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Climate Change and Environmental Crises in Coastal Cities: Charleston vs New York City

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Abstract

This paper addresses the increasing vulnerability that coastal communities face regarding climate crises and rising sea levels. Specifically, this paper investigates the environmental crises facing Charleston, South Carolina, and New York City. The geographical location of these cities places a more severe threat upon their environment, as opposed to urban collectives removed from the immediate effect of rising sea levels. A cross-examination of politics and economics is discussed in order to determine the causal relationship of each city's engagement with its surrounding environment. This paper examines how each city is affected by climate change, what measures are in place to protect their environment, and the feasibility needed to prevent further crises. Additionally, this paper offers an economic analysis of the differentiation between highly funded cities and their counterpart. Chapter 1 offers current statistical evidence of the environmental crises looming over these cities. The environmental history and current ecological conditions pertaining to each city are examined, along with a brief discussion surrounding each urban area's economic, political, and legal characteristics. Chapter 2 expands upon the historical background briefly overviewed in the previous chapter. Additionally, a historical overview of environmental crises caused by human intervention is put forth. Urban planning, economic status, and the political landscape are cross-examined through a historical lens, both past and present, in order to provide a vivid description of the complexity of environmental degradation. Chapter 3 discusses the economic attributes surrounding each city's role in relation to the environment. Sustainable practices, such as environmental engineering, architecture, and education, are discussed in order to examine the feasibility of potential ecological solutions. Chapter 4 examines the sociopolitical characteristics of each city to unveil the interrelatedness between politics, social justice, economics, and the environment. Theoretical concepts such as structural racism and

environmental justice are included to provide examples of the severity of climate change and the societal implications inextricably linked to ecological crises. Chapter 5 provides a brief overview of previous chapters, along with several policy recommendations that each city could implement. Environmental crises must be addressed as multi-faceted issues in order to adequately provide feasible solutions.

Keywords: Charleston, New York, politics, economics, environment, coastal cities, climate change, ecological solutions, social justice, environmental justice

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Introduction: Two Cities, One Issue

How does climate change affect coastal cities? Specifically, how do rising sea levels affect the socioeconomic and political characteristics surrounding these vulnerable communities? Throughout my life, I have exclusively lived along the East Coast. During the beginning of high school, my family relocated to Charleston, South Carolina. Since residing within this coastal city, I have experienced the irreversible damage of rising sea levels first-hand. Following a heavy rainstorm, which occurs semi-frequently, the oversaturation of water becomes all too evident. Streets become flooded almost instantly, often leading to many people being unable to commute to work or school. I can remember instances of risky individuals kayaking along the streets of downtown Charleston with the intention of having fun despite the costly damages of nature's wrath. At first, I thought the overflooding of streets, neighborhoods, workplaces, malls, etc., was a part of living near the coast. However, this is simply not true.

Years later, I began my academic journey of higher education in one of the greatest cities in the world: New York City. Since I was a child, I have always dreamed of living in NYC. Endless opportunities are within the grasp of your fingertips. Additionally, the city offers countless activities and beauty, which attract millions of visitors every year. There is something quite comforting about living within close proximity to the coast. Unfortunately, this comes with a higher risk of climate vulnerability experienced by the individuals living within the confines of this enormous city. Although I have not lived in NYC for long, I have already experienced the intensity of nature's impact on this metropolis. Public transportation, especially the subway system, has experienced significant delays and shutdowns due to hazards caused by rising sea levels and climate change. Shortly after moving to NYC, I vividly recall watching clips of stormwater rushing down the stairs, slowly filling the subway system with water. If alternative

forms of transportation exist, why is it important to focus on these particular instances of underground flooding?

Approximately 2.4 million individuals per day rely on the subway system as their primary method of transportation. Unfortunately, this can lead to millions of individuals unable to commute to work. If individuals cannot make their way to work, then thousands of businesses and institutions are left with an economic disadvantage. Over time, places may shut down due to financial losses, which causes unemployment to rise. Furthermore, if unemployment begins to increase, there will be countless political, economic, and social ramifications that will ensue. This hypothetical example aims to unmask the severity of climate change and just how far its disparities can reach. While negative ecological externalities affect every individual around the globe, coastal communities are facing intensifying repercussions due to their proximity to various bodies of water. Born in the 21st century, I have already begun to experience the drastic effects climate change has on every aspect of life. My experience of living in Charleston and New York City has shed light on the importance of making environmental changes in order to prevent further devastation.

Throughout this paper, I focus on the similarities and differences between Charleston and NYC in order to show how climate change affects both small and big cities. Additionally, the GDP surrounding each city is insurmountably different, which raises ethical questions in relation to deciding the level of importance when prioritizing which cities to “save” and which to leave disadvantaged. In Chapter 1, I will discuss the problem of climate change, along with an overview of the current ecological, political, and economic conditions surrounding each city. In Chapter 2, I will provide an in-depth analysis of environmental degradation along with its sociopolitical implications. I will discuss the severity of the issue through a multi-faceted lens.

Chapter 3 will focus on the economic aspect of climate change, coupled with a discussion of sustainable practices in order to understand the complexity and feasibility required to adequately address the issue. The interrelatedness between politics, economics, society, and the environment is discussed in Chapter 4. In conclusion, Chapter 5 will briefly discuss ecological solutions put forth by various governmental actors prior to putting forth my personal policy recommendations, with the hopes of limiting the effects of the climate crisis.

Chapter 1. The Current Crises Facing Each City

What exactly is climate change? Simplified, this term refers to long-term shifts in average temperatures and weather patterns. Planet Earth is a self-sustaining ecosystem that does not require the use of human knowledge to maintain its existence. The temporal measurement of our planet's existence stretches far beyond human comprehension. However, within the past quincentennial, humanity has drastically exacerbated the effects of climate change. The ecosystem services that are naturally provided to us play an essential role in sustaining life on Earth, encompassing all species and organisms. Climate change—along with the environmental crises that ensue—has to do with the degradation of the regulatory services that we rely upon. Ecological preservation and limiting global emission levels is a vital task that must be achieved if life on Earth is to continue. While every individual around the globe experiences climate change to some degree, particular regions are more prone to the unpredictable patterns of nature. Communities and urban collectives situated along the coastline are highly susceptible to extreme weather phenomena, flooding, rising sea levels, and so on. As outlined in the introduction, this paper focuses on two cities in particular: Charleston, South Carolina, and New York City. Establishing the causes and effects of climate change is an essential place to begin when

determining the feasibility needed to address such crises. A brief discussion surrounding ecosystem services is put forth, followed by an individual analysis of the current issues facing each metropolis.

a) *Ecosystem Services.* As previously mentioned, ecosystem services provide countless benefits to humans; in fact, these services play an essential role in the survival rate of every living organism on Earth. In essence, climate change has to do with the degradation and exploitation of these regulatory services. However, what exactly are ecosystem services? These natural systems of climate regulation, which can be divided into four main groups, provide both seen and unseen advantages to human survival. These services can be categorized into provisioning, regulating, supporting, and cultural subsections.[1] The linkages between ecosystem services and human well-being are quite inextricable. The environment provides many benefits to humankind, influencing almost every avenue of life and human development. Following the gradual decrease in these systems' effectiveness, many ecological issues have arisen from environmental carelessness and lack of preservation efforts. Reparations must ensue if these services are to continue supporting life.

Provisioning services are ecosystem services that describe the material outputs from ecosystems; these include, but are not limited to, food, raw materials, freshwater, and medicinal resources.[2] The food and water you consume are provided by your surrounding ecosystem through the natural processes of material output. Often, it is easy to forget where these essential needs come from. Purchasing a bottle of water from the local grocery or filling a glass of water from the tap is rarely given a second thought. It is easy to take advantage of these luxuries, which, unfortunately, many people around the globe do not have access to. These basic survival

[1] Millennium Ecosystem Assessment 2005.
[2] "Annex 2: What Are Ecosystem Services" (n.d.).

needs are provided by our ecosystem, which stresses the importance of caring for such services. The physical materials required for construction and human development, i.e., steel, wood, plastic, etc., are sourced from our surrounding environment. Furthermore, the medication or various medicinal methods used to restore human health are sourced from the environment. Throughout human history—dating back to ancient civilization—various plants, animals, fungi, and so forth played a significant role in aiding human survival. Medicinal healers used the natural elements at their disposal to produce cures and remedies for countless ailments that arose. Contemporary methods of medicinal care continue to draw upon the natural world in order to alleviate illnesses by providing new ways of restoration.

Regulating services are the various services that ecosystems provide by acting as regulatory agents in relation to the quality of air, soil, and water by providing disease and flood control.[3] Under this umbrella, the water, carbon, nitrogen, and phosphorus cycles are essential in maintaining all forms of life within our planetary boundaries; without these cycles, life would cease to exist. The water cycle collects, purifies, and distributes the earth's fixed supply of water through various methods of production. As a biogeochemical process, the continuous movement of water throughout the global ecosystem remains fairly consistent over time, which provides the necessary amounts of precipitation needed for survival across a multitude of varying organisms. Various elements formulate into compounds, i.e., carbon dioxide, carbonic acid, bicarbonate ions, etc., in what is known as the carbon cycle. Carbon compounds circulate through the biosphere, the atmosphere, and parts of the hydrosphere in this regulatory process.[3] The natural regulation of CO_2 in the atmosphere provides the necessary temperatures specific to varying regions in order to support the wide range of organisms residing within our ecosystem.

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[3] Miller and Spoolman 2018, 55-61.

Following suit, the nitrogen cycle is the process by which nitrogen is converted into multiple chemical forms as it circulates through all living things, which may be carried out in biological or physical processes. As a vital component of proteins, many vitamins, RNA, and DNA, nitrogen is one of the several elements that all living things have in common.[3] This element makes up the majority of the Earth's atmosphere while simultaneously acting as one of the building blocks of proteins and nucleic acids. Closely related, the phosphorus cycle allows the cyclic movement of phosphorus through water, the earth's crust, and living organisms.[3] It is the biogeochemical process of transforming and translocating phosphorus in soil, water, and living and non-living organic materials: one of the building blocks of life. It plays an essential role in the transfer of energy within organisms, the structure of genetic material (RNA and DNA), and the composition of cell membranes, bones, and teeth. The ecosystem services described above only begin to scratch the surface of the countless ways in which our ecosystem provides necessary regulatory processes.

The supportive services provided by the environment underpin almost all other services.[3] These include providing habitats for various species, as well as the maintenance of genetic diversity. Furthermore, soil formation, photosynthesis, primary production, nutrient cycling, and water cycling fall under this scope of services. Supporting services differ in the sense of their visibility and temporal measurement. Their impacts on people are typically indirect and occur over an exaggerated amount of time. However, they are essential in supporting and maintaining life! Aside from the many scientific and critical services that these systems provide, our ecosystem provides many cultural benefits as well. The non-material benefits obtained from the interactions with our environment include aesthetic, spiritual, psychological, physical, and inspirational benefits.[3] As a species, humans developed alongside nature, continuously relying on

its plethora of gifts. Therefore, it is in our nature to be involved with the surrounding elements. Observing the marvelous wonders of our ecosystem can provide spiritual and psychological benefits that improve the quality of life in relation to mental health. The daily stresses we indulge ourselves in can be relieved when our time is spent in nature. It can be quite healing and restorative to observe the complexities of the world around us, free from human touch. Patterns and designs observed within the natural world can influence the way in which we construct societies. Countless individuals have gained inspiration through such observance, which informs the way in which societies are structured. Artistic expression draws upon the features of our biosphere to portray one's way of interacting with living organisms. Recreational activities such as national parks and athletic competitions can increase tourism and provide numerous economic benefits. Social relations may improve through the establishment of a shared community around such activities, greatly improving cultural relations. Encapsulating the many features of ecosystem services unveils the importance of viewing these benefits through a multi-faceted lens while simultaneously arguing for the importance of climate mitigation; it is effortless to take advantage of something that is intangible.

b) *Causes of Climate Change.* Since the start of the Industrial Revolution, environmental degradation has increased exponentially. Prior to the start of the nineteenth century, CO_2 levels were consistently around 280 parts per million (ppm) during the most recent 6,000 years of human civilization.[4] Since then, CO_2 levels have increased dramatically. In May 2022, data suggested that CO_2 levels had reached an all-time high of 421 ppm. This is an increase of nearly 50% since pre-industrialization. What is the cause of global warming? Primarily, it is through the increase of human activities on an industrial scale. Greenhouse gas emissions have increased

[4] Stein, *Carbon Dioxide,* 2022.

dramatically, caused by unsustainable practices and the overproduction of goods. This has unequivocally caused global warming, with global surface temperatures in 2011-2020 reaching 1.1°C above 1850-1900 temperatures.[5] This increase has led to numerous consequences that are detrimental to human health as well as the environment and its ecosystem services. Additionally, global mean sea levels have increased within the last century. The average rate of sea level rise was 1.3 [0.6 to 2.1] mm yr-1 between 1901 and 1971, increasing to 1.9 [0.8 to 2.9] mm yr-1 between 1971 and 2006, and further increasing to 3.7 [3.2 to 4.2] mm yr-1 between 2006 and 2018.3 Within recent decades, extreme weather conditions have occurred more frequently. Heatwaves, heavy precipitation, droughts, and tropical cyclones have not only increased, but strengthened as well. The increase in global sea levels has led to observable consequences in coastal communities and will only worsen over time. In the graph shown below, the amount of carbon dioxide contained within the atmosphere is parallel to the increased number of human emissions caused by unsustainable practices and economic development.

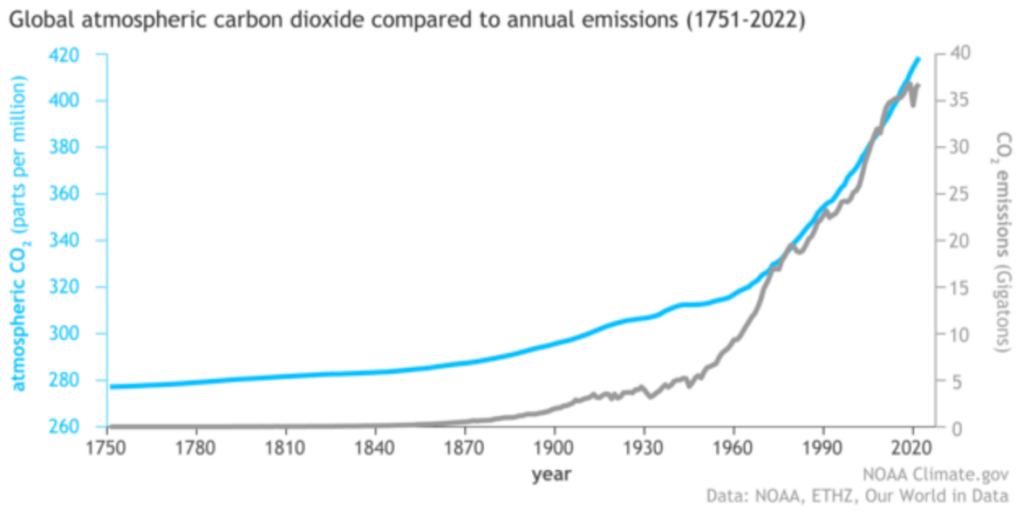

Figure 1. The amount of carbon dioxide in the atmosphere (blue line) has increased along with human emissions (gray line) since the start of the Industrial Revolution in 1750.[6]

[5] IPCC, *Panel on Climate Change,* 2023.
[6] Lindsey 2024.

