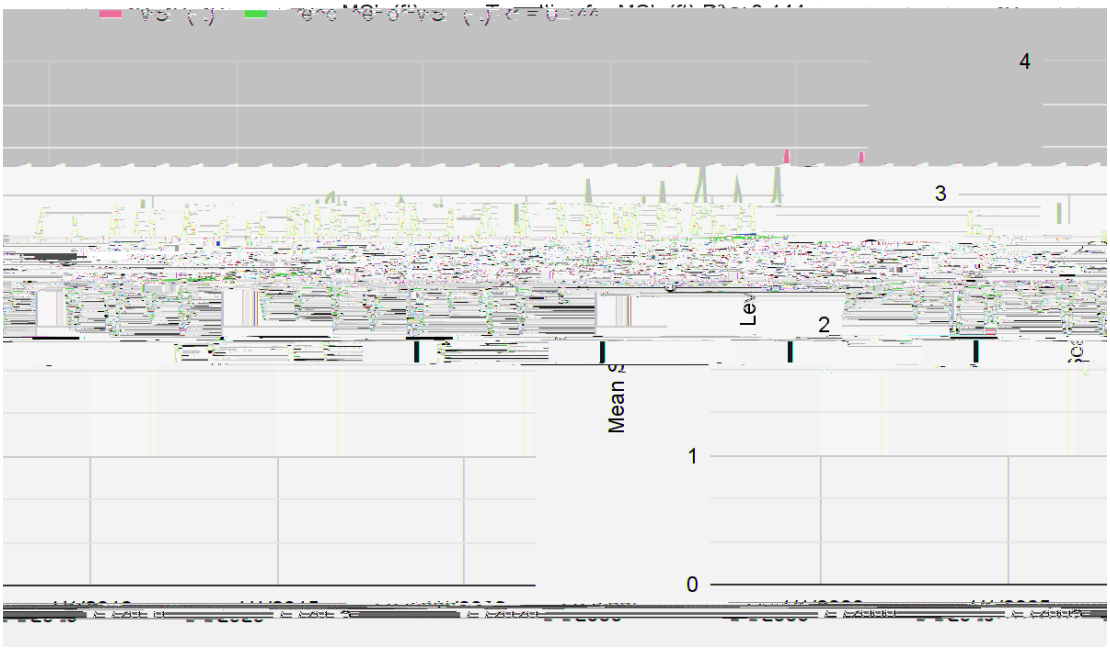
and intensify storm event damage to estuaries, vital ecosystems where freshwater systems meet ocean water, and wetlands (Wu et al., 2002).

Sea level rise also increases the severity of storm aftermath, particularly in the amount of coastal flooding and inundation that occurs. Rising seas affect storm surge levels by moving

has proven to be exacerbated in the northeast coastal regions of the United States (Stanley et al., 2004; IPCC, 2007; Jianjun et al., 2009; Sallenger et al., 2012).

**Figure 1: Monthly Mean Sea Level, Atlantic City New Jersey (1996-2020)**




*Source: NOAA, Tides & Currents Station #853470*

Figure 2 shows sea level data from another tidal gauge located on the bay side of the southernmost point of Cape May, New Jersey. Similar to Figure 1, frequent measurements are averaged together in Figure 2 to create monthly means that are plotted from the years 1997-2021. The trendline for mean sea level rise based on measurements from the Cape May tidal gauge also suggests an overall increase in sea level during this time period.

**Figure 2: Monthly Mean Sea Level, Cape May New Jersey (1997-2021)**

*Source: NOAA, Tides & Currents Station #8536110*

## Coastal Flooding

As mean sea levels rise, the potential for coastal flooding events increases, threatening coastal infrastructure. The extent of damage as a result of storm-related coastal flooding events depends on tidal and wave effects, particularly storm event duration and onshore wind speeds (Kirshen et al., 2008). Sea level rise increases the height of storm surges, which are predicted to significantly increase along the entire eastern seaboard by 2050 (Kirshen et al., 2008). In New Jersey, the current 100-year flood water level will be exceeded three to four times more

riverine flooding is also a concern in storm events and can amplify the effects of coastal flooding caused by surges (Wu et al., 2002).

Another type of hazardous coastal flooding is tidal flooding, often referred to as nuisance flooding or sunny day flooding. This type of flooding occurs in the absence of storm events, and results from exceptionally high tides. Low-lying areas such as roadways are inundated with relatively slow-moving oceanic water via piping systems. This causes transportation disruption and infrastructure strains. These events are often less damaging overall than large storm events, but are occurring at an increasingly greater frequency (NOAA, 2014). Sea level rise contributes to the increasing frequency of nuisance flooding, as the acceleration of sea level rise reduces the gap between regular high tides and flooding thresholds (Li et al., 2021). This acceleration is more pronounced along the Eastern Seaboard, where mean sea level has risen faster than in other parts of the country, (Pethick, 2001; Li et al., 2021). Nuisance flooding may not result in extensive property damage or threaten public safety, but it adds strain to critical infrastructure such as sewage systems and roadways (Jacobs et al., 2018). This can lead to loss of income or worsened public health risks (Moftakhari et al., 2018). These issues are magnified in urban areas and are a large concern for coastal communities in southern New Jersey, all of which are examined further

