FLOOD RISK ANALYSIS OF ANCHORAGE ALASKA

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Introduction

The threat of climate change has long been an issue looming over the heads of the world. Since 1896, scientists like Arrhenius have hypothesized and modeled how the earth is gradually warming (NASA). With this increase in temperature, comes glacial retreat and the possibility of sea level rise, rising 8 inches over the past century and increasing (R.S. Nerem et al., 2015). This is particularly threatening to communities in high latitudes, closer to the poles where more glacial flow occurs. We modeled what sea level rise would look like for the Anchorage area of Alaska, United States and the threat that certain sea level rise conditions would pose to that particular community. The Anchorage area of Alaska in the United States is situated within Cook Inlet, a major port and bay for the state and for the country. This location has made Anchorage a prime location for determining the effects, damage, and population displacement caused by global sea level rise. Our model depicts the area of the city that would suffer water rises from 5 meter increases to up to 30 meters of additional water within Cook Inlet.

Methods

We were able to use elevation data from the USGS to determine low points in the city of Anchorage. (USGS.org) ArcGis Pro was used to create raster diagrams of 5, 10, 20, and 30 meter rise in elevation respectively. Additionally, data from the US Census Bureau was used to calculate the population density of Anchorage's city blocks (US Census Bureau). We divided the total population of the varying blocks by the total area and got the density per block. ArcGis Pro was again used to perform analysis on the data, and present it using a classified color gradient. Using geoprocessing tools, we were able to identify the percentage of the total population that would be affected by sea level rises. Then, using data from the National Oceanic and Atmospheric Association, we were able to calculate a per person cost of flooding. Using this number we calculated the total cost for each respective flooding event.

Data & Results

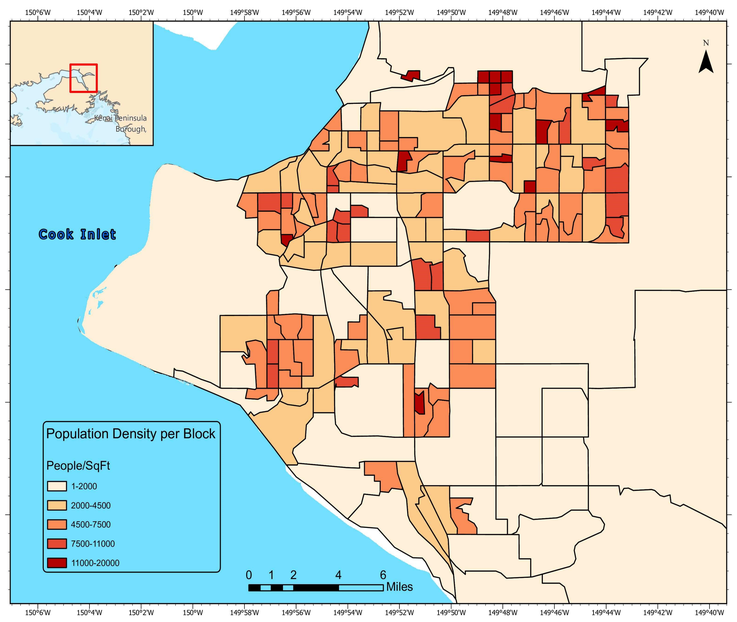

Fig 1.0: Population density map of Anchorage County

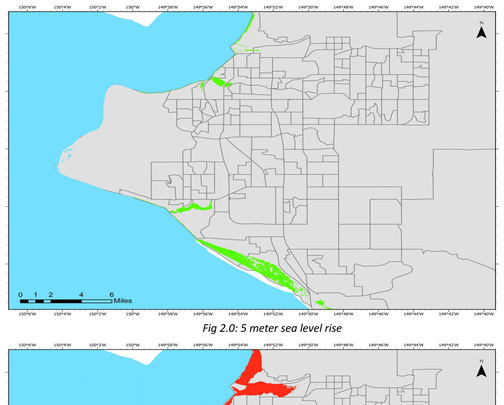

Fig 2.0: 5 meter sea level rise

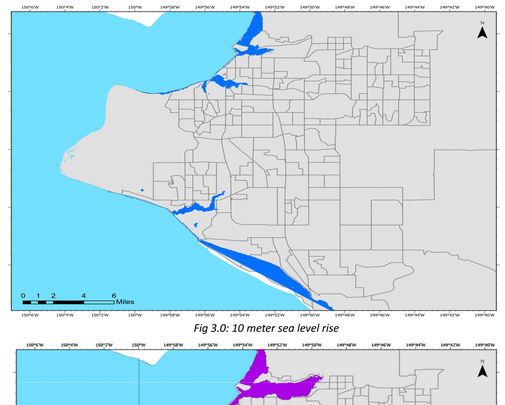

Fig 3.0: 10 meter sea level rise

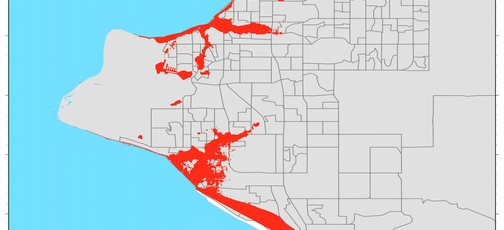

Fig 4.0: 20 meter sea level rise

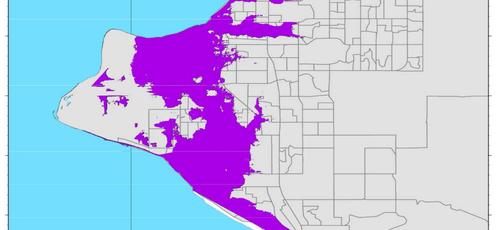

Fig 5.0: 30 meter sea level rise

Discussion

Using ArcGis Pro, we were able to calculate the affected population for each of the scenarios seen above. Using geoprocessing tools, we concluded that with a 5 meter rise in sea levels the number of individuals affected would be approximately 47,373 and the total damage cost would be around 7 million USD. With a 10 meter rise the numbers would be 55,059 and around 8 million. With a 20 meter rise the numbers would be 90,915 and around 14 million. With a 30 meter rise the numbers would be 132,071 and around 19 million. The maps show that the north-west and south-west blocks of Anchorage would be the most affected. While a 30 meter rise in sea level is unlikely, a tsunami that travels up Cook Inlet could bring about 5-10 meters of surge. Out of the total population of Anchorage County we found that a 5 meter rise would affected 16% of the population. A 10 meter rise would affect 18%. A 20 meter rise would affect 30%. And finally, a 30 meter rise would affect 47% of the total population.

Conclusions

In conclusion, this report has detailed the significant flooding risk faced by Anchorage, Alaska, due to a combination of factors including climate change, geographic location, and existing infrastructure vulnerabilities. The analysis of historical flood events and climate trends clearly indicates an increasing frequency and severity of flooding incidents in this region. It is evident that urgent action is required to mitigate the impact of flooding in Anchorage. This includes implementing adaptive measures such as improving stormwater management systems, enhancing floodplain regulations, and investing in infrastructure upgrades designed to withstand extreme weather events. Furthermore, community awareness and preparedness play a crucial role in minimizing the loss of life and property damage associated with flooding. Education campaigns and emergency response planning are essential components of a comprehensive strategy to address this pressing issue. In conclusion, addressing the flooding risk in Anchorage requires a multi-faceted approach that integrates scientific research, public policy, and community engagement. By taking proactive steps now, we can enhance the resilience of Anchorage and ensure a safer, more sustainable future for its residents.