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GSP 270

Sea Inundation within the Los Angeles County

Abstract

Sea level rise will not only effect coastal cities by inundating land under water, it also has the potential to increase the amount of heat which can be stored in the ocean. Potentially leading our planet to get warmer and drastically changing our weather patterns. This study was done to show the potential areas in the Los Angeles County that would be most affected by the increase of sea level rise. A digital elevation map (DEM) was utilized to create multiple parcels that replicated areas of inundation at different sea levels and to find the total area of different land usage effected by those inundations. Using the scenarios that were created by the Intergovernmental Panel on Climate Change (IPCC) and the National Research Council (NRC) for sea level rise, I discovered that Industrial and Governmental areas will primarily be impacted and Recreation land will be the least affected by the rise in sea level. This study shows the potential areas in the Los Angeles County that are more at risk by the increase of sea level rise. Unfortunately, this study does not provide must information what could be done to lessen the severity of the situation or provides a solution to this issue.

Introduction

Over the course of earth's history, the height of the ocean waters have continuously changed throughout the years due to the warming and cooling of our planet. But only in certain instances has the level of the ocean waters risen and fallen drastically, causing massive environmental and climate changes throughout our planet. Many scientists in the recent years have made observations stating that we are on track to melting away our global ice sheets resulting in sea level rise. The rise of sea level will not only affect coastal cities but will in fact, affect everyone and everything as a whole. We could be facing large displacement of human populations, increasing health issues and massive extinctions of many primary food sources. It is estimated that sea level has risen by 17 centimeters in the last hundred years and will rise by 3 millimeters (mm) a year. (1.)

In today's society, there seems to be a split between those who believe and those who do not believe in sea level rising. The goal of my project is to use actual scientific data to create a series of maps that represent future sea levels based on the simulations done by two reputable institutions; the IPCC and the NRC. The IPCC has created many scenarios forecasting what the sea levels might be ranging from the best to the worst possible outcome. For this study, I will be using their worst outcome the **RCP 8.5** scenario that results in the highest possible greenhouse emissions. This outcome predicts a large exponential growth in the human population with higher energy demands with little growth in energy efficiency (2.). The NRC simulations are based on the main concept of the **A1B** (3.) scenario created by the IPCC. This scenario predicts rapid growth in our population and economy following a rapid decline. It takes into account the usage of both fossil fuel and renewable energy were both are equally used. These projections will represent the level of sea rise that will occur over the course of 3 different time periods; 2030, 2050, and 2100. I will be looking into how these changes in sea levels will affect coastal cities, primarily in the Los Angeles County **(Figure 1.)** and the types of land that will be most affected by these changes.

Figure 1. Map show the location of the Los Angeles County within California.

Methods

This study was completed following the instructions from Lab 8 and 9 from the labs corresponding to this course. Data for the lab was obtained from multiple sources, the DEM for the Los Angeles County was obtained from the United States Geological Survey website and the numbers for the two scenarios were obtained from two different online articles. The data was organized and extracted into a standard structure work folder and uploaded to ArcMap program. ArcMap was used to simulate six different models (three and three for each) depicting the sea level rise in 2030, 2050, and 2100. After obtaining the models of sea level inundation, I proceeded to use the parcel for the Los Angeles County obtained from the County of Los Angeles Open Data website. The county parcel was first converted from a polygon data set to a raster data set to depict the different land sites within the county. Both maps of the Sea Level inundation and the Land Use Raster were "multiplied" together to obtain a map that represented

the total area of inundation in hectares of each Land Use. The Final map then was reclassified to depict the areas within the Los Angeles County at risk for inundation.

Results

The results of the study show that areas closer to the ocean will see a higher level of inundation. Places like harbors and river cannels that connect to the ocean will experience a more noticeable change since they are lower in elevation. This can be seen in the following maps **(Figure 2.-6.)** which represent the scenarios created by the IPCC and the NRC. The six maps focus on areas that I saw to be most threatened by the sea level rise. There are two chart **(Table 1.)** is provided just below that maps that show how much area (hectares) of each land use is inundated in by water for every scenario.