## Event Frequency

Human interaction with the global environment has exacerbated the negative effects of climate change. The frequency of flooding events, storms, and hurricanes has increased as a result of climate change, with more than 90% of observed flood days occurring due to anthropogenic contributions to climate change (Strauss et al., 2016). In this most recent decade, there is greater than a 95% probability that more than half of observed flood days would not have

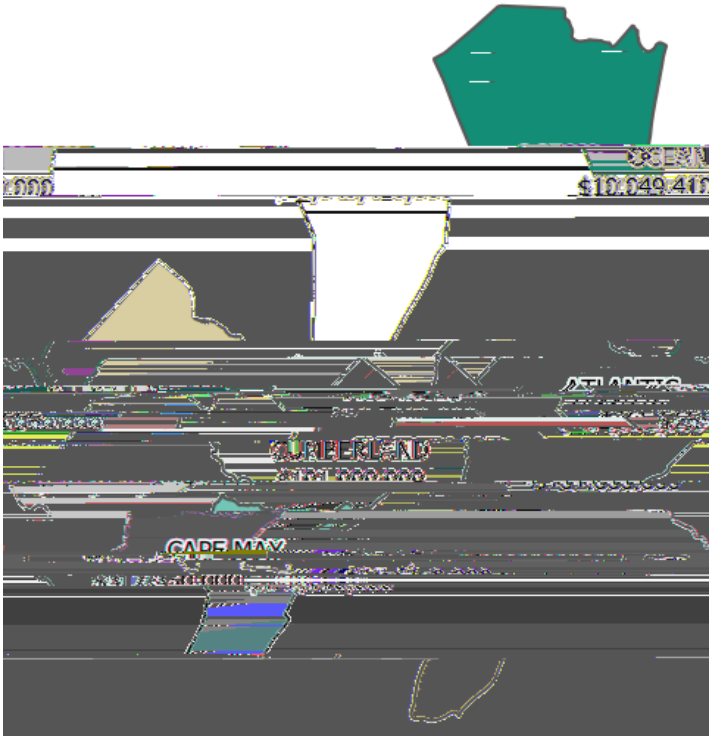
occurred without the human contribution to global sea level increases (Strauss et al., 2016). The impacts of climate change occurring on a global scale are also observable along the eastern Seaboard. Since 1980, New Jersey c

## Property Damage & Economic Vulnerability

Historically, coastal ecosystems have been a desirable place for settlement due to resource prevalence, logistical options for trade and transport, and recreation (Neumann et al., 2000). Many of the most densely populated cities globally are located in coastal zones with increasingly prevalent coastal hazards. In southern New Jersey, coastal communities are vulnerable to risks associated with increased storm event frequency in terms of property damage, loss of economic activity, and mitigation costs. Increased sea level rise and regional subsidence alone will be responsible for the permanent inundation of some areas, resulting in land loss and economic disruption.

Figure 4 shows the total cost of property damage associated with coastal flooding events for each year from 1998-2021 in Atlantic, Ocean, Cape May, and Cumberland counties.

**Figure 4: Property Damage Associated with Coastal Flooding Events (1998-2021)**




*Source: NOAA Storm Events Database*

*Studying*

due to damage caused by coastal flooding (Kenward et al., 2013). The flooding of known contaminated sites is also a concern, particularly in those located in coastal communities. In Atlantic City alone, a 100-year flood will submerge 18 Superfund sites, locations designated by the U.S. Environmental Protection Agency as hazardous and needing long-term cleanup, and nearly 150 known contaminated sites (Lathrop, 2017). Incidents like these are detrimental to public health and the environment and are extremely costly to remediate.

## Mitigation and Adaptation

With increasing sea levels exacerbated regionally on the Eastern Seaboard and projected increases in tidal flooding occurrences (Sweet et al., 2020), coastal communities in southern New Jersey are at risk. These threats highlight the importance of concentrated effort toward climate action by regional and local policymakers and emergency planners. Practical adaptation strategies for extreme weather events include the formation of contingency plans for public transportation (Clark et al., 1998), increased wetlands preservation for flooding mitigation purposes (Kirshen et al., 2008), increased land use regulations (Kirshen et al., 2004), greater coastal zone management (Burger et al., 2017), and increased resiliency of water management facilities (Kirshen et al., 2004; Kenward et al., 2013). There must also be increased education on flooding risks, as well as perceptions between sea level rise, severe storms, climate change, and ecological barriers. Polling in New Jersey environmental justice communities has shown a lack of understanding in the role of ecological structures and their functions, particularly in protecting coastal communities (Burger et al., 2017). Greater public awareness of these issues is essential in creating meaningful policy solutions to protect coastal communities into the future.

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