**	**$62,239.60**	**0.4681**
	San Francisco	$65,021.28	$62,239.60	0.4681
San Mateo		**$68,443.38**	**$80,542.32**	**0.3121**
	Belmont	$66,796.00	$86,612.71	<0.0001
	Burlingame	$69,834.38	$83,650.73	0.1814
	Daly City	$71,640.00	$64,853.02	0.3264
	East Palo Alto	$45,007.10	$47,382.00	0.4483
	El Granada	$83,615.00	$86,281.17	0.4443
	Foster City	$101,725.35	$96,073.94	0.3669
	Half Moon Bay	$73,128.33	$75,706.33	0.4207
	Menlo Park	$39,323.00	$100,747.90	0.0516
	Millbrae	$57,553.00	$71,762.56	0.0968
	Montara	$95,307.00	$98,716.00	x
	Moss Beach	$83,206.00	$93,501.75	x
	Pacifica	$69,593.17	$72,410.81	0.3974
	Redwood City	$62,859.00	$71,794.43	0.3897
	San Bruno	$57,407.40	$64,839.64	0.2810
	San Carlos	$77,264.00	$90,972.10	0.0968
	San Mateo	$63,252.35	$74,116.95	0.2061
	South San Francisco	$54,102.50	$61,071.66	0.0113
Santa Clara		**$87,322.89**	**$81,076.95**	**0.4207**
	Milpitas	$71,371.22	$86,710.14	0.0778
	Mountain View	$56,627.00	$76,615.59	0.1492
	Palo Alto	$102,896.09	$100,184.31	0.4681
	San Jose	$73,195.00	$73,721.11	0.4880
	Santa Clara	$80,298.00	$68,723.77	0.2643
	Sunnyvale	$60,680.83	$80,585.63	0.0001
Solano		**$48,792.21**	**$54,351.56**	**0.3897**
	Benicia	$57,485.14	$69,107.42	0.2296
	Fairfield	$65,743.00	$52,862.84	0.0901
	Suisun City	$38,185.50	$55,435.17	0.1685
	Vallejo	$44,504.09	$51,759.10	0.3594
Sonoma		**$51,522.80**	**$55,198.26**	**0.3936**
	Petaluma	$51,806.00	$51,759.10	0.5000
Total		**$64,082.92**	**$67,591.68**	**0.2514**