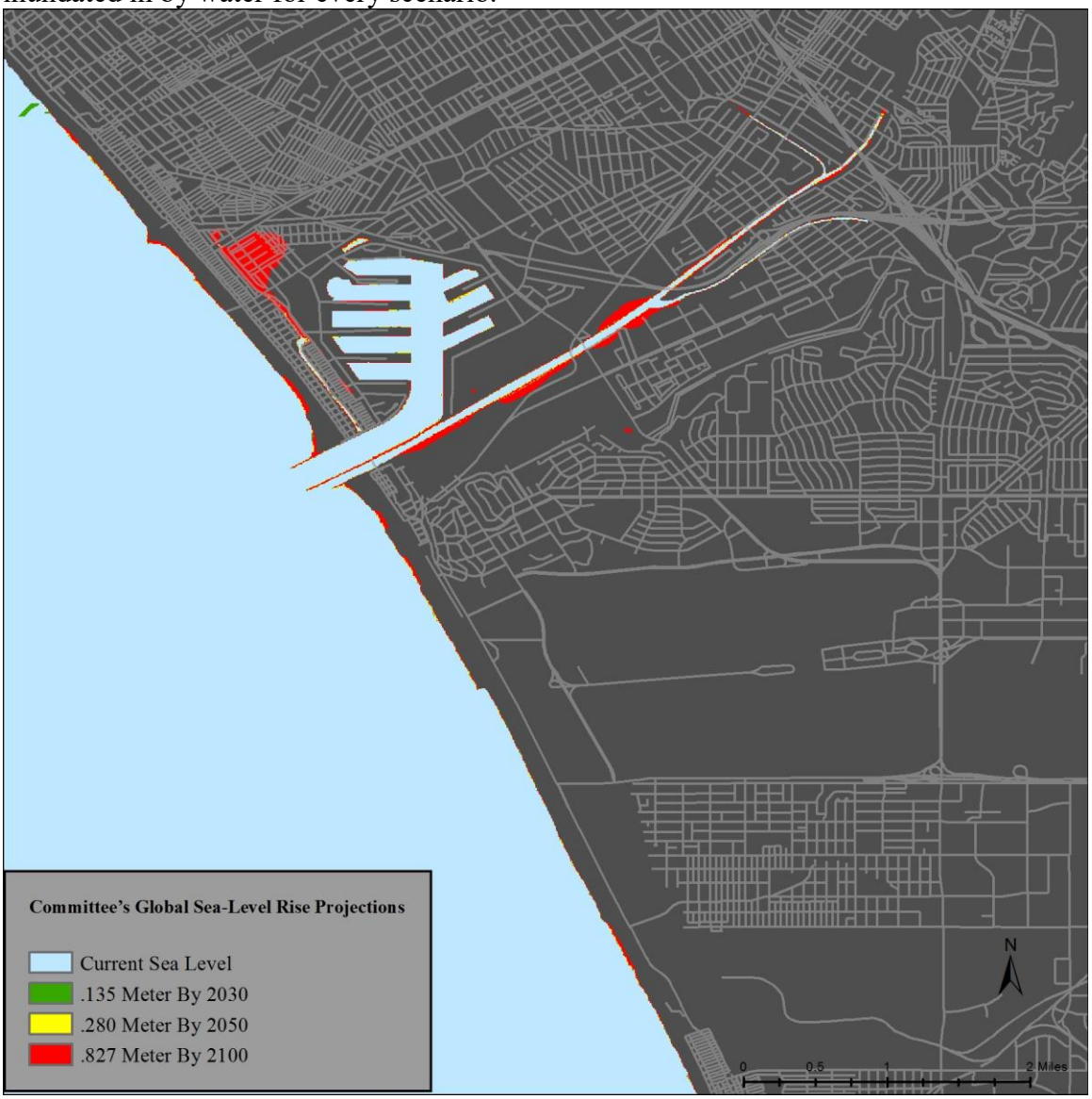

Figure 2. This map shows the projections of the NRC of the different levels of inundation around the Marina Del Rey area within the L.A county for three different years.