How have humans caused such a dramatic increase? Capitalism, simply viewed as a form of economics, requires continual growth. That means that the production of capital must continually occur, as well as expand, in order to support the system of capitalism as a whole. This requires industries to grow, expand, and produce more goods. Consumerism must consequently increase in order to support capitalism's endeavors; the more goods produced, the more goods consumed. The inherent nature of purchasing a good with the intention of bettering one's life is justifiable and supported. Essential products that we use today have transformed everyday life in certain aspects to make things easier. For example, a dishwasher frees up the time spent washing dishes. Online shopping has made purchasing clothes as easy as pressing a button. Temperate systems, such as AC and heating, have allowed the comfort of residing within indoor spaces regardless of external temperatures. These luxuries, along with countless more, have improved the quality of life compared to pre-industrial living conditions. However, all of these processes have contributed to the increase in climate destruction.

Immense amounts of energy are required to create and maintain the everyday items that we take for granted. Nonrenewable energy powers almost everything we see today. The primary resources associated with this form of energy include oil, natural gas, and coal—known as fossil fuels. Inferred from the name, these forms of energy are finite. Within our planet, there is a limited number of natural resources. Once we exploit these resources, there will be nothing left to harness. The continued extraction of nonrenewable resources, coupled with the continuation of production, has led to severe ecological threats. While every individual has experienced the effects of climate change, whether recognized or not, certain communities are more vulnerable than others. One critical aspect of the climate crisis is the increasing level of sea waters. Nearly 40% of the world's population resides relatively close to the shoreline. However, approximately

10% of the world's population resides in extremely low-elevation coastal zones. This number translates to roughly 800 million individuals living in high-risk zones, which poses a severe and immediate threat to these communities. Therefore, it is critical that individuals living near the coast prioritize protecting the environment for their own safety.

Typically, the amount of greenhouse gas emissions per sector is measured using metric tons. The sheer number of pollutants in the atmosphere has increased exponentially over the past century. Using metric tons as a form of measurement alludes to the severity of climate change and how detrimental its effects have been. $MTCO_2e$ represents the amount of greenhouse gas present in the atmosphere, which is measured in metric tons. In 2019, the $MTCO_2e$ present in the atmosphere was measured across various sectors in New York City in terms of the total GHG emissions associated with consumption in households. The transportation sector was responsible for 4.1 $MTCO_2e$; the housing sector, 7.0 $MTCO_2e$; the food and beverage sector, 7.5 $MTCO_2e$; the goods sector, 4.2 $MTCO_2e$; the service sector, 5.9 $MTCO_2e$; total emissions during 2019 equated to 29 million $MTCO_2e$.[7] The various categories that were measured in this report unveil the many causes of climate change.

As previously mentioned, CO_2 emissions have increased drastically, which has been a product of societal advancement. What methods of household consumption contribute to the astronomical output of toxic pollutants? The transportation category includes on-road vehicle travel, vehicle purchases, maintenance, and flights; the housing category includes household energy usage, home construction and maintenance (shelter), and water; the food category includes food consumed at home (and from expenditures at food service venues) by residents of New York, categorized by meat, dairy, fruits, vegetables, and so on; the goods category includes

[7] EcoDataLab, *NYCBEI Report,* 2019.

all products purchased by households, such as furniture, clothing, electronics, and personal care products (excludes items accounted for in other categories, such as food and fuel); the service category includes services used by households such as healthcare, education, insurance, finance, and entertainment experiences like concerts and museums.[7] What is the commonality among these sectors? Human society. Every aspect of human development and societal relations has (and will continue to have) long-lasting effects on the environment.

The data mentioned above pertains to the amount of greenhouse gas emissions caused by household consumption. Although this number is quite high, it only begins to unmask the effect that overconsumption has on the environment. It does not include the many additional facets of society that contribute to the climate crisis. Including the pollutants from all sectors citywide, the total amount of CO_2e during 2022 was 87.15 million $MTCO_2e$.[8] This is roughly three times larger than the amount of GHG emissions caused by household consumption. A large portion of this number comes from the energy sector, followed by transportation and waste. Nonrenewable methods of energy extraction greatly inhibit environmental preservation efforts, greatly contributing to the climate crisis. Especially in cities such as New York, astronomical amounts of energy are required in order to maintain the metropolitan's daily functions. This directly ties into the second largest contributor—transportation. Unsustainable forms of fuel, such as gasoline and diesel, greatly impact environmental conditions. With roughly 900,000 cars entering the city each day, millions of $MTCO_2e$ remain stagnant in the air, which leads to countless issues. Aside from the environmental degradation caused by vehicular travel, many health issues have arisen, along with increased roadway congestion. Unsurprisingly, many of these causes are directly tied to increased human activity, which includes a wide range of features (previously discussed).

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[8] "NYC Greenhouse Gas Inventories" (n.d.)

In Charleston, South Carolina, specific data on greenhouse gas emitters is slightly scarce due to the complex nature of the city. Charleston is divided into sub-counties, which make up the metro area in its entirety. Unlike the household consumption-based emissions inventory of New York City, this southern metropolis does not have the ability to create such a report. As will be discussed in Chapter 4, this is partially due to the political climate of the region. There are few climate inventories and reports pertaining to citywide emission levels as opposed to urban collectives with left-leaning governing institutions. However, there is state-wide data pertaining to greenhouse gas emission levels. In 2020, South Carolina's total GHG levels reached 73.746 million $MTCO_2e$.[9] The largest contributor to this amount was the transportation sector, followed by electrical power generation and various industrial processes. There is an extensive highway and non-highway road system throughout the state, which greatly impacts South Carolina's overall emission levels. However, this issue is not state-specific. The transportation industry as a whole is one of the greatest emitters of CO_2 around the world. Human societies have become an interwoven network of connectivity through various means of transportation. Socioeconomically, this is an important feat of human development, but it has had detrimental consequences on the environment. Through research and development (a feature of environmental economics), sustainable methods of transportation would greatly decrease the amount of $MTCO_2e$ in the atmosphere.

Within the city of Charleston, transportation is the second largest contributor (25.2%) to GHG emissions, with the first being energy (64.8%). The most recent data suggested that emission levels citywide reached 1.33 million $MTCO_2e$ in 2018.[10] This can be separated into four groups: buildings, transportation, waste, and additional factors. Energy usage in residential,

[9] Palmetto Air Quality Collaborative 2024.
[10] City of Charleston Sustainability Division 2018.

governmental, and industrial buildings; emissions from cars, motorcycles, trucks, and other vehicular travel; landfill emissions from citywide waste; direct emissions from additional industries; these facets of human development provide the basis for such quantitative data sets. GHG emissions in Charleston are seemingly insignificant compared to NYC emissions levels. However, it impacts the surrounding area in a similar fashion. There are countless aspects of human society and economic development that contribute to the climate crisis. Identifying the areas causing climate change is a critical place to begin. Once these negative externalities are addressed, proper methods of environmental preservation can begin to take hold.

c) *Effects of Climate Change.* Briefly discussed, climate change has had detrimental consequences on ecosystems globally. As this paper focuses on coastal cities, specifically Charleston, South Carolina, and New York City, it is important to examine the climate vulnerability these regions face. Over 64 million people are concentrated within the Northeast.[11] Most of the largest cities in the Northeast are located along the coastline. This places millions of individuals in highly vulnerable situations. Between 1958 and 2010, the Northeast experienced more than a 70% increase in the amount of precipitation falling in extreme weather events. Not only does this place many individuals at risk, but it also compromises infrastructure, agriculture, and ecosystems. Consider the effect of Hurricanes Irene and Sandy. These devasting storms disrupted the lives of millions and caused billions of dollars in damages. The severity and frequency of these events have increased dramatically following the rise of climate change and increased human development.

The largest city in the Northeast, New York City, has experienced the effects of climate change firsthand. The average elevation of NYC is fifty-two feet above sea level. Considering

[11] "National Climate Assessment" (2014).

the consistent rise in sea level, NYC is in an extremely vulnerable situation because flooding will only continue to increase during large storms and heavy rainfall. The subway system is a staple piece of NYC culture, with millions of individuals using this form of transportation daily. Located underground, these systems are highly vulnerable to flooding, which has the potential to cause billions of dollars in economic losses. In the Southeast, more than 80 million individuals reside within this region. Additionally, this region includes some of the fastest-growing metropolitan areas, including Charleston. Located along the coastline, Charleston is prone to extreme weather conditions such as hurricanes and heavy rainfall. Since this region is situated close to the equator, these states experience higher temperatures. From personal experience, Charleston temperatures reached over 90 degrees for a record 98 days in 2016. This extreme rise in temperature has led to countless issues within the state. It is difficult to be outside in these extreme weather conditions, making it nearly impossible to complete tasks that require outdoor labor. Consequentially, this may lead to heat strokes and additional health problems, which can negatively impact quality of life, as well as the economy. Furthermore, many diseases thrive in hot pockets, which can further impact human health. With an average elevation of thirteen feet above sea level, including many areas below sea level, Charleston is in an extremely vulnerable situation. Unfortunately, even heavy rainstorms can cause massive flooding throughout downtown Charleston. As a southern city, there is a great deal of marshland and small waterways located throughout the region; this only amplifies the amount of flood potential. Many of the waterways throughout the region are fairly stagnant, meaning that they do not continuously flow. Therefore, heavy amounts of precipitation cause these bodies of water to overflow, leading to frequent flooding.

Examining the causes of climate change unveils the extreme effects it has on the environment and society at large. Extreme heat, precipitation, flooding, wildfires, and drought are notable features linked to the increasing impact of socioeconomic development. Representing climate risk relative to each city may be measured through a rating scale, with 100 being the highest risk for the hazard and 1 being the lowest risk for the hazard. How does Charleston rank? Extreme heat is ranked at 84, flooding is ranked at 65, precipitation is ranked at 69, fire is ranked at 25, and drought is ranked at 41.[12] Extreme heat has become a pressing issue in Charleston, with recent summers reaching record-breaking highs. In the 1990s, residents would experience about seven days (annually) of temperatures over 94.5ºF; by 2050, this number is expected to increase to 34 days annually. In terms of flooding, Charleston is very prone to the effects of increased precipitation and extreme weather events. About 81% of buildings in the metro area pose a significant risk of water damage from storm surges and various forms of flooding. This number will only continue to increase as the effects of climate change worsen. In correlation to flooding, increased precipitation has caused a great deal of destruction, placing thousands at risk. Due to the increase in temperatures, extreme rainfall becomes more frequent since warmer air can hold more water vapor. It is expected that annual precipitation will increase from about 48 inches per year to 52 inches per year by 2050. Following suit, wildfires and drought are projected to increase due to climate change. While they may not occur frequently in Charleston, many residents and homeowners are beginning to experience the risk of weather phenomena on an inordinate basis.

How does New York City rank? Extreme heat is ranked at 67, flooding is ranked at 32, precipitation is ranked at 78, fire is ranked at 3, and drought is ranked at 22.[13] Although this city

[12] Climate Check, *Charleston,* (n.d.).
[13] Climate Check, *New York,* (n.d.).

is in the northern region of the United States, extreme heat during the summer has become quite normative. A typical year in the 1990s would experience about seven days of temperatures over 92ºF; by 2050, that number is projected to reach about 29 days annually. While the risk of fires and drought increases with rising temperatures, the risk of such events occurring within New York City remains relatively low. Since the metropolitan collective is situated directly along the coastline, the risk of extreme flooding and precipitation remains quite high. For example, toward the end of September 2023, New York experienced extreme flooding and precipitation throughout the five boroughs. It was estimated that nearly 10 inches of rain fell during a two-day period, causing over 100 million dollars in damages. This is only a recent example of the extreme risk that this city faces in terms of flood vulnerability. Precipitation frequency is only expected to increase by 2050, nearing estimates of 50 inches per year. Climate change and the environmental crises that ensue greatly affect the functioning capacity of these metropolitan collectives. The facets of climate change mentioned above represent the vulnerability that coastal cities face—every aspect of life is affected by environmental degradation.

d) *A Brief Overview.* Previously, the notion of the connectivity between politics and environmental degradation was briefly touched upon. How do these connect? As discussed in the beginning of the chapter, the rise of industrialization has perpetually led to the rise in CO_2 emissions present in the atmosphere—in turn, this has led to detrimental environmental consequences. Capitalist endeavors and corporate greed are largely responsible for producing the output of unsustainable economic development across a multitude of industries. However, lobbyists, politicians, and other governmental actors carry a great deal of weight in terms of establishing eco-friendly policies in order to combat climate change. The individual will not stop the production and growth of massive corporations; governmental actors carry the power to

make real change in these regards. Observing the political instability scattered throughout our country makes it quite difficult to curb the effects of climate change, considering polarized viewpoints on the issue. In 2020, the percentage of individuals who said 'protecting the environment' should be a top priority for the president and Congress was 85% of Democrats and only 39% of Republicans. In the graph below, this information, along with 'global warming' and 'climate change', can be visualized.

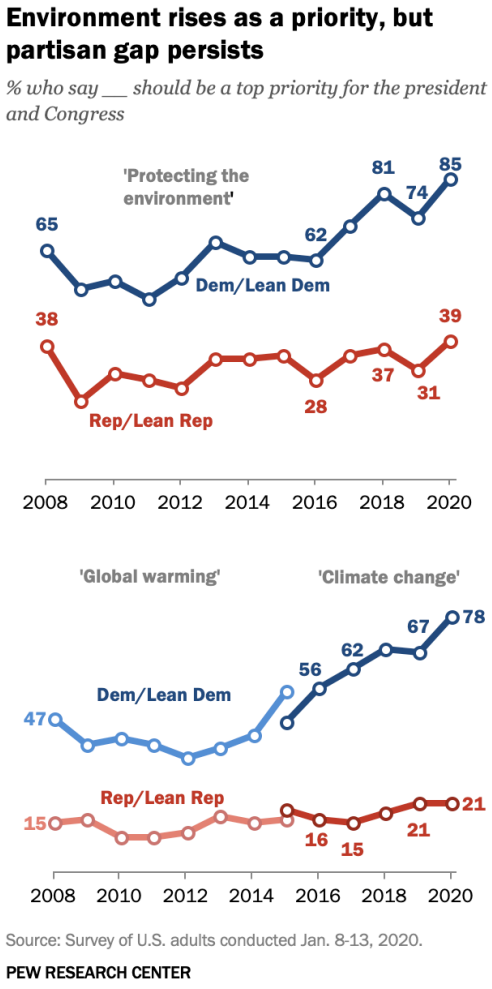

Figure 2. Percentage of people who say, 'protecting the environment', 'global warming', and 'climate change' should be a top priority for the President and Congress, 2020.[14]

[14] Kennedy and Johnson 2020.

This may seem unimportant, but it is critical when deciding environmental policy outcomes. Consider when Donald Trump was president. The policies he enacted while in office had numerous negative effects on society. Exclusively pertaining to the environment, his cabinet overturned decades of hard work done by the Environmental Protection Agency. Trump proposed slashing the EPA's budget by 31%, along with overturning more than 46 environmental regulations put in place to protect individuals and those most vulnerable to the effects of climate change.[15] This example only begins to unmask the influence that politics has over environmental conditions. Consider the cities of interest throughout this paper: Charleston and New York City. Within the city of Charleston, 55.5% of people voted Democrat, while 42.6% of people voted Republican. On the contrary, New York's political affiliation is roughly 80% Democratic and 18% Republican. Therefore, it is safe to assume that environmental policies are less important to governmental agents in Charleston than in New York. The interconnected nature between political party ideologies and policy formations regarding environmental sustainability is quite tangible.