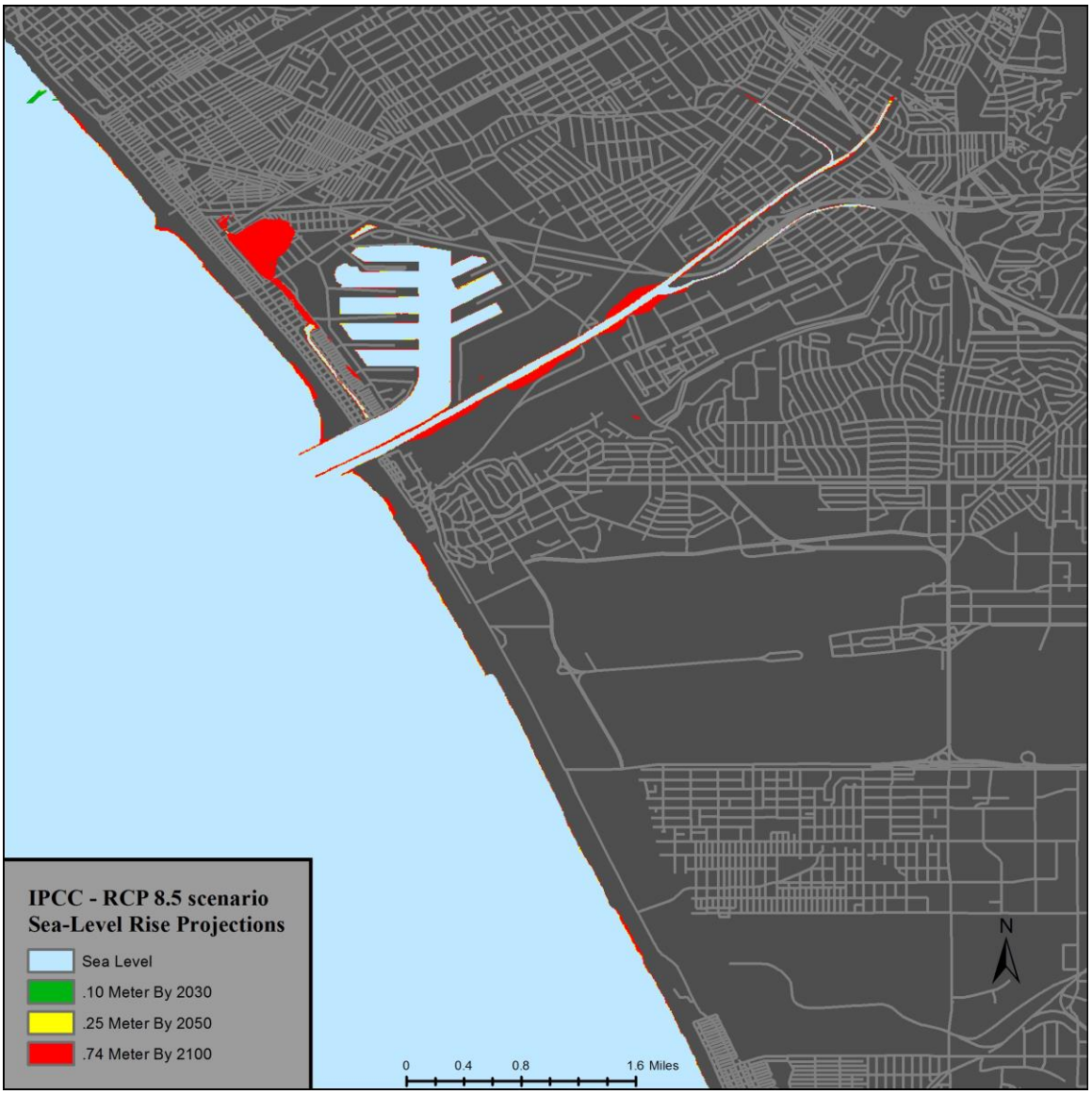

Figure 3. This map shows the projections of the IPCC of the different levels of inundation around the Marina Del Rey area within the L.A county for three different years.

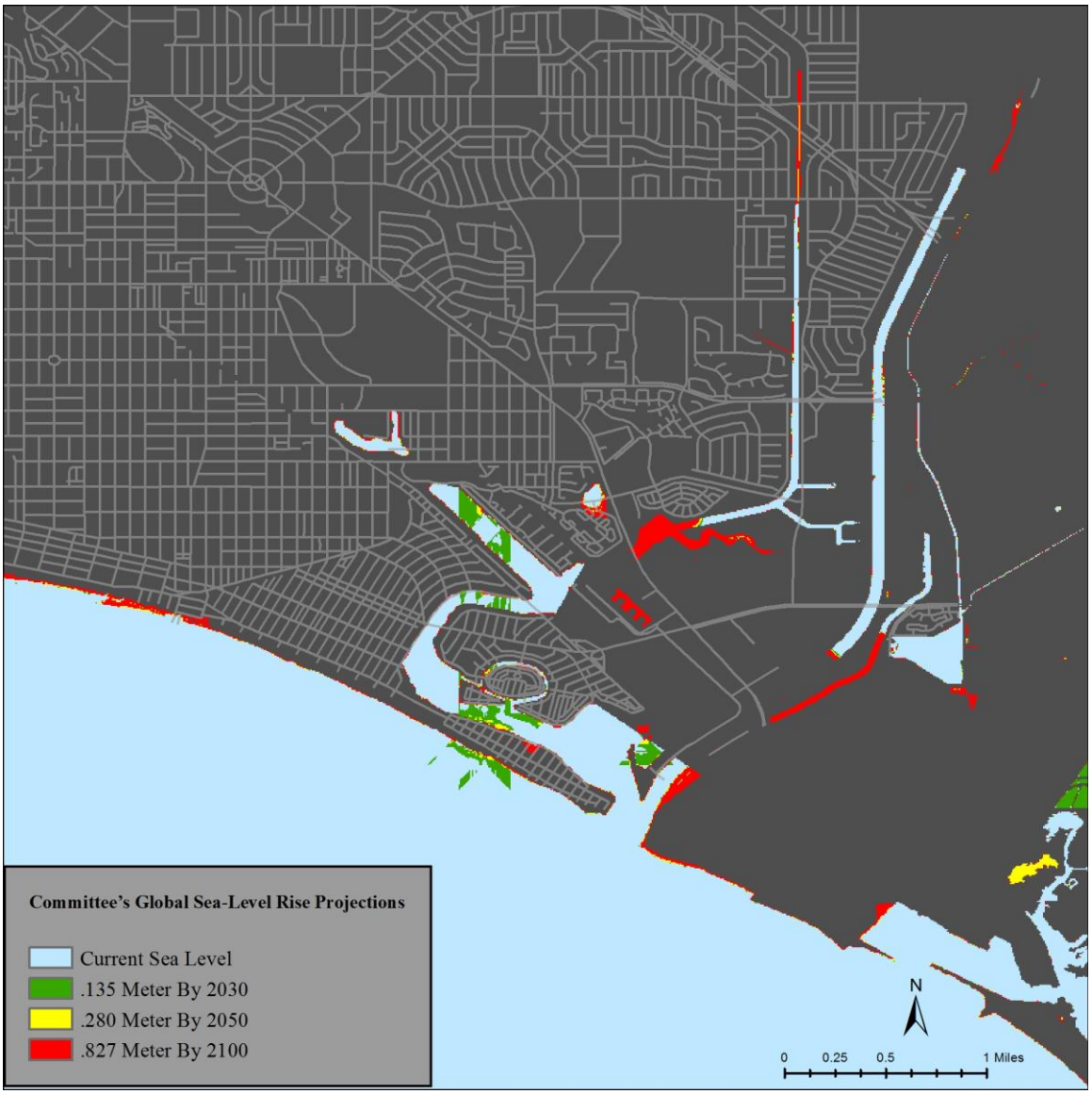

Figure 4. This map shows the projections of the NRC of the different levels of inundation around the Marina Pacifica and Seal Beach area within the L.A county for three different years.