Aside from politics, it is valuable to consider the GDP (gross domestic product) of each city. The economic characteristics of each metropolis correlates to the outcomes of various environmental regulations. For example, if a city is a leading exporter of fossil fuels, it is highly unlikely that policymakers will enforce harsher environmental regulations in the fear that industries will relocate to a more economically advantageous region. On the other hand, a higher GDP opens up the possibility of ecological solutions that may cost more in the short run but may reap higher benefits in the future. Hypothetically, if it were to cost a billion dollars to implement solar panels throughout an entire city to improve energy efficiency, those with a higher GDP may

[15] Miller and Spoolman 2018, 624.

be more prone to completing this project than their counterpart. Charleston County has a GRP (gross regional product) of $34.5 billion, while NYC has a GDP of approximately $1.4 trillion. The disproportionate allocation of wealth among these cities, coupled with the political nature of each collective, proves the complexity of dealing with environmental degradation. If a region consists of highly democratic actors and a high GDP, then it is more likely that climate mitigation efforts would be prioritized. In Chapter 3, an economic approach to understanding climate change is put forth, which expands upon the topics mentioned above. The intersectional relationship between politics, society, and the environment is further discussed in Chapter 4—unveiling the importance of environmental justice and equitable solutions when addressing contemporary issues related to climate change and environmental crises.

Chapter 2. Historical Overview

Planet Earth has existed for billions of years. It has experienced countless changes throughout its extensive and largely unknown history. As humans, the Earth provides the ecological services required to sustain life of all forms. Using environmental history as a discipline, it is important to highlight the various historical patterns that have led us to the state in which we find the world today. From the first human uses of fire and early agriculture to our new world of power plants, specialized chemicals, and global supply chains, people and nature have been intertwined in myriad relationships. Environmental history is the study of these relationships. How have people perceived and shaped nature? How have they adapted to a changing natural world? Environmental history can aid in our understanding of contemporary debates over climate change, as well as providing insight into the vastly different ways that humans have lived in the past.

a) *Global History of Climate Change.* In Chapter 1, the history of climate change was briefly touched upon. Specifically, the exponential increase in the amount of CO_2 in the atmosphere was discussed in comparison to Pre-Industrial Revolution levels. However, the history of climate change is not so cut and clear. Humans have impacted the environment over a long period of time. When did climate change start? There is no correct answer to this question. It has been a slow, gradual process that has resulted in the current ecological situations observable today. The Earth is roughly 4.5 billion years old, while humans have been around for about 300,000 years. Compared to our planet's timeline, humans have been around for only a blip in time. Our planet has gone through countless ecological changes throughout this time, which has allowed life to evolve in fascinating ways. Geologists have separated the Earth's history into five main categories: the Archean era, 4 billion years ago; the Proterozoic era, 2.5 billion years ago; the Paleozoic era, 541 million years ago; the Mesozoic era, 252.2 million years ago; followed by the Cenozoic era, which we currently live in. Since the rise of modern civilizations, climate change has increased exponentially. Since the eighteenth century, carbon dioxide, methane, and nitrous oxide have increased anywhere between 40 and 250 percent.[16] This increase is historically attributed to the start of the Industrial Revolution.

The production of various technologies on a large scale greatly increased the amount of harmful chemicals in the atmosphere. Additionally, the growing population and rapid urban expansion led to the destruction of countless environments and ecological communities. This period began in 1760 and lasted until about 1840. Many of these technological advancements led to the creation of entirely new systems of viewing the relationship between governmental institutions and economics. These changes included the following: the use of new basic

[16] Environmental Protection Agency, *Causes of Climate Change,* 2023.

materials, chiefly iron and steel; the use of new energy sources, including both fuels and motive power, such as coal, the steam engine, electricity, petroleum, and the internal-combustion engine; the invention of new machines, such as the spinning jenny and the power loom that permitted increased production with a smaller expenditure of human energy; a new organization of work known as the factory system, which entailed increased division of labor and specialization of function; important developments in transportation and communication, including the steam locomotive, steamship, automobile, airplane, telegraph, and radio, and the increasing application of science to industry. This has led global temperatures to rise dramatically. Even though certain regions around the globe experience frigid conditions, the average temperature of the globe has increased. Many warm, dry regions have experienced a much higher increase in average temperature, which affects many ecological services. Overall, global temperatures have increased greatly over the past several years, which have been observable through the many instances pertaining to record-breaking heat waves, including hotter summers. Since the late nineteenth century, the global average temperature has risen by 2 degrees Fahrenheit.[17] While Earth may have an extensive geological history, the current era we are a part of has experienced the greatest amount of change throughout its relatively short history. It is critical to understand the historical aspects of climate change to reflect on the extreme damage that human societies have inflicted upon our environment. However, climate science is a fairly new field of scientific research that does not have much information on our planet's seemingly infinite past. It was not until the 1950s that global warming studies revealed just how much the environment has changed due to human impact. Since then, scientists have learned a great deal about the alarming effects caused by the Earth's changing climate.

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[17] NASA 2024.

b) *Examples of Past Ecological Events.* There are countless examples of previous weather phenomena that have increased in their severity. Also, there have been many instances throughout our environmental history that have placed particular individuals in dangerous situations in relation to the natural world. Weather conditions, such as hurricanes and tropical storms, have increased greatly within the last century. Since 1900, the thirteen most destructive Hurricanes have taken roughly 16,950 lives and caused more than 330 billion dollars in damages.[18] The ecological harm caused by Hurricanes alone is difficult to fully grasp but offers a glimpse of the power that nature possesses. Aside from the increase in extreme weather events, humans have caused many environmental disasters throughout our historical relationship with nature. As discussed in Chapter 1, the continued extraction of nonrenewable resources and the overconsumption of fossil fuels have caused extreme consequences for entire ecosystems. For example, in 2010, an explosion occurred at an oil rig located along the Gulf of Mexico. The Deepwater Horizon drilling platform was the largest oil spill in history, with an estimated 134 million gallons of oil contaminating the Gulf.[19] This resulted in the death and destruction of countless aquatic species and their ecosystems. Furthermore, it cost billions of dollars in resources to clean up this tragic environmental disaster. Years later, the Gulf of Mexico still felt the effects of the oil spill from 2010. Events such as this do not go away slowly, sometimes rarely reverting to their original state.

As noted in the previous section, diseases, illnesses, invasive plant species, and invasive animal species have manipulated the natural ordering of certain ecological systems. Dating back hundreds of years, personal greed and the lust for power have resulted in the complete destruction of habitats and the eradication of entire species. Certain animal and plant species

[18] Brooks 2023.
[19] NOAA, *Deepwater Horizon,* 2010.

contain particular biological characteristics that allow them to adapt to the environmental conditions pertaining to their habitats. A snow leopard has a thick coat of fur in order to survive harsh, colder climates. Palm trees are a significant feature in tropical regions because they cannot survive cold temperatures. Additionally, certain diseases and illnesses were particular to their geographic location. Globalization allowed the transfer of countless toxins and invasive species to unknowingly unprepared cultures and societies. This increase and spread of ecosystem features led to the biological displacement of countless species, ultimately changing the global biosphere as we know it. Globalization began to increase in the nineteenth century following the adaptation of capitalist ideologies, which incentivized the expansion of global trade.[20] Planetary systems have evolved in particular ways to suitably survive their respective environments. Historical implications of trade have led to the correlation between human activity and environmental degradation. New York City and Charleston have experienced this correlation firsthand. Many natural disasters have devasted the metro areas throughout their environmental history. Charleston has been devasted by several extreme weather events, such as Hurricane Hazel, Gracie, and Hugo. Earthquakes, drought, wildfires, and tornados have affected the area heavily throughout the recent history of the city. In New York, similar weather events have impacted the region, causing billions of dollars in damages. Within the last 40 years, there have been 86 confirmed weather-related disasters caused by climate change and environmental negligence. Many urban collectives along the coast have experienced the harsh effects of the climate crisis, which is why environmental conservation efforts must ensue if we hope to mitigate future risks. It is crucial to examine our relationship with nature through a historical lens

[20] O'Rourke and Williamson 2000.

in order to address the most important issues regarding the future state of our planet and their sociopolitical implications.

c) The Anthropocene. How have humans affected the environment throughout history? The idea of the Anthropocene is a proposed geological epoch describing the way in which humans have interacted with the environment, further exasperating the effects of climate change.[21] Paul Crutzen, an atmospheric chemist, coined the term "Anthropocene" in 2000.[22] This term is meant to represent the period in time in which humans have greatly affected the environment around them. While this is a fairly new term and highly debated, its roots span thousands of years into the past. To acknowledge the current state of our ecological crises, it is important to evaluate the past in order to draw similarities among mistakes made throughout history. Examining historical patterns can allow us to conjure up possible predictions about the future with the hopes of living more harmoniously with nature. The Anthropocene Working Group, led by Jan Zalaciewicz, have proposed this inclusion of a new period within the geological time stamp.[22] What is the point of this? Due to climate change being a hotly debated form of science, it is important to establish this crisis we face as factual in order to provide the urgency needed to address this issue. Geology is a widely accepted science that goes hand in hand with the characteristics of the Anthropocene.

The inclusion of a new epoch in time may result in an academic need for ecological change concerning the increasing threat of climate change. An epoch is a subsection within an overarching period of time used to describe historical geological changes on a global scale. A 'golden spike' is a physical manifestation of a change recorded in a stratigraphic section, reflecting a global change phenomenon.[21] Think of this as a marker signifying the start of a new

[21] Lewis and Maslin 2015.
[22] Zalasiewicz et al. 2010.

era in relation to geological events. For example, the destruction of the dinosaurs would mark a 'golden spike,' or global change phenomenon that could be observed in a physical or geological sense. How does this relate to the historical aspect of climate change? Exasperated by human intervention, we must dissect the past in order to create a more sustainable future. Recognizing when humans began to impact the global environment may offer solutions to future ecological crises. History provides us with the tools and methodologies to analyze and explain problems in the past that may be invisible in the present—thus providing a crucial perspective for understanding and solving current and future problems, especially in correlation to the environment.

Simon Lewis and Mark Maslin have proposed several possible start dates that could be attributed to the geological time stamp concerning the Anthropocene. These dates, or periods in time, are as follows: (1) Pleistocene: fire and megafauna extinction; (2) settled agriculture and CO_2 or methane values; (3) Columbian Exchange and 1610 Orbis Spike/decline in CO_2; (4) Industrial Revolution; (5) elevated C-14/radionuclides and the Great Acceleration (1964).[21] The Pleistocene epoch, roughly 11,700 years ago, began with the incorporated use of fire as an important facet of human life. Since fire gives off CO_2, this began to affect the environment on a smaller scale. This may be too far into the past, but it is an important aspect of human intervention to consider. Settled agriculture allowed humans to harvest much larger yields of crops, which required a greater use of land. Flora and fauna began to be displaced due to the expansion of agricultural endeavors. While this may not have been the direct cause of the climate crises we experience today, it was a precursor to the unfathomable amount of land required to feed the current global population. Sadly, while slavery and the oppression of minorities have existed throughout human history, the Colombian Exchange was a major shift in the way the

world operated. The British began to colonize regions of the globe that superseded previous expectations, leading to the disenfranchisement of millions. Diseases and invasive species were transported around the globe, leading to millions of deaths and a decrease in the amount of CO_2 in the atmosphere.[21] This could be considered the start of globalization, which has caused detrimental harm to the environment due to human carelessness.

The Industrial Revolution, mentioned in the previous section, saw the rise of technological advancements that have irreversibly intensified the effects of climate change. The Great Acceleration, first proposed by Will Steffen, is closely related to the effects that WWI and WWII had on the environment in relation to the atomic bombs and heavy machinery used during the war.[22] The advancements that took place during this time killed millions of innocent people and created many ecological crises. The Great Acceleration refers to this period beginning in the 1950s, which saw an exponential increase in population, greenhouse gas emissions, and environmental injustices. Technology was not accessible to every person prior to this period. However, this marked a shift in the way we interact with technology, as it became integrated with many facets of day-to-day life. The Anthropocene start date is debatable, but it offers a critical analysis of the time frame regarding the beginnings of climate change. Examining this geological epoch through a historical lens quantifies the extreme ways in which humans have changed the fabric of our planet.

d) *Charleston's Environmental History.* In order to provide adequate solutions to contemporary problems of climate change, it is imperative that we examine the environmental history of a particular region to learn from past mistakes. As one of the original Thirteen Colonies, the state of South Carolina has an extensive history dating back hundreds of years. Charleston is known for its beauty, culture, architecture, beaches, and extensive historical

nuances. This coastal community offers many natural sources of entertainment and relaxation. Countless beautiful beaches, rivers, and parks are scattered all throughout Charleston and the surrounding counties. Due to this, a large portion of Charleston's economy comes from tourism and the use of its natural resources—which will be discussed in Chapter 3.

However, this is not a recent development, as Charleston has always relied on land usage to support its growth. Devastatingly, much of the city's growth can be attributed to the inhumane characteristics of slavery. Land ownership, plantations, and various trading outposts were a large source of income across the state during the eighteenth century.[23] As one of the first colonialized settlements in America, the economy was largely driven through trade and rice cultivation. Enslaved Africans were forced to work in treacherous conditions, often dying within the first year after being ripped away from their homes. Charleston was North America's largest Transatlantic Slave Trade port of entry—nearly 150,000 kidnapped Africans (40% of all enslaved Africans in North America) arrived through the Charleston Harbor.[24] The plantations scattered throughout the city relied on slavery to increase rice production, which ended up causing the Lowcountry to be the wealthiest region in the world in the late eighteenth century. Although Black individuals made up 70% of the population in 1776, Charleston was home to nine of America's ten wealthiest people (all of whom were white men).[24] The product of slave labor created the wealth of the oppressors in the Lowcountry. Aside from rice cultivation, many of the historical aspects of this city were built upon the backs of enslaved Africans.

Shockingly, the historical use of slavery in Charleston's establishment is largely ignored by local historians in the area. It is important to note that it was slightly difficult to acquire accurate accounts of Charleston's history that included the appalling treatment of enslaved

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[23] Lambert 2021.
[24] Equal Justice Initiative (n.d.)

Africans. The omission of slavery as the prime reason for Charleston's growth is quite alarming, which raises important ethical questions related to contemporary debates of equality within the metropolitan area. In Chapter 4, the many facets of environmental justice are discussed, which only reinforces the need for environmental inclusion when addressing the needs of disenfranchised individuals and communities. The environmental history of Charleston must include the oppression that these communities have faced in order to move toward a more equitable future. Meeting at the intersection between history, culture, and the environment provides a more accurate description of the issues at hand, with the hopes of amending past colonial harms that have been wrongfully inflicted upon marginalized groups.