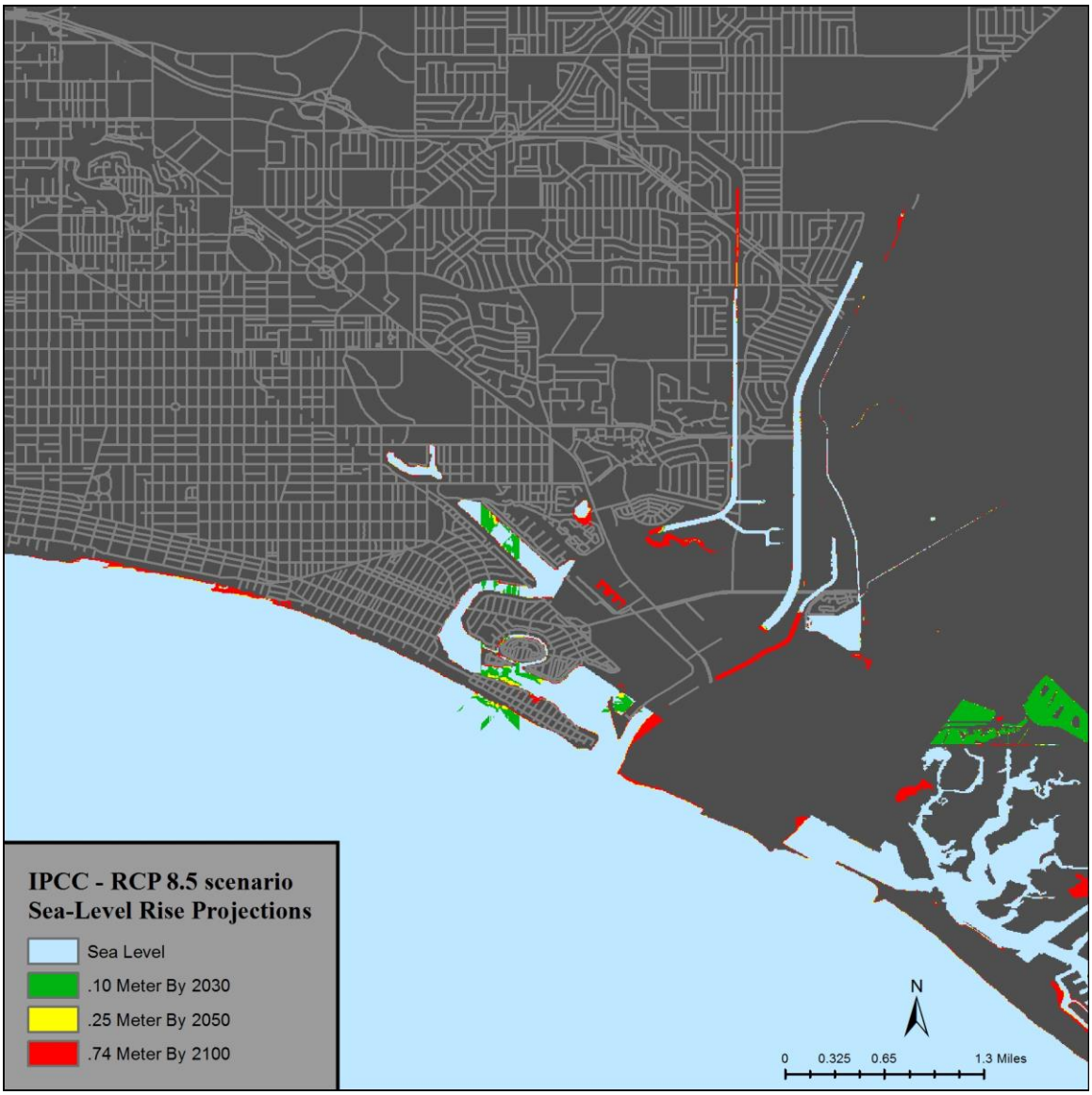

Figure 5. This map shows the projections of the IPCC of the different levels of inundation around the Marina Pacifica and Seal Beach area within the L.A county for three different years.

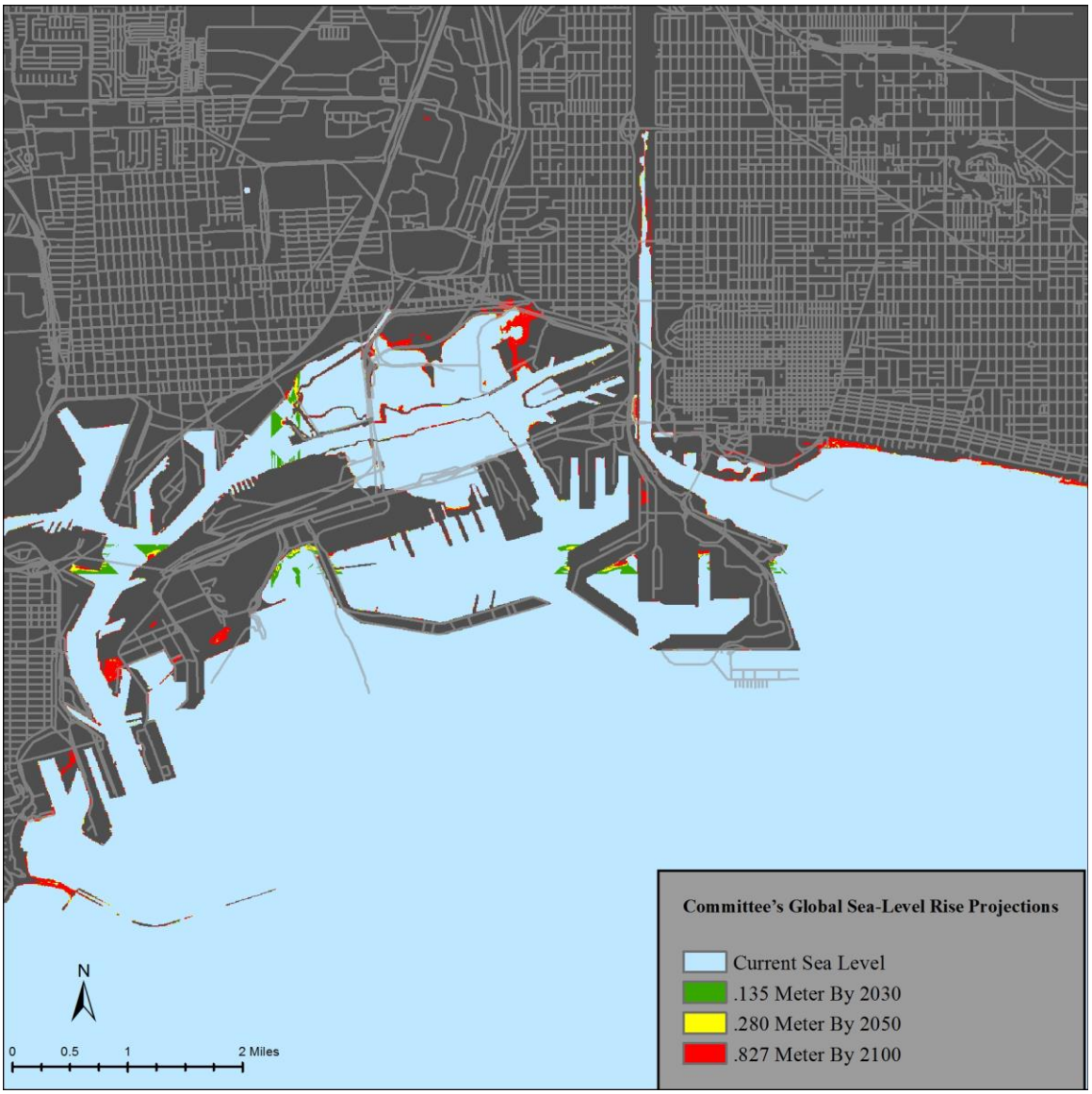

Figure 6. This map shows the projections of the NRC of the different levels of inundation around the Long Beach Pier and Terminal Islands area within the L.A county for three different years.