Charleston is loaded with rich natural resources, greatly contributing to its economic gain. Historically, the city has relied on its surrounding environment in numerous ways, both economically and socially. Located nearly perpendicular to sea level, this metropolitan area has experienced many extreme weather events that have thrown residents for a loop. In the previous chapter, some examples of weather phenomena were discussed, alluding to the severity of the climate crisis. Several hurricanes have devastated the region, causing millions of dollars in damages. Many historical landmarks have been greatly damaged throughout the city's history, which led to the creation of the Preservation Society. Their goal is to preserve the history of Charleston through the maintenance of historical landmarks and environmental conservation efforts. A local law within the city of Charleston restricts the development of high-rise infrastructure projects, stating that no building may be taller than the tallest church steeple. This example alludes to the importance of preservation efforts within the metro area. In 1931, the city

passed the nation's first zoning ordinance—urged by the Preservation Society—to protect historical buildings, landmarks, and natural wonders.[25]

This victory of historical preservation led to the city's re-evaluation of its relationship with the environment. It was at this moment that sustainable development and environmental stewardship became an issue of importance to certain legislators and city officials. Since then, many city board commissioners have focused on preserving Charleston's history through sustainable methods of development. This led to the establishment of many county parks as a place for individuals and tourists to enjoy the benefits of nature and all it has to offer. Nearly 90,000 acres of protected land are designated as rich, natural destinations that visitors and residents alike can enjoy.[26] This modern allocation of land usage dates back to the city's founding principles related to environmentalism. Founded in the late nineteenth/early twentieth century, the Preservation Society became a catalyst for contemporary methods of interacting with the city's extensive and complicated history.

e) *New York City's Environmental History.* Founded nearly 400 years ago, New York has an extensive environmental history that is fascinating to observe. The Dutch first settled along the Hudson River in 1624, naming the colony New Amsterdam. Forty years later, the British took control of the region and renamed the settlement New York.[27] Positioned along the coast, this settlement was in an ideal location because of its access to natural resources and its proximity to major waterways. The port of New York became a major place of commerce and trade among neighboring countries. This led to an economic boom within the region, causing New York to become one of the wealthiest cities in the world. Extensive amounts of untouched

[25] Preservation Society (n.d.)
[26] SC State Parks 2019.
[27] History.com Editors 2022.

real estate led to endless possibilities for development and economic growth. While this is beneficial to societal progress, the largely untouched environment became tainted by human growth.

After the American Revolution, millions of individuals from around the globe immigrated to New York City in search of a better life. Due to this, the metropolitan area quickly became the fastest-growing city in America, with nearly 3.5 million residents in 1898: the biggest city in the world at the time, only second to London.[28] While this extreme growth is not inherently bad, it has led to extensive environmental consequences. One of the main complications throughout New York's history has been land limitations. The island of Manhattan is land-poor but remains heavily in demand because of exponential population growth and extensive economic development.[28] The construction of bridges allowed the surrounding lands to become intertwined together, which led to the uniformity of a connected city. It became a metropolis that imposed human practices and technological advancement in order to control nature, transforming the region into the massive accumulation of capital and human development observable today.[28] One of the most profitable industries, real estate, has been a key factor in steering the city's development. Humanities longing to hold dominion over nature can be examined through the study of New York's history. Ultimately, the environment where this metropolis was settled is not ideal for human survival. Although it provided certain benefits, the dispersion of land masses provided difficult challenges to urban planners. The risk of extreme weather phenomena, including flooding, rising sea levels, hurricanes, and so on, is a direct consequence of building directly along the coast.

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[28] Zimring and Corey 2021.

Even though Central Park is generally perceived to be a natural wonder, it is a product of human design. Frederick Law Olmsted is widely considered to be the father of U.S. landscape architecture, supported by his role in designing one of the world's most famous parks. What was the intention behind this environmental project? There were many varying reasons for this park's establishment, which alludes to the relationship that New Yorkers had with their surrounding environment. "For some, the new park would increase adjacent property values and provide a leisure ground for rides in well-appointed carriages. Most of the city elite, though, offered less self-serving arguments, at least publicly. A large green space would not only cleanse the air of dangerous smoke and miasmas, it would convince the overworked sons and daughters of Puritans to leave their homes and offices, get out in the sunshine and fresh air, and indulge in health-giving leisure. Even more, the park would draw workers and immigrants away from 'dissipating' and 'uncivilized' leisure practices, such as drinking in saloons, gambling, and cock fighting. Outdoors, all New Yorkers could engage in healthy and restorative Victorian nature tourism. Such refined and regenerating recreation would not only heal social divisions and add much-needed culture to a frontier city far from Europe; it would also make citizens more productive workers in the long run."[29] While the intentions of the wealthy remained ambiguously sinister, the psychological benefits of interacting with nature were generally agreed upon. Aside from the many ecosystem services that our planet provides, the aesthetic and spiritual connection to the natural world can be quite healing, leading to a rejuvenation of the soul.

With that in mind, New York has continued developing parks throughout its history. Decades later, Theodore Roosevelt placed emphasis on conservation efforts, which eventually gave rise to later environmental efforts. "It is also vandalism wantonly to destroy or to permit the

[29] Fisher 2011, 27.

destruction of what is beautiful in nature, whether it be a cliff, a forest, or a species of mammal or bird. Here in the United States, we turn our rivers and streams into sewers and dumping-grounds, we pollute the air, we destroy forests, and exterminate fishes, birds and mammals—not to speak of vulgarizing charming landscapes with hideous advertisements. But at last it looks as if our people were awakening."[30] The environmentalist efforts of Theodore Roosevelt helped to shape the way in which we interact with the world around us.

As discussed in the preceding chapter, the Industrial Revolution played a large role in amplifying the effects of the climate crisis. Poor air quality and harsh living conditions led to a change in attitude regarding the importance of environmental justice—although this term came much later, it is an accurate description of the environmental change that many people advocated for. Over half of the city's population was employed in the manufacturing, trade, and transportation industries—the biggest emitters of greenhouse gases. Countless residents and lower-income communities complained about the poor air quality that had run rampant throughout the city. Aside from the air pollutants, the quality of water was quite terrible, raising public health concerns. "The ways in which New Yorkers have interacted with the land, air, water, and each other since 1898 reveal tensions particular to this setting and to urban environments worldwide."[28]

Predating the conservation efforts of Theodore Roosevelt, public health advocates demanded better environmental conditions, especially clean air and safe drinking water. A New York Times reporter in 1871 called for the advanced sanitation of air, land, and water, scathingly denouncing those "responsible for the criminal neglect of the condition of this City."[31] Around this period, numerous social justice groups began to sprout, advocating for widespread change

[30] National Park Service 2016.
[31] Save the Sound 2023.

across many fronts. The labor movements of the late nineteenth/early twentieth century advocated for more sanitary working conditions and better pay. In conjunction, public health organizations fought for clean air and water—something the city desperately needed. These various social organizations fought to improve living conditions and society across an interdisciplinary plane.

In 1892, the City Club of New York was founded to provide a clean water supply to the residents of the surrounding areas.[31] This organization protested the Department of Health and Sanitation's inability to adequately perform its duties, urging the local municipality to use a scientific, intersectional lens when formulating public policy. Nearly a century prior to the environmental movement of the 1970s, New Yorkers were advocating for the same ecological utopia that many contemporary grassroots organizations are fighting for. This alludes to the extensive yet complicated environmental history of the Empire State. Humanity has always relied on the environment; without it, life would cease to exist. The environmentalist efforts observable today draw upon the experiences of our recent ancestors in terms of preserving our ecosystem. It is vital to maintain our relationship with the Earth if we hope to improve the current conditions of our ecological dilemma. Examining the environmental history of a region may allow societal conditions to improve along many fronts through an interdisciplinary approach to amending mistakes from the past.

Chapter 3. The Economics of Climate Change

Addressing the issue of climate change is not so cut-and-dry. Economic feasibility is a critical component when addressing the climate crisis. In order to properly address the issue, sustainable growth must replace our current method of production; as of now, few economically

feasible alternatives exist. Using a multi-disciplinary framework, environmentally feasible solutions will improve quality of life if they are more regularly implemented across a multi-faceted level. The economic system of capitalism requires continual growth in order to sustain itself.[32] Environmentalism is directly juxtaposed to this notion, requiring a significant reduction of industrialized production to provide eco-friendly remedies to the damages inflicted upon our environment. Hence, the inextricable link between climate change and economics manifests itself in society through the form of environmental degradation. The focal cities of this paper offer vastly opposing approaches to understanding this complex relationship. Highly-funded cities, such as New York, are more prepared to address socioecological dilemmas than their counterparts—Charleston. Environmental justice, discussed in the following chapter, unveils the interrelatedness between various sectors of academia in relation to solving environmental complications. This includes operating within an economic system that accounts for all individuals, especially marginalized and disadvantaged communities.

a) *The Empire State.* Statewide, commercial banking is the largest industry in terms of revenue. Portfolio management and investment advice, public schools, hospitals, life insurance and annuities, search engines, colleges and universities, health and medical insurance, open-end investment funds, private equity investment vehicles, and hedge funds investment vehicles round out the top ten biggest industries within the state, based on total revenue.[33] With a GDP of 2.1 trillion dollars, the state of New York experiences an abundance of wealth. Countless millionaires, along with several billionaires, reside scattered throughout the state. The Hamptons, which are located on Long Island, are home to some of the wealthiest individuals in the country. However, this does not mean that these individuals do not experience the effects of climate

[32] Magdoff and Foster 2011.
[33] IBIS World, *New York,* (n.d.)

change. In fact, many areas within the county area face a severe threat of extreme flooding. Sea levels have continued to rise over the past several decades, which has greatly impacted the residents of Long Island. Many of the homes and establishments along the coast are prone to extreme water damage due to their proximity to the ocean. Communities within the peninsula have proposed renewable methods of energy production, urging governmental institutions to aid in protecting their property. Despite the massive amounts of wealth in the region, the climate crisis affects every individual in some capacity. It is critical to allocate the share of extreme wealth into sustainable methods of infrastructure development in order to curb the effects of global warming, hopefully mitigating the effect that rising sea levels have on the region.

As the largest city in the United States, New York experiences exponential economic activity and is considered to be one of the world's financial capitals. Finance, health care, academia, technology, biotechnology, real estate, tourism, and insurance are some of the biggest industries that form the basis of New York's economy. The financial industry handles astronomical amounts of money on a daily basis, often in conjunction with financial institutions around the globe. Wall Street, located in the Financial District in lower Manhattan, is one of the world's trading centers, with thousands of individuals trading company stocks daily. Millions of visitors—one of New York's largest economic sectors—from across the globe dump billions of dollars annually into the city's economy. The Empire State Building, Central Park, Times Square, Grand Central, and Madison Square Garden are iconic staple pieces in New York's image, greatly increasing the economic benefits accrued from these architectural feats. Additionally, New York is the nation's most important hub for mass media, journalism, publishing, and the arts. The performing arts are an exceptionally beneficial industry to New York, drawing in billions of dollars annually. As of 2022, New York City had a GDP of 1.2 trillion dollars.

Unsurprisingly, it is one of the largest economies in the world while remaining the largest economy within the United States. Insurmountable sums of money flow throughout the city's economy daily, which, in turn, supports the country's economy and provides countless economic benefits to other countries around the globe. The city acts as a hub of information across numerous industries, which is critical for the survival of the global economy. The table below examines the employment trends in varying New York City industries based on data from the past four years. While some industries have flourished, others have suffered; a large factor that has affected the economy on a global scale was the COVID-19 Pandemic of 2020. Fortunately for New York, the city has made a relatively successful rebound, which cannot be said for many urban collectives around the globe.

NYC Employment by Industry

INDUSTRY	EMPLOYMENT (thousands)							
	Feb 2024	Jan 2024	Previous Month Change	Year-Over-Year Change	Jobs Lost, Pre-Pandemic to Trough	Jobs Regained, Trough to Feb 2024	Percent of Lost Jobs Regained	Job Change, Pre-Pandemic to Feb 2024
FIRE	**503**	**503**	**0.0%**	**0.8%**	**25,600**	**41,200**	**160.6%**	**15,500**
Finance & Insurance	368	368	0.2%	0.9%	10,800	30,600	283.5%	19,800
Securities	197	196	0.1%	-0.5%	5,600	19,600	347.1%	13,900
Banking	110	109	0.8%	2.6%	3,700	8,500	228.8%	4,800
Other	62	62	-0.5%	2.0%	1,400	2,500	175.2%	1,100
Real Estate	134	135	-0.7%	0.5%	16,200	11,900	73.7%	-4,300
SERVICES	**2,848**	**2,841**	**0.3%**	**1.3%**	**641,600**	**733,400**	**114.3%**	**91,800**
Information	222	222	0.1%	-6.7%	35,400	28,600	80.7%	-6,800
Professional & Business	786	787	-0.1%	-2.0%	101,500	106,600	105.1%	5,200
Professional, Scientific & Technical	454	455	-0.2%	-3.4%	37,500	45,300	120.8%	7,800
Management of Companies & Enterprises	75	75	0.1%	1.5%	11,100	13,700	123.5%	2,600
Administrative & Support	257	258	-0.1%	-0.5%	57,500	52,200	90.8%	-5,300
Educational	252	254	-0.5%	-4.6%	27,700	23,600	85.4%	-4,000
Healthcare & Social Assistance	969	959	1.0%	8.0%	116,000	261,200	225.1%	145,100
Arts & Entertainment	88	87	1.8%	4.4%	55,700	48,300	86.6%	-7,500
Accommodation & Food	348	350	-0.5%	1.2%	268,600	242,700	90.3%	-25,900
Other	182	182	0.1%	0.3%	66,900	52,700	78.8%	-14,200
TRADE	**433**	**433**	**0.1%**	**-2.0%**	**147,300**	**94,700**	**64.3%**	**-52,600**
Retail	303	303	0.0%	-2.3%	115,800	73,000	63.1%	-42,700
Wholesale	130	130	0.1%	-1.5%	31,600	21,700	68.6%	-9,900
MANUFACTURING	**56**	**56**	**0.5%**	**-2.3%**	**28,100**	**18,500**	**65.9%**	**-9,600**
TRANSPORTATION AND UTILITIES	**150**	**149**	**0.6%**	**0.0%**	**39,700**	**39,700**	**100.1%**	**0**
NATURAL RESOURCES, MINING AND CONSTRUCTION	**137**	**138**	**-0.5%**	**-7.0%**	**74,900**	**49,100**	**65.6%**	**-25,800**
TOTAL PRIVATE	**4,127**	**4,119**	**0.2%**	**0.5%**	**946,200**	**965,600**	**102.0%**	**19,400**
GOVERNMENT	**575**	**581**	**-1.0%**	**1.7%**	**22,100**	**2,400**	**10.9%**	**-19,600**
TOTAL (PRIVATE + GOVERNMENT) NYC	**4,702**	**4,700**	**0.0%**	**0.6%**	**956,400**	**956,100**	**100.0%**	**-300**

Note: *Numbers may not add to totals due to rounding. Employment trough is April 2020 except for the following sectors, for which the trough is July 2020: FIRE (inclusive of all sub-sectors), Information, and Government*

New York City Economic Snapshot as of 3.28.24

Figure 3. NYC employment by industry, including the growth within each sector, 2024.

At an average elevation of 52 feet above sea level, New York City remains highly vulnerable to flood damages caused by rising sea levels. The negative economic impacts of this quandary are significantly relevant when assessing new infrastructure development projects. Considering the effects of Hurricane Sandy, billions of dollars were spent attempting to fix the damages caused by natural weather phenomena. "Properties that were damaged by Sandy in 2012 suffered a significant price drop in NYC by 17–22% immediately following the hurricane. Properties in a flood hazard zone that were not damaged by Sandy also showed a price penalty by 8% in the year 2017 due to increased risk perceptions of the natural disaster."[34] The creation of sea walls or the extension of land surrounding the five boroughs could alleviate a portion of the flood vulnerability facing lower Manhattan. An initiative in 2004 led to the creation of the New York City Climate Change Task Force, "with the mission to ensure that all aspects of departmental planning take into account the potential risks of climate change on the city's water supply, drainage, and wastewater management systems and also integrate GHG emissions management to the greatest possible extent."[35] Such initiatives incentivize the implementation of green infrastructure projects in place of unsustainable methods of economic expansion. Operating within the sphere of environmentally focused economic expansion is critical when addressing the climate effects that coastal communities, in particular, face. Maintaining the city's environmental integrity and planning for the future will require a new method of approaching economic output. Sustainable development remains a largely untapped sector with unlimited potential if used correctly. Green jobs are the fastest-growing job sector in the country due to the increase in demand for environmental restoration efforts. The city of New York possesses innumerable sums of money, which could be applied towards developing sustainable projects.