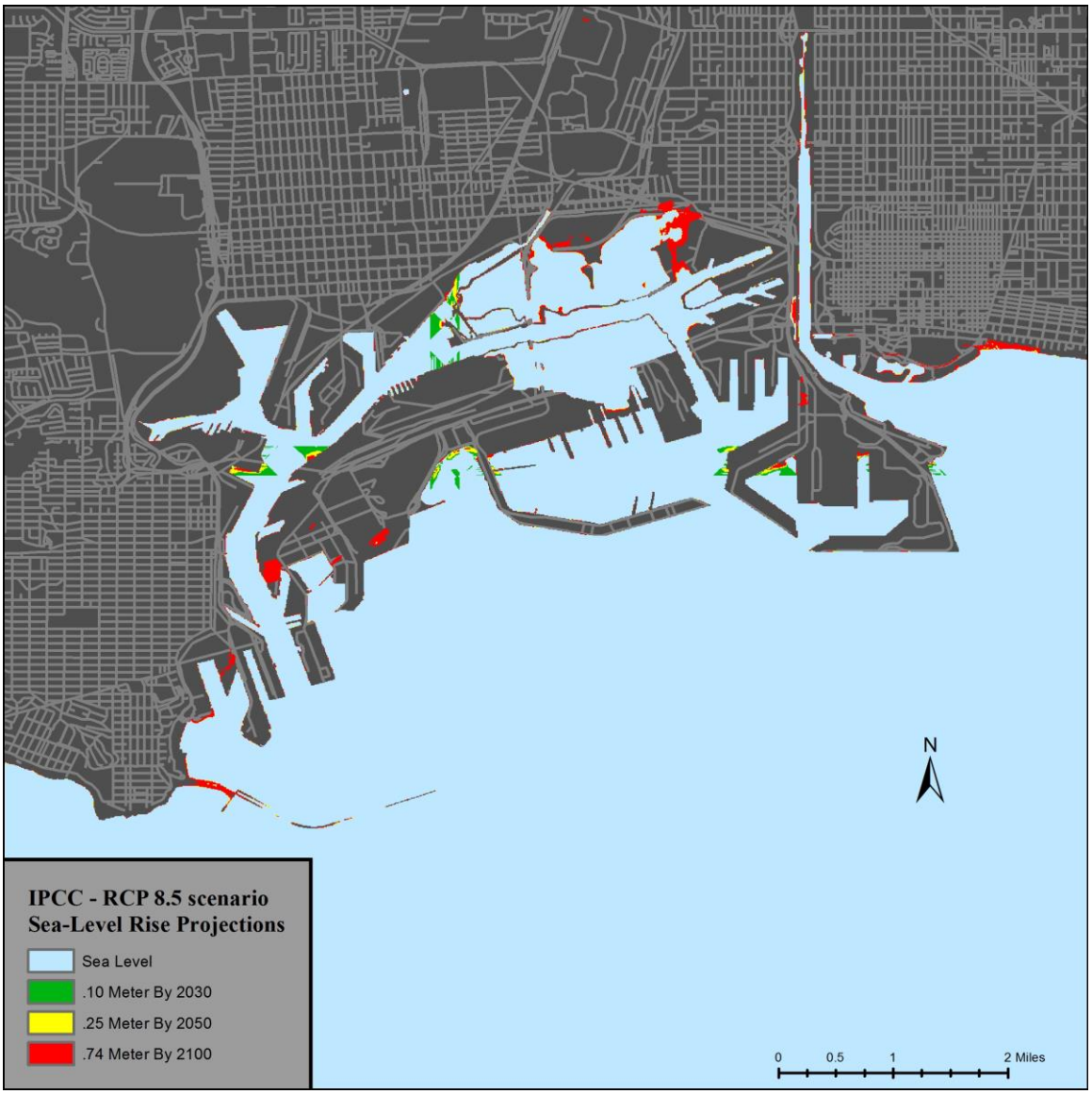

Figure 7. This map shows the projections of the IPCC of the different levels of inundation around the Long Beach Pier and Terminal Islands area within the L.A county for three different years.

IPCC RCP 8.5 Scenario

Land Use	Commercial	Industrial	Schools	Government	Recreational	Residential	Other
Sea Level Rise .10 Meter	0	7.34	0.05	2.56	0	0	0
Sea Level Rise .25 Meter	0.22	26.55	4.11	7.74	0	0.072	0.008
Sea Level Rise .74 Meter	1.29	124.68	21.81	28.88	0	0.265	0.177

Committee's Global

Land Use	Commercial	Industrial	Schools	Government	Recreational	Residential	Other
Sea Level Rise .135 Meter	0.03	12.06	0.91	3.89	0.00	0.024	0.000
Sea Level Rise .28 Meter	0.31	31.14	4.94	8.91	0.00	0.104	0.008
Sea Level Rise .827 Meter	1.52	138.30	24.60	31.22	0.00	0.281	0.185

Table 1. These charts show the level of inundation of different land uses within the LA County. It is separated by the type of land use and the different heights of sea level rise as predicted by the two institutions.

Conclusion

Rising sea levels have been documented time and again by many scientists throughout the years. Many of them have urged for the reduction greenhouse gases emissions to combat climate change to prevent sea level rising. The purpose of this project was to allow me to see how much land from my home city would actually be inundated by the rising sea levels, as projected by the two scenarios in the near future. This project was not intended to cover the reasons why sea levels are rising or what the consequences might be as a result of their rise. These questions can be answered by looking at scholarly articles that document the main causes and consequences of sea level rise for those who wish to know more. All in all, this assignment improved my understanding of how to turn raw data into a visual projection to better understand a situation. It was also a form of practice to polish and demonstrate the skills of which I have learned throughout this and other courses on to one final project.

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