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[34] Kyum Kim 2020.
[35] Solecki 2012.

Despite the insurmountable forms of economic potential within New York, the wealth disparity remains increasingly alarming. In terms of population, the lower and middle economic classes far outweigh the wealthy economic class. The polarization among economic classes increases the number of individuals hovering around or below the poverty line. Although the median price for a home was $650,000 in 2020, the median household income was $70,000.[36] Comparing the national average, the median price for a home was $250,000 in 2020, while the median household income was $67,000. This disparity has only continued to increase in recent years, with many marginalized and lower-income communities being forced out of their neighborhoods due to outlandish living costs. The exponential increase in property values and living costs is due to numerous reasons, including the limited available real estate within the metro area. This raises issues related to social justice, which is an inseparable facet of environmentalism. An economic re-evaluation of the city's inner workings must align with ecological practices in order to curb the potential loss of future economic gain. In the figure below, the area highlighted in green represents the societal foundations we must aim to reside in. To protect the future, it is imperative to alter current economic methods of fiscal output to limit the drastic changes humanity has made to the ecosystem.

[36] Federal Reserve Bank of New York 2024.

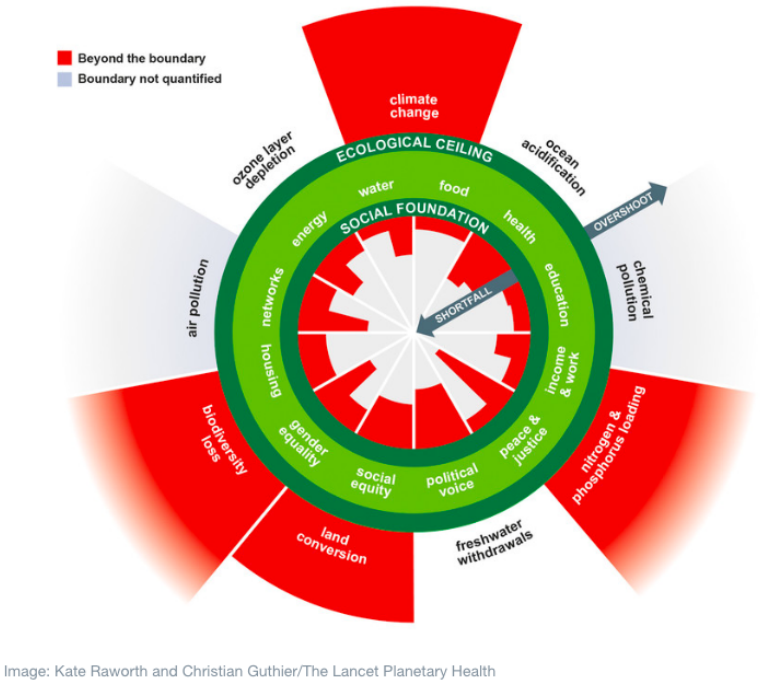

Figure 4. A representation of planetary boundaries, including the socioeconomic conditions of society. The area in light green represents the space in which society should operate in.

b) *The Palmetto State.* Charleston, the largest metropolitan area in South Carolina, is responsible for much of the state's economic activity. In recent decades, many northerners have slowly begun to migrate south to enjoy the warm weather, which nearly lasts year-round. This has led to an exponential increase in the region's economic activity. Many industries within the region have experienced a boost in economic gain within recent decades. As of 2022, the state of South Carolina had a GDP of 226.42 billion dollars.[37] The ten largest industries within the state are as follows: hospitals, new car dealers, automobile and light-duty motor vehicle manufacturing, gas stations and convenience stores, professional employer organizations, warehouse clubs and supercenters, supermarkets and grocery stores, commercial banking, life insurance and annuities, and health insurance. Many of these industries are located throughout

[37] IBIS World, *South Carolina,* (n.d.)

the state, with many headquarters located in Charleston. While the GDP of Charleston is unknown, the GRP (gross regional product) of the region is 51.1 billion dollars. GDP is used to measure economic development in comparison to other countries, while GRP is used as a measurement between regions or the national economy. Within the Lowcountry, the median household income is $68,000.[38] The wealth disparity in this region is much less severe as opposed to that of New York. This is largely due to the recent boom in economic activity within the metropolitan area, as many business sectors have grown immensely. The figure below indicates the largest employment sectors within the Charleston area.

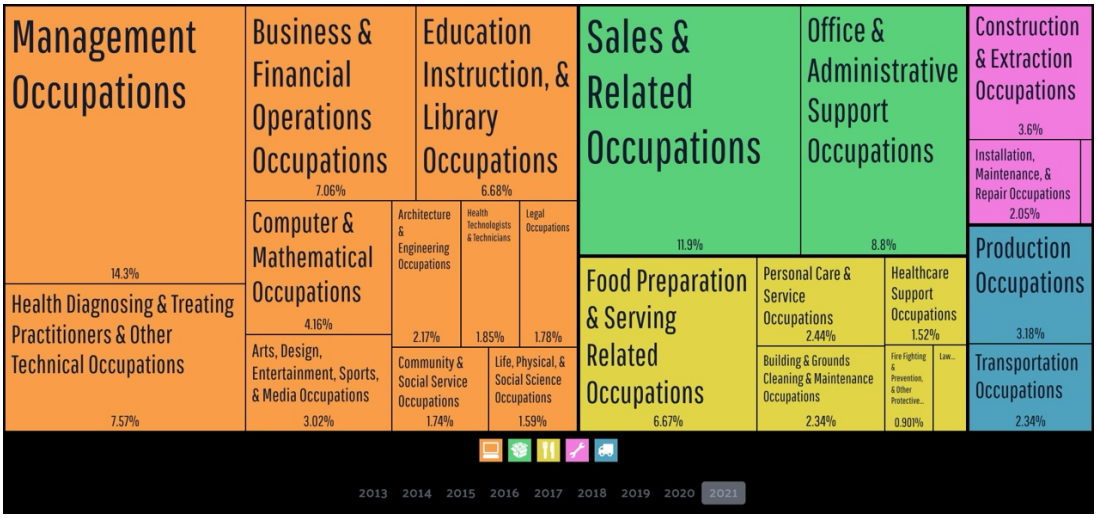

Figure 5. Economic data on the largest employment sectors within the Charleston area, 2021.

Conversating with the local natives of Charleston revealed a complicated history in relation to external economic factors. The county area was a fairly small town, with most of the locals having generational ties to the land. Prior to Hurricane Hugo in 1989, Charleston was a largely unknown coastal collective. Many individuals came from varying states following this natural disaster to aid the affected region. At the time, many northerners and out-of-state

[38] Charleston County Economic Development (n.d.)

residents began to marvel at the city's natural beauty and desirable climate. Thereinafter, Charleston's economy began to boom following the relocation of out-of-state residents. Ultimately, this led to the city's establishment as a tourist hotspot, causing an increase in annual economic activity.

The key industries attributed to this growth include aerospace, automotive, defense, tech, life sciences, and logistics.[38] Boeing, one of the largest aerospace manufacturers, relocated their production facility to North Charleston, greatly altering the economy. Many individuals struggling to find work were able to acquire a steady mean of income from the relocation of this industry, which employs over 7,500 individuals from the surrounding area. Boeing contributes over $4 billion dollars of total annual output to Charleston's economy.[38] Although this industry greatly increases CO_2 emissions, Boeing is focused on developing alternative methods of fuel usage that emphasize renewable energy and emissions reduction. Adapting sustainable production methods in relation to aviation would significantly improve ecological conditions within the tri-state area. Additionally, the transportation and vehicular manufacturing industries produce excess amounts of CO_2 emissions due to the size of their economic production. As discussed in Chapter 1, these industries are the second largest polluters, only behind energy consumption. Similar methods of sustainable development that are used in the production of Boeing aircraft could be applied to vehicular development as well. Many companies have used technological research to develop electric-powered vehicles, which would drastically curb pollution levels.

Historically, South Carolina has been a natural resource-based economy, receiving fiscal gains from iron production in the Upcountry and naval stores production in the Lowcountry.[39]

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[39] Willis and Straka 2016, 2.

The Lowcountry encompasses Charleston and its surrounding counties, while the Upcountry contains the regions in the northern part of the state. Due to the state's abundance of natural resources, economic output related to these industries has increased dramatically. Over the last decade, the collective economic contribution of South Carolina's natural resource-based sectors has grown by 15%. There is an abundance of untouched real estate throughout the metro area, greatly contributing to this increase. As the population of this urban collective continues to grow, the possibilities of economic gain run parallel to this growth. There are countless parks throughout the region that provide numerous ecosystem services vital to human development. Annually, the natural resource-based sectors contribute $33.4 billion dollars of economic activity and supply 218,719 jobs to the state's economy.[40] However, many of these resources remain highly vulnerable to the effects of climate change. The city of Charleston is located only 13 feet above sea level, with many areas residing below sea level. After a moderate rainstorm, the city faces economic consequences due to the environmental instability attached to the region's location. In extreme weather conditions, such as hurricanes, billions of dollars in damages can ensue due to Charleston's extreme flood vulnerability. As a rapidly expanding city, Charleston faces unlimited economic potential if the management of its resources is meticulously cared for. It is paramount to incorporate sustainable research and development methods when assessing potential economic avenues for the city to maintain its path of fiscal development.

c) *Environmental Economics.* How are economics and the environment related? As previously mentioned, the economic system of capitalism requires continual growth in order to sustain itself. Environmentalism goes directly against this notion. Ecological solutions require an extreme cutback of current emission levels. A new method of economic development must

[40] Willis and Straka 2016, 18.

replace our current methods of capital production in order to curb the number of pollutants present in the atmosphere. A brief history of climate change was discussed in Chapter 2, which highlights the ecological changes that have occurred due to human activity. Capitalism has exasperated the climate crisis through means of mass production. Consider the fashion industry as an example. Valued at over two trillion worldwide, the production of clothing contributes immensely to the accumulation of wealth pertaining to corporate branding. There are countless fast-fashion brands that provide cheap, inexpensive clothing to a large portion of the global population. However, the material output used to produce these goods is extremely unsustainable. The life cycle of fast-fashion clothing is expeditiously quick, with most of the materials dissipating within a few months of purchasing. These materials are toxic to the environment and end up wasting away in landfills. This example provides a glimpse into the detrimental effects that capitalism has on ecological conditions.

Industrialization, while not inherently bad, is a catalyst of environmental degradation. In order to effectively address these issues on an economic scale, the system in which we operate must evolve. Under the umbrella of economics, environmental economics is the study of the cost-effective allocation, use, and protection of the Earth's natural resources. Transitioning to this framework of analysis using environmental indicators could provide feasible alternatives to economic advancement that align with environmental preservation. Environmental indicators are simple measures that tell us what is happening in the environment, including the societal implications that follow. This framework of analysis provides a more practical and economical method of evaluating the complexities of our ecological dilemmas. To measure the level of development of a country, environmental economists use the following indicators: 1) number of clean air days, 2) minimum level of waste, 3) nature-based environmental designs, 4) percentage

of population using potable water, 5) percentage of population using sewers, 6) percentage of population using public transport or carpooling, 7) percentage of prime agriculture land, 8) percentage of households participating in recycling programmes, 9) tons of hazardous waste generated annually, 10) tones of per capita of solid waste generated annually, 11) tons of toxic release annually, 12) number of institutions dealing with environmental issues, 13) number of environmental education classes in public and private academic institutions, 14) legal environmental structure, 15) awareness among the people about collective benefits of clean environment, 16) people sensitivity to pollutions, 17) nature of waste management system, 18) budgetary allocation for environmental projects, 19) volume of the use of chemicals and chemical fertilizers, 20) level of health hazards.[41] It is much more feasible to address each facet individually rather than attempting to tackle the issue's genesis in its entirety. The figure below is an example of a methodological approach to managing the formation of sustainably innovative products. Incorporating similar methods of environmentally focused economic growth would dramatically decrease the amount of greenhouse gas emissions caused from the production of goods and services.

[41] Awan 2013.

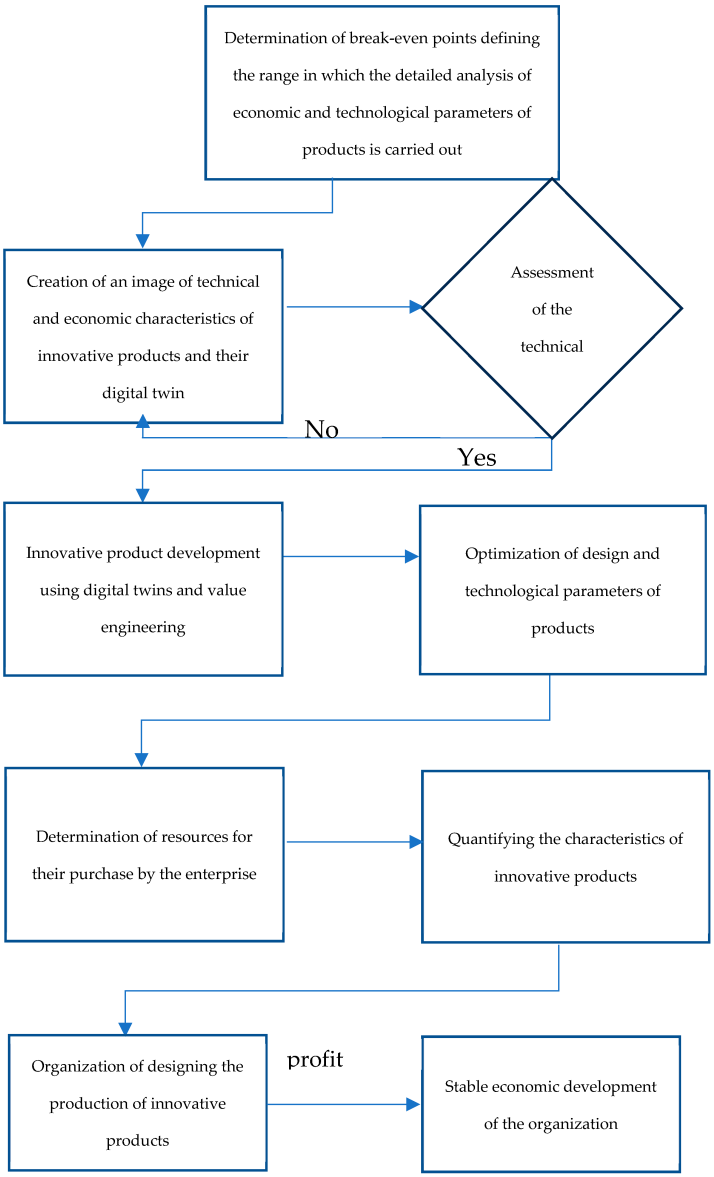

Figure 6. Algorithm of methodological tools for managing the formation of technical and economic characteristics of innovative products, 2023.

As previously mentioned, ecological crises include the social ramifications of human-caused climate change. The environmental indicators listed above allude to the complexity of addressing such issues. A typical characteristic linked to all forms of economics is the measure of social welfare. “Many economists do give more attention to measures of aggregate social welfare than to measures of the distribution of the benefits and costs of policies among members of

society. The reason is that an improvement in economic efficiency can be determined by a simple and unambiguous criterion—an increase in total net benefits."[42] Environmental economics emphasizes the complex relationship of social welfare, which is the measure of net benefits correlated to ecological conditions—that being the quantifiable data associated with the amount of financial aid received by poor or disadvantaged communities. Simplified, social welfare is a measure of the economic status of every individual within a society. This is not a measure of climate reparations, but it alludes to the state of human populations against a variety of factors. It is very unlikely that the economic system of capitalism will evolve despite increasing ecological harms. This branch of economics acknowledges this fact but does not shy away from the negative impacts of non-renewable resource extraction and the overproduction of physical goods. It operates within contemporary society in the hopes of alleviating environmental burdens caused by overproduction and overconsumption. Garrett Hardin's *Tragedy of the Commons* explains this relationship by highlighting the features of a common-pool resource—a finite resource that is available to everyone but will eventually dissipate.[43] In this sense, the environment acts as a common pool resource because every individual has access to its ecosystem services. Addressing economic development and the system of capitalism through an ecological lens could allow new solutions to arise in order to curb pollution.

Using an interdisciplinary lens, it is possible to discover feasible methods of producing industrialized goods that focus on existing harmoniously with the environment. Engineering, architecture, urban planning, and the manufacturing of goods can emphasize sustainability if new methods of production are acquired. A fundamental aspect of environmental economics is research and development, which is focused on technological advancements regarding

[42] Fullerton and Stavins 1998.
[43] Hardin 1968.

sustainable development. Potential projects would include the social, economic, and environmental dimensions of development. Global Urban Development lists the four core objectives of sustainable economic development, known as the Four Greens. Green Savings encourages businesses, families, communities, and governments to cut costs and save money by efficiently using renewable resources and by reducing and reusing waste, with the goal of all businesses becoming Green Businesses. Green Opportunities relates to the growth of Cleantech companies, jobs, and incomes through business development and the expansion of markets for products and services that conserve natural resources and prevent pollution. Green Talent refers to the investment in the fundamental assets of education, research, technological innovation, and modern entrepreneurial and workforce skills. Green Spaces promotes eco-smart development that features low-impact, mixed-use, resource-efficient design and utilizes multi-modal transportation, sustainable infrastructure, and green energy to protect and enhance the natural and built environment, leading to communities and regions that are more attractive, livable, healthy, vibrant, prosperous, and productive.[44] The table below illustrates the benefits of climate action, which unveils the many positive externalities of sustainable economic development.

[44] Hurd Nixon and Weiss (n.d.)

Co-benefits from climate action – for illustration, not comprehensive					
Policy goal	Details/actions	Health	Economic	Social	Resilience
Energy use					
Shift to renewable energy use	E.g. encourage switch to renewable energy use for industry and households	Significant health benefits from reduced particles in the air, especially when replacing coal power plants and indoor wood or coal stoves	Reduction in energy bills; reduction in dependence on fossil fuels can provide stable foundations for busines ses and households to budget their energy expenditure		Resilience to future energy price increases and overheating; reduces vulnerability to wider geopolitical events; improves energy security and reliance on energy imports; reduces risk of conflict over access to resources
Transport					
Discourage private cars from city centres and encourage car-sharing	E.g. congestion charges, parking levies	Health benefits linked to improved air quality; reduction in premature deaths and diseases	Improvements in productivity from reduced congestion and improved health	Reduced congestion can improve quality of public transport services	Reduction in dependence on fossil fuels and protection from potential price increases
Encourage shift to EVs	E.g. invest in EV charging stations, replace existing public transport fleet with EVs, licensing regulation for taxis and other vehicles	Health benefits linked to improved air quality (see above)	Improvements in productivity from reduced congestion and improved health		Reduction in dependence on fossil fuels and protection from potential price increases
Encourage cycling and walking	E.g. building of cycle lanes, cycle-to-work schemes, building of pedestrian zones	Health benefits linked to improved air quality (see above); mental and physical health benefits from exercise for individuals	Reduction in public health costs from reduction in air pollution and associated health benefits; improvements in productivity	Reduces inequalities between those who can and cannot afford a car	Reduction in dependence on fossil fuels and protection from potential price increases
Buildings					
Improve energy efficiency	E.g. enforce minimum energy efficiency standards, subsidies to encourage retrofits	Reduced ill health through cold homes, increased well-being from access to warmer and more comfortable homes	Savings on fuel bills, especially for energy importers; improvements in productivity from improved health; improvements in housing affordability thanks to reduced cost of repairs	Reduced fuel poverty; improved social mobility through improvements in ability to study at home; protection from vulnerability to energy price increases	Resilience to future energy price increases and overheating; reduces vulnerability to wider geopolitical events; improves energy security and reliance on energy imports; reduces risk of conflict over access to resources
Green spaces and land use					
Increase tree cover and green spaces		Improves air quality; improves mental health and well-being	Increases house values; reduces risk of disruption in economic activity from flooding	Provision of a public good to those not able to afford properties with a garden; benefits to vulnerable groups from heat stress (including elderly and children)	Reduces risks of flooding; contribution to protection of biodiversity
Diet					
Alignment with WHO recommended diet	E.g. incentives for reduction in meat intake and shift to plant-based diet	Improvements in individuals' health and increase in life expectancy/reduction in premature mortality rate	Reduction of spending on public health		

Figure 7. Co-benefits from climate action. This includes policy goals, details/actions, health, economic factors, social factors, and climate resiliency, 2022.

Coastal cities such as Charleston and New York could benefit from climate adaptation measures—hard infrastructure, green infrastructure, increased adaptive capacity, and privatized solutions. Such measures could address issues of flooding, storm surges, and other weather phenomena. "Overall green infrastructural projects preserve accessibility to natural amenities and recreational opportunities, as well as provide a similar function of planned retreat strategy by creating room to mitigate adverse impacts of hurricanes."[45] Raising land-elevation levels and implementing storm barriers could limit the economic damages caused by flooding and increased precipitation. Sustainable resource extraction methods could provide power to the electrical grid pertaining to each city if they utilized the surrounding environment. Implementing wind, solar, geothermal, and hydraulic forms of renewable energy could exponentially decrease the amount of GHG emissions caused by non-renewable energy extraction. While these forms of energy

[45] Kyum Kim 2020, 13.

installation are expensive in the short run, they are very profitable in the long run. However, governmental subsidies could be provided in order to offset a portion of the initial costs. Through the use of innovative technological advancement, environmental conditions could improve while simultaneously boosting economic gain. It is imperative that sustainable economic development replaces current methods of societal growth.

Chapter 4. Politics, Society, and the Environment

An economic and historical analysis of climate change, in previous chapters, has begun to unveil the complexity of environmental crises. Ecological solutions must include the societal features of the climate crisis to adequately address the issue along a multi-dimensional plane. Political and governmental actors possess the ability to enact change for the betterment of society, including correcting past environmental degradation and its societal implications. An increase in environmental policies and rigorous corporate regulations could improve social welfare (related to the environment) in numerous ways. The interwoven relationship between politics and the environment has become increasingly evident through the cross-examination of Charleston and New York City's political demographic. The interrelatedness between politics, society, economics, and the environment is discussed extensively in this chapter to unveil the complexity of our socioecological dilemma; environmental crises must be addressed as multi-faceted issues in order to adequately provide feasible solutions.

a) *Climate Resiliency—Charleston.* Charleston, located along the coast, remains highly vulnerable to the effects of climate change. Situated fairly close to sea level, Charleston faces extreme susceptibility to flood damages caused by rising sea levels. This places tens of thousands of individuals at an economic disadvantage due to unstable ecological conditions.

Extreme weather events, such as hurricanes or tropical storms, have intensified throughout recent years, causing extreme economic damage. Charleston is the largest city in South Carolina—by far—which alludes to potentially devasting economic effects state-wide unless change occurs. Have any efforts been made to address this issue before reaching irreversibility? State-wide, there are no climate resiliency plans or adaptation measures currently in place. This is quite alarming, considering the impact that climate change has on the state of South Carolina. Numerous factors have influenced this standstill of environmental legislation, which will be discussed in greater depth throughout this chapter. However, the city of Charleston has several climate resiliency plans in place to provide ecological support to the surrounding communities.

The Mayor's Office of Resilience, Sustainability, and Emergency Management addresses climate change from a holistic approach to understand the threats, risks, and interdependencies between systems, people, and policy.[46] Individuals within this institution place an emphasis on environmental education—a critical component of ecological preservation—along with raising awareness of the extremity of the climate crisis. As a primarily republican state, environmental concerns begin to dissipate within the political climate—legislators' stance on the issue remains ambiguous. Consequentially, this has led to general negligence from the public on whether or not climate change is an important focal point in policy formulation and implementation. Despite this, a proposed initiative in Charleston was adopted in May 2021 and is a 5-year strategic framework to reduce carbon pollution. The Climate Action Plan includes 12 strategies and 51 action items for the City of Charleston and the entire community to pursue over the next five years with the hopes of reducing emissions by 56% by 2030 and net zero by 2050.[46] Prescribed in the proposal, this strategic framework highlights several areas of specificity that require

[46] Charleston SC Mayor's Office (n.d.)

extensive planning in order to meet quotas of emissions reduction. Infrastructure, transportation, waste, and carbon sinks are listed as the four main areas of strategic policy planning that would improve the city's relationship with the surrounding environment. Chapter 1 focuses on programs, projects, and policies to reduce emissions from energy use in existing infrastructure. Chapter 2 focuses on programs, projects, and policies to reduce emissions from transportation, which is the second largest GHG emitter citywide. Chapter 3 focuses on programs, projects, and policies to reduce emissions from waste. While the exact amount of GHG emissions caused by waste is unknown, there are many ecological benefits to reducing waste and overconsumption. Chapter 4 focuses on programs, projects, and policies that help pull carbon dioxide out of the atmosphere to sequester and store it.

If net zero emission goals are to be achieved, reducing GHG emitters *alone* is not enough to reverse ecological fallibility; carbon must *also* be removed from the atmosphere. This may be achieved through the Research and Development of new technological methods of carbon extraction, which is an important aspect of environmental economics. The Climate Action Plan promotes meticulous planning while equivocally failing to implement legislative efforts that are applicable and noticeable throughout the region. The ecological data and socioeconomic research gathered by the team behind this plan is quite impressive. It offers a beacon of hope surrounding the feasibility of future ecological solutions, with a focus on inclusion and equity—a critical factor when addressing environmental crises and their sociopolitical implications. Despite Charleston's Climate Action Plan, there are few legislative policies that provide concrete, methodological approaches to achieving their target goals in an economically feasible way. Although this climate resiliency effort has been a relatively new development, many of the goals set out by this plan have yet to be put into action. This is due to the political climate and

legislative actors located throughout the city, as well as the state. Environmental negligence from such actors has made it difficult to achieve the goals set out by the Climate Action Plan. Since its establishment nearly three years ago, very little progress has been made in terms of implementing these climate resiliency plans into action. Charleston County has been drafting various environmental action plans since then, but none have stuck. Representatives within the local government often shy away from environmental concerns, which impedes the success rates of these climate action plans. As previously discussed, Charleston relies on tourism and coastal activities to support its economic growth. Therefore, it would be in the best interest of all parties to bring ecological solutions to the forefront of policy formations. Environmental policy and climate resiliency plans must reside at the forefront of legislative processes within the city if ecological solutions are to be implemented in a substantial capacity.

b) *Climate Resiliency—New York.* New York City, the largest metropolitan area in the country, offers endless opportunities to residents and visitors alike. Considered to be one of the financial capitals of the world, NYC witnesses unfathomable sums of money flowing throughout its economy on a daily basis. Despite this, New York experiences the effects of climate in the same fashion as other cities located along the coast. Due to this, it is critical to implement climate resiliency plans in order to curb some of the effects of climate change. Environmentally focused legislation, city and state-wide, has become a focal point in political debates and policy formations. Why is this? The political demographic of a region heavily influences the types of policies that are enacted by governmental officials. Environmental policies and regulations are far more likely to be implemented in New York than in Charleston, which will be thoroughly discussed in the proceeding chapter. Several institutions and governmental programs have been erected with the task of addressing the climate crisis, along with its societal implications, which

sheds light upon the complexity of solving environmental concerns. The NYC Mayor's Office of Climate and Environmental Justice, the New York City Council's environmental legislation efforts, the New York State Department of Environmental Conservation, and the New York City Panel on Climate Change are among these governmental institutions solely focused on environmentalism and environmental justice. Aside from the legislative and communal work these organizations achieve, public image and mitigation efforts by these groups offer a sense of hope that environmental change is possible—and feasible.

State-wide, the Department of Environmental Conservation (DEC) prioritizes three overarching focal points. Community engagement works to inform, support, and empower local governments and communities as they reduce greenhouse gas emissions and adapt to unavoidable impacts; greenhouse gas mitigation uses the best available science to develop regulations to reduce greenhouse gas emissions, establish greenhouse gas accounting practices, conduct research and demonstration projects, and to aid in the development of climate change plans; climate change adaptation and communication conducts climate change impact analysis, coordinates climate adaptation planning, coordinates communication and public outreach, and supports the development of climate change resilience and adaptation policies and strategies to help New York respond to current and future impacts of climate change.[47] These focal points offer a guideline for incorporating sustainable practices into everyday life. While these goals remain ambitious, many climate change statutes have been signed into law that attempt to limit the amount of greenhouse gas emissions found in the atmosphere surrounding the state. The Climate Leadership and Climate Protection Act (Climate Act) was signed into law in January 2019 and became effective on January 1st, 2020. This Climate Act includes emission reduction

[47] New York State, *Response to Climate Change,* (n.d.)

quotas linked to specific deadlines: a 40% reduction in GHG emissions from 1990 levels by 2030, an 85% reduction by 2050, and 70% renewable energy sources by 2030.[47] Although there is a long way to go, the state of New York has made slight progress on some of the goals set out by this institution. As one of the most ambitious Climate Acts in the nation, NY is at the forefront of environmentally focused legislative efforts. This could allow other cities to follow suit, dependent on the success rates of these policies.

Within the city of New York, several legislative efforts to enact environmental policies have been accomplished with relatively high success rates. In April of 2022, an environment-focused legislative package included the following bills: Citywide Curbside Organic Collection; Accelerated Phase Out of Dirty Fuel Oils; Electric Vehicle Chargers in Parking Lots; Encourage Community Recycling; Citywide Greenway Master Plan; Tree Pit Plantings; Expanded Benchmarking of Buildings.[48] As an extension of the state-wide Climate Act, these city-specific bills, which target various areas in need of improvement, aim to reduce greenhouse gas emissions by developing sustainable architecture. New York is surrounded by nature, which can be incorporated more regularly into developmental efforts. Issues of waste management and vehicular congestion are key components of environmental degradation. Highly concentrated amounts of CO_2 are emitted into the atmosphere from the chemical discharge needed to fuel various forms of locomotion. Hence, the accelerated phase-out of dirty oils and incentivizing electric vehicle ownership is a critical aspect to consider when mitigating the climate effects experienced in New York City. Although it may take time to observe these bills in action, it is an excellent starting point. Aside from the Council's work, the Mayor's Office currently has 23 initiatives in place to address the varying aspects of climate change. AdaptNYC identifies the

[48] New York City Council 2022.

climate hazards that pose the greatest threats, the populations and neighborhoods that are most at risk, and the resiliency and adaptation measures the city is taking to protect residents, property, and infrastructure.[49] AdaptNYC is an extensively thorough initiative focused on adaptation methods, sustainable infrastructure development, and environmental justice.

A critical component of solving environmental crises is the inclusion of those most affected by the repercussions of climate change. Marginalized communities and lower-income individuals experience the effects of climate change to a more severe degree than others. This initiative includes these societal facets of environmental degradation, taking into account the complexity of such issues. Although this important aspect of social justice is mentioned in AdaptNYC, very little information surrounding the inclusion of these communities is mentioned. Aside from this, the Mayor's Office includes several focal points of climate action that could improve conditions within the city. In recent years, extreme weather events have increased in frequency. Extreme rainfall has greatly affected the New York area and will only worsen over time. In the past 100 years, sea levels have already risen over a foot. This number is only going to increase over time, with estimates up to two feet by 2050. It is not a matter of *if,* it is a matter of *when.* Using climate science and data, researchers and legislative actors are able to work alongside one another to formulate adequate solutions that address the climate crisis from an intersectional approach. Proposed solutions include extreme heat adaptation, coastal flood adaptation, extreme rainfall adaptation, and social resiliency. Although these adaptation methods focus on varying aspects, there is a great deal of overlap within their proposed policy recommendations. A common thread among these subgroups includes the importance of green infrastructure development when assessing future developmental projects. Expanding tree

[49] NYC Mayor's Office, *Climate Change and Environmental Justice,* (n.d.)

canopy, protecting and expanding natural coasts, cloudburst management, green infrastructure and stormwater management, and sewer upgrades are several goals that AdaptNYC is focused on accomplishing.[49] Addressing climate change through a multi-faceted lens across various disciplines is necessary in order to provide equitable solutions that include those disproportionately affected by this phenomenon.

c) *Politics, Law, & Policy Formation.* Investigating the causal relationship between political party ideologies and environmental policy implementation emphasizes the important role that politics has in environmental conditions. Through policy formation and enforcement, it is possible to mitigate the effects of climate change. In Chapter 1, this relationship was briefly touched upon. Socioeconomic and political issues differ among political parties in terms of their engagement with each subject. Left-leaning individuals typically focus more on social justice, while right-leaning individuals typically focus more on economics. Nationwide, the percentage of individuals identifying with a particular party remains nearly parallel. As of April 2024, 49% of registered voters are Democrats or left-leaning, while 48% of registered voters are Republicans or right-leaning.[50] These numbers were spatially separated until relatively recent administrations. The partisan balance has tightened in recent years, leading to an equal split among opposing political views. Political tensions within the nation have intensified in recent years due to the regression in social advancement. Underrepresented individuals and minorities have witnessed many oppressive policies being implemented within their communities. The outcome has manifested itself in the ways tied to environmental injustices, which will be discussed in the latter portion of the chapter. The continued polarization of political identities within the United States has greatly influenced the way in which societal relations occur.

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[50] Pew Research Center 2024.

Opposing ideologies often lead to stagnant governmental change caused by heated debates—a compromise rarely being achieved. In the graph below, this pessimistic outlook can be examined through the numerical differences between opposing parties and their stance on various issues.

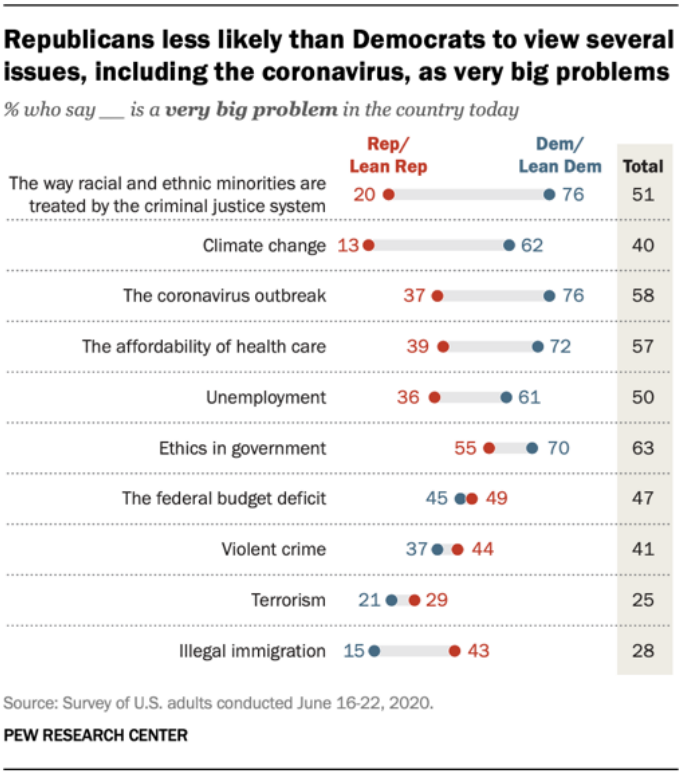

Figure 8. Republicans less likely than Democrats to view several issues as very big problems, 2020.

I would like to note that 'the way racial and ethnic minorities are treated by the criminal justice system' and 'climate change' are highly varying issues among Democrats and Republicans relative to their perception of such topics. Environmental justice is directly concerned with this cross-section of differing ideological viewpoints. "EJ activists coined the term 'environmental racism' to describe processes that resulted in minority and low-income communities facing disproportionate environmental harms and limited environmental benefits."[51] In relation to political party affiliation, this causality is observable through an

[51] Taylor 2014.

examination of opposing viewpoints on particular social issues—like the ones described above. Inferring upon this information, environmental legislation, in conjunction with environmental justice, is more likely to remain as a focal point for policymakers in democratic regions as opposed to those in conservative spaces. In Chapter 3, environmental economics alludes to this fact by proposing a space of equitability when addressing concerns similar to the figure described above. Consider Donald Trump's presidency. During his time in office, his appointed cabinet members overturned decades of hard work put forth by environmental organizations. Trump proposed slashing the EPA's budget by 31% while simultaneously eradicating over 46 environmental regulations put in place to promote environmental justice and to protect disenfranchised individuals most vulnerable to the effects of climate change.[52] The overturning of such policies had detrimental consequences on the environment and social relations alike.

There are several factors that can limit the effectiveness of environmental lawsuits, which are typically civil suits brought to settle disputes or damages between two parties. First, plaintiffs bringing the suit must establish that they have the legal right, known as legal standing, to do so in a particular court. Second, bringing any lawsuit forward costs a great deal of money, often too much for individuals to pursue a civil suit. Third, public interest law firms cannot recover their attorneys' fees unless Congress has specifically authorized that they be compensated within the laws that they seek to enforce. On the other hand, large corporations have the ability to reduce their taxes by deducting their legal expenses, which creates an extremely uneven playing field, placing individuals with environmental lawsuits at a disadvantage. Fourth, to stop a nuisance or to collect damages from a nuisance or an act of negligence, plaintiffs must establish that they have been harmed in some significant way and that the defendant caused the harm. This can

[52] Miller and Spoolman 2018, 624.

prove difficult because environmental injustices are not so easily identifiable. If a company dumps toxic waste into a water supply, causing cancer in nearby residents, then it can prove difficult to trace the source back to the polluter. Suppose other industries dump toxic waste into the same water supply; establishing the specific culprit would be extremely difficult, requiring expensive investigation, scientific research, and expert testimonies. Fifth, most states have statutes of limitations, which are laws that limit how long a plaintiff can take to sue after a particular event occurs. This makes it essentially impossible for victims of cancer, which may take 10-20 years to develop, to file or win a negligence suit. Sixth, courts can take years to reach a decision, which allows the damaging action to continue until a verdict is reached.[53] These facets of ineffective environmental lawsuits represent the environmental injustices that occur along a multi-dimensional plane when addressing issues related to ecological harm and human health. Most environmental laws use a command-and-control approach when tackling climate-related issues. This includes 1) the legal enforcement of regulations issued by the EPA for states, 2) compliance by states, municipalities, industries, and other entities, and 3) penalties for non-compliance with the set regulations.[54] However, since the 1980s, well-organized and highly funded anti-environmental movements have mounted a strong campaign to weaken or repeal environmental laws and regulations, ultimately hoping to dismantle the Environmental Protection Agency. Typically, this resonates with right-winged individuals and governmental actors because their focus is primarily on economic gain and fiscal development. Many environmental laws restrict the number of pollutants that a corporation is allowed to emit, which poses a problem to those in power. Environmental laws and policy recommendations face significant opposition, leading to unsuccessful attempts at ecologically beneficial policy

[53] Miller and Spoolman 2018, 620-21.
[54] Miller and Spoolman 2018, 623.

implementation. More often than not, these policies face extreme pushback with little success rates.

Why is that? Typically, republican policies tend to focus on economic growth and stability while placing climate change and environmental regulation towards the bottom of the list. 84% of Republicans believe that strengthening the economy should be a top priority, as opposed to 68% of Democrats. An economic discussion in Chapter 3 highlighted these differences and their societal implications. The economic system of capitalism requires continual growth in order to sustain itself.[55] Environmentalism inherently goes against this notion due to the fact that ecological reparations require a reordering of economic structures in order to adequately address the situation at hand. Legislators who prioritize climate change as a pressing issue of concern are more likely to implement policies that include the features of environmental justice and conservation—a mere glance at the influence that politics has over environmental conditions. In the graph below*, a comparison between political parties and their stance on environmental issues is given, which shows the correlation between environmental policy success rates dependent on the political affiliation in control.

[55] Magdoff and Foster 2011.
*This graph is located in Chapter 1, which is why it is labeled as *Figure 2.* The figure was copied and is located below for convenience.

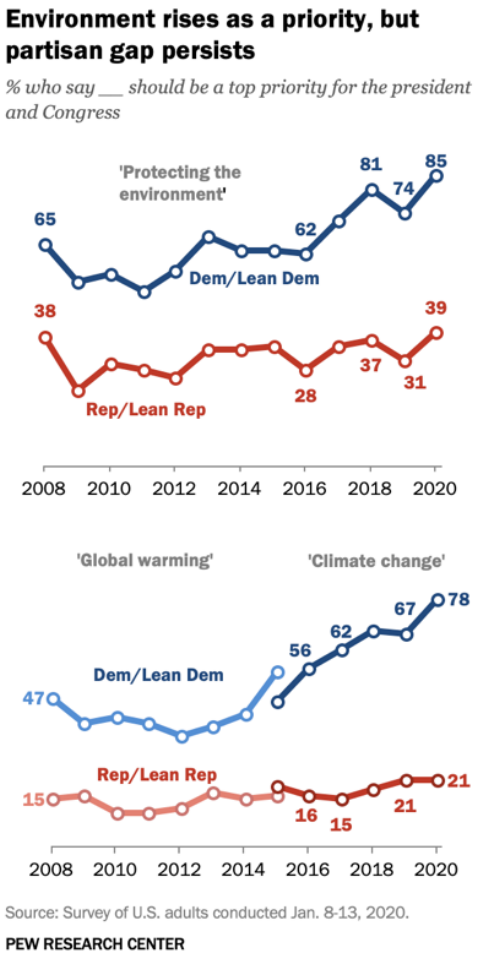

Figure 2. Percentage of people who say, 'protecting the environment', 'global warming', and 'climate change' should be a top priority for the President and Congress, 2020

Within the city of Charleston, 55.5% of people voted Democrat, while 42.6% of people voted Republican. Statewide, the disparity among political ideologies only increases; 43% of individuals identify as conservative, 35% as moderate, and only 15% as liberal. On the contrary, New York City's political affiliation is roughly 80% Democratic and 18% Republican. Statewide, only 60% of individuals identify as liberal, while 38% of individuals identify as conservative or right-leaning. How does this influence environmentally related conditions? At the beginning of the chapter, the current climate resiliency plans and policies within each city were examined, alluding to the power of governing institutions' impact on ecological crises. New York has

several policies in place to address the issues stemming from the climate crisis, as well as several administrative institutions with the sole task of limiting these effects. While not always successful, the metropolitan area acknowledges the climate vulnerability it faces, which is an important place to begin. The climate action plans that have been proposed by these governing agents could act as a blueprint for policy formulation in other regions around the country. On the other hand, Charleston has very few policies in place to combat the severe ecological threats experienced by its residents. Although the city has established a climate action plan, it has failed to bring about visible change in the surrounding communities. Additionally, this resiliency guideline was proposed in 2021 as a 5-year strategic framework; while ambitious, it is not feasible to implement the characteristics described in this briefing in a timely fashion. Hence, the political demographic of a particular city greatly influences the social and environmental policies that ensue. In order to improve the quality of life along a multi-dimensional plane, legislators must incorporate the following policy principles when evaluating socioeconomically feasible solutions to our current ecological dilemma: 1) reversibility principle—avoid making decisions that cannot be reversed, 2) precautionary principle—taking measures to prevent harm, 3) prevention principle, 4) net energy principle—limit the widespread use of energy resources and technologies with low or negative net energy yields, 5) polluter-pays principle—developing economic tools, such as green taxes, to ensure that polluters bear the costs of mitigating the pollutants and waste they produce, 6) environmental justice principle—no group of people should bear an unfair share of the burden created by pollution and GHG emissions, 7) holistic principle—focusing on long-term solutions that address the root causes of interconnected environmental crises, 8) and the triple bottom line principle—balancing economic,

environmental, and social needs when making policy decisions.[56] Implementing these policy principles into common practice is not so easy, nor cut-and-dry. It requires policymakers and governing institutions to become more environmentally literate, which can be achieved through environmental education. Using the triple bottom line principle as a measure of socioecological conditions, could lead to an increase in the effectiveness of environmentally focused legislation.

Figure 9. Triple bottom line principle, which includes the social, economic, and environmental features of sustainably oriented legislation.

d) *Social Welfare & GDP.* As described above, the political climate of a particular city greatly influences the sociopolitical relationship with the surrounding environment. The economic differences between Charleston and New York City became evident following the fiscal examination of each city in Chapter 3; the features of environmental economics were discussed, which emphasizes the importance of social welfare. Welfare typically refers to a type of governmental support with the intention of ensuring that all members of a society are able to meet the basic needs of human survival, i.e., food and shelter. Social welfare includes efforts to

[56] Miller and Spoolman 2018, 615.

provide a basic level of societal well-being through governmentally subsidized social services such as healthcare, education, infrastructure, vocational training, and public housing. If the state assumes responsibility for the social services described above, then it is known as a welfare state. In the United States, social security is quite synonymous with welfare tactics. Specifically, it refers to insurance programs that provide support only to those who have previously contributed, as opposed to social assistance programs that provide support based on needs alone. The International Labor Organization defines social security as covering support for those in old age, support for the maintenance of children, medical treatment, parental and sick leave, unemployment and disability benefits, and support for sufferers of occupational injury. While this is not directly influenced by GDP, these variables are strongly correlated. In the graph below, this relationship is made visible.

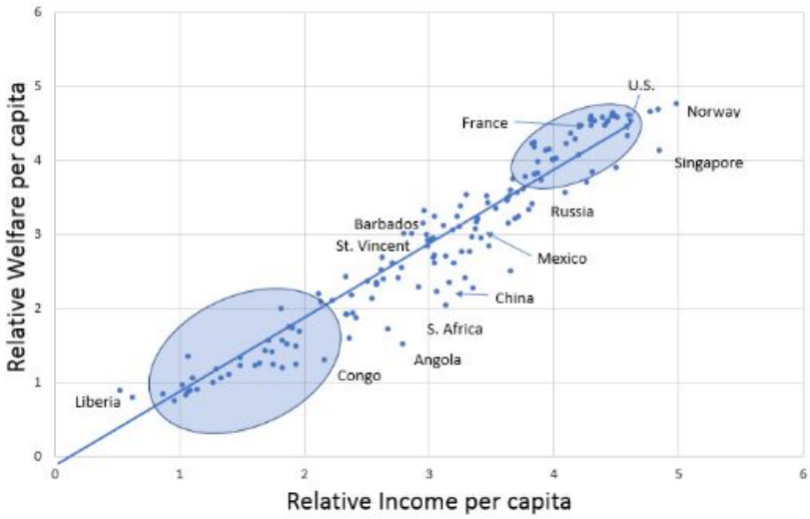

Figure 10. IMF analysis of relative welfare per capita compared to relative income per capita, 2018.

Typically, a higher GDP leads to higher social welfare due to the increase in economic activity of a particular state or region. This may take form in social programs and environmental policies focused on the betterment of society along a multi-dimensional plane, examined through

the influence that political affiliation has over environmental conditions. Applying this information to the climate resiliency plans within the focal cities of this paper unveils this highly complex relationship. The GDP of the New York metro area is much higher than the GDP of the Charleston metro area. In spite of the fact that GDP does not translate to social welfare, it allows the possibility of increased social programs due to an excess of funds flowing throughout the economy. Municipalities could raise taxes in their designated city, widening the implementation potential for welfare programs. However, this is dependent on policymakers and their political party affiliation, which was discussed in the previous section. Democratic or left-leaning institutions are more concerned with protecting the environment and social welfare programs as opposed to conservative or right-leaning institutions, which are more concerned with the economy, the federal budget, and crime. Thus, liberal governing bodies are highly likely to incorporate social justice programs into policy formations as opposed to their counterparts. This would include the importance of environmental justice efforts within democratic cities. In the graphs below, the wealth disparity among social classes is measured through a cross-analysis of Republican and Democratic stances pertaining to the issue.

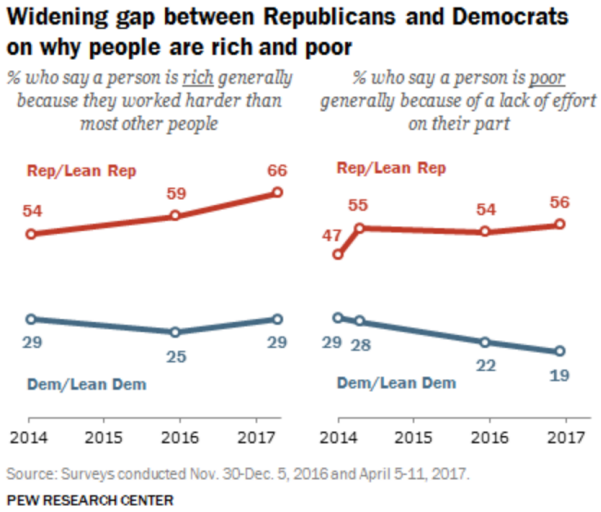

Figure 11. Reasoning behind economic class disparities, signifying a gap among opposing political ideologies, 2017.

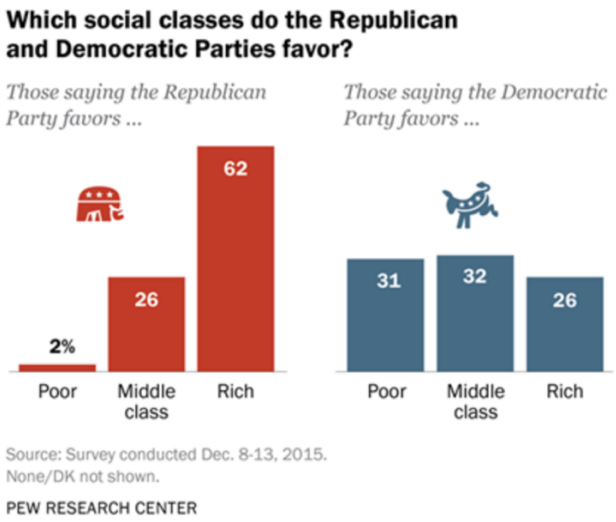

Figure 12. Perception of social class favorability among political parties, 2015.

Inferred from this quantifiable data set, New York is more likely to focus on environmental justice as opposed to Charleston. Disadvantaged individuals experience the effects of climate change to a more severe degree than wealthier individuals. The Democratic Party is generally believed to favor members from each economic class in a relatively equal fashion, while the Republic Party disproportionally regards the needs of lower-income communities. Hence, there is an inextricable link between social welfare and environmental conditions. While social welfare is not a measure of happiness, it is a quantitative method of evaluating societal standards and their sociopolitical implications. Thus, the inclusion of environmental-focused legislation, with an emphasis on social justice, is paramount when discussing tactics to combat climate crises and their societal impacts. Mitigating the effects of climate change and environmental crises is directly tied to the measure of social welfare. As mentioned in the previous section, all aspects of social justice and equality (which is a facet of social welfare) fall within the scope of environmental justice. Operating within this space allows for new frameworks for analyzing the relationship between politics, society, and the environment.

e) Environmental Justice. In this study, environmental justice has been a recurring theme. What differentiates this term from other forms of social justice? The conceptual apparatus attached to this methodological approach to evaluating societal relations refers to the fair treatment of all people regarding the protection from environmental hazards. However, no set definition describes this concept's features due to the multi-dimensional characteristics attributed to this branch of equitable inclusion. Robert Kuehn's *A Taxonomy of Environmental Justice* strategically articulates four variations of social justice attributed to the development of this concept. Distributive justice is the right to equal treatment, that is, to the same distribution of goods and opportunities as anyone else has or is given (10683). Procedural justice is the right to treatment as an equal, that is, to equal concern and respect in the political decision about how these goods and opportunities are to be distributed (10688). Corrective justice involves fairness in the way punishments for lawbreaking are assigned, and damages inflicted on individuals and communities are addressed (10693). Social justice is a branch of the virtue of justice that moves us to use our best efforts to bring about a more just ordering of society—one in which people's needs are more fully met (10698). The Environmental Justice Movement (EJM) draws upon these factions of justice with the goal of addressing issues of racism, gender and socioeconomic inequality, and the unfair distribution of environmentally hazardous burdens upon marginalized groups. Ecological crises, climate change, pollution, economics, politics, gender inequality, and racism are inextricably linked with one another; they cannot, and should not, be thought of as separate issues. Environmental injustices caused by oppressive structural institutions such as capitalism directly correspond to environmental destruction. If we are to create a more sustainable, equitable future, it is imperative that we recognize the interconnected nature of these issues.

A defining characteristic of environmental justice is the acknowledgment of the disproportionate effects that climate change inflicts upon certain groups of people. The term *environmental racism* is used to describe the processes that result in minority and low-income communities facing disproportionate environmental harms and limited environmental benefits.[57] What exactly does this entail? Minorities can experience environmental racism through structurally oppressive institutions. As Robert Bullard proves, environmental racism occurs through environmental planning and decision-making.[58] Low-income communities, usually consisting of ethnic minorities, are meticulously placed adjacent to regions with the highest pollution and toxin rates. This facet of racism is difficult to siphon through due to the structurally oppressive racism embedded within our society. Structural racism and discrimination (SRD) refers to macro-level conditions (e.g., residential segregation and institutional policies) that limit opportunities, resources, power, and well-being of individuals and populations based on race/ethnicity and other statuses, including but not limited to gender, sexual orientation, gender identity, disability status, social class or socioeconomic status, religion, national origin, immigration status, limited English proficiency, physical characteristics or health conditions, and so forth.[59] Neighborhood segregation, a widely studied form of SRD, has been shown to directly influence racial disparities in public health outcomes. Aside from its direct effects on access to opportunities and resources, it affects psychological health by enforcing institutional policies that create and sustain oppressive structural forces. Disenfranchised individuals and low-income communities who experience the greatest burden of environmental harm are not able to afford

[57] Taylor 2014, 2.
[58] Bullard 1993, 17.
[59] NIMHHD, *Structural Racism,* 2022.

the outlandish costs of relocation. This example unmasks the deep-seated roots of environmental racism scattered throughout the history of our nation.

Examining the work done by Lucas Chancel, he puts forth five sources of environmental inequalities: unequal access to resources, unequal exposure to environmental damage, unequal responsibility for environmental damage, unequal exposure to environmental protection, and unequal access to environmental decision-making.[60] These environmental inequalities affect socioeconomically disadvantaged individuals despite having little responsibility for environmental damages. Consequentially, these communities are more exposed to environmental hazards and have little say in environmental decision-making—these features are further perpetuated by the economic system and societal structures in place. Social justice is not only a fight for equality but a fight for ecological equality as well. The EJM cannot simply focus on environmental issues; it must focus on the societal structures and issues that enable environmental degradation to continue.

Although Charleston and New York have governmental programs in place that briefly describe environmental justice, structural changes must occur if reparations are to ensue. Climate adaptation planning and environmental equality are critical features of environmental restoration and social justice, which are necessary in order to sustain life in vulnerable communities such as Charleston and New York. Individuals who possess the power to enact radical change must include the features of the triple bottom-line principle (social, economic, and environmental variables) if sustainable methods of interacting with our ecosystem are to take hold. Urging officials to enact climate-focused legislation requires the political participation of the public sphere. Community-based organizations (CBO) may provide incentives for legislators through

[60] Chancel 2020, 63-108.

the use of collective action. A study conducted on the participation of New York organizations revealed a common thread among varying organizations. Based on this study, "planners should examine their outreach and awareness campaigns and develop solutions that target a more diverse array of CBOs and specifically aim to include groups that have not previously participated in planning or have not even been aware of opportunities to participate. In addition to making efforts to increase the number of CBOs made aware of plans, planners should also make an effort to directly support CBOs with priorities that may not traditionally align with climate change adaptation planning."[61] Real change happens at the local level through collective action, education, protesting, and positivity. Organizations such as the Environmental Justice Movement may provide unique insight into alternative methods of environmentally focused solutions with the intention of eradicating our current socioecological dilemma; the EJM has the potential to create lasting, institutional changes. Adequately providing solutions to the climate crisis requires the development of a new framework of perception; sociopolitical and ecological resolutions may ensue if these issues are tackled through a multi-disciplinary lens.

Chapter 5. So…What Now? Ecological Solutions

Human development and ecological dominance have exasperated the effects of climate change, nearing irreversibility. While every individual around the globe experiences the effects of environmental crises to varying degrees, coastal communities, in particular, face a more severe threat related to climate vulnerability and its implications. Due to their geographical proximity to water, cities located along the coast are highly susceptible to flood damage and extreme weather phenomena, i.e., hurricanes, tropical storms, tsunamis, etc. Pertaining to this paper, Charleston,

[61] Rudge 2021, 15.

South Carolina, and New York City have experienced increasing ecological threats as human development has exponentially increased at the expense of the environment. Throughout this study, each city was examined through a multi-disciplinary lens to examine the successes and failures of current climate resiliency plans and their overall preparedness. In Chapter 1, an overview of the crises facing each city was put forth, highlighting the impact of industrialization on ecological conditions. Chapter 2 expanded upon the history of climate change, examining the causal relationship between economic advancement and environmental degradation. The Anthropocene, a proposed Epoch in the geological time scale (meant to represent the impact that humans have had on the environment), was discussed in order to raise concern about the extensive effect that the climate crisis has inflicted upon society. An economic analysis of each city was addressed in Chapter 3 to showcase the interconnectedness between economics and climate change. It is critical to reinvent our economic system of operating if we hope to amend the damages inflicted upon our planet. The feasibility of implementing ecological solutions was briefly discussed, concluding with the importance of researching and developing efficient, environmentally focused methods of production. Drawing upon previous data from Chapters 1-3, Chapter 4 examined the sociopolitical implications of addressing our ecological dilemma. Through a cross-examination of politics, society, social justice, and the environment, the disparities between Charleston and New York City became extremely evident. The political nature of a metropolitan area greatly influences ecological outcomes and the social implications that ensue. Politically conservative demographics experience harsher environmental pushback, rarely achieving success. Contrary to this notion, politically liberal demographics experience higher success rates in implementing environmentally focused legislation. Comparing the largest city in the United States with a smaller city in the southern region of the country offered a unique

viewpoint into the complexity of solving environmental crises and their sociopolitical implications. To conclude, this chapter will offer several policy recommendations that each city could implement in order to improve social welfare and alleviate environmental burdens. Climate change and environmental crises must be addressed as multi-faceted issues in order to adequately provide feasible solutions that could elevate our society to an enlightened way of interacting with the natural world around us.

a) *Department of Environmental Economics*. As discussed in Chapter 3, Section 3, environmental economics is more suited to deal with the fiscal aspect of climate change. Under the umbrella of economics, this branch emphasizes the importance of social welfare in relation to economic gain. Garrett Hardin's *Tragedy of the Commons* explains this relationship by describing the features of common-pool resources and the fallibility linked to current methods of resource extraction. Every living thing, including non-human entities, has access to the environment and its abundance of gifts. Therefore, our planetary system acts as a common pool resource; everyone has access to the environment and its benefits, although these resources are finite. In order to curb pollution and limit the levels of harmful chemicals circulating through the air, the economic system causing this predicament must evolve. Capitalism requires continual growth, which directly opposes the core values of environmentalism. It is critical to provide feasible alternatives to current economic output if we hope to improve ecological conditions. Charleston, South Carolina, and New York City have various programs and governmental initiatives in place to address the focal points causing climate change. However, neither city has a task force dedicated to the establishment of environmentally focused economic practices. Pertaining to my personal policy recommendations, the establishment of a *Department of Environmental Economics* within each city's government would greatly aid in the overall

economic output of sustainable methods of resource allocation and production. Including discount rating and full-cost pricing methods when addressing economic concerns would provide an incentive to develop sustainable infrastructure. The value of a resource is determined by its discount rate, which is an estimate of a resource's future economic value compared to its present value. Including external costs of harm to the environment and human health in the market prices of goods and services within environmental economics is known as full-cost pricing.[62] These economic methods of dealing with climate change offer a statistical evaluation of ecological conditions. While not feasible in all economic sectors, these features of environmental economics allude to the severity of the climate crisis and the fiscal cost of exasperating future ecological degradation. Both Charleston and New York could benefit from such programs. Each of these cities has a Department of Economics or a Department of Economic Development. Creating a Department of Environmental Economics, whether it be a subgroup within these existing structures or an independent institution, is feasibly possible and economically advantageous. Furthermore, due to each city's proximity to the coast, the management of its natural resources is critical when addressing future economic concerns. Including the discount rate in resource extraction projects would deter overconsumption and total resource exhaustion from occurring. Additionally, Green Jobs are the fastest-growing employment sector in the country, which allows endless possibilities for sustainable practices to infiltrate every aspect of human development. As described above, the features of environmental economics are more equipped to handle the intersectional linkage between economic advancement and ecological preservation. Education and environmental-focused advising are simple factettes of this branch of economics that are fairly simple to incorporate into existing structures. Establishing a

[62] Miller and Spoolman 2018, 594-96.

Department of Environmental Economics in each city could provide new insight into various methods of economic growth that are sustainably feasible and ecologically beneficial.

b) *Department of Green Infrastructure Development.* In conjunction with my previous policy recommendation, creating a *Department of Green Infrastructure Development* would significantly improve the foundational conditions of urban expansion in relation to sustainability. This method of infrastructure development focuses on solving environmental crises and addressing climatic challenges by building with nature instead of against it. Downspout disconnection, rainwater harvesting, rain gardens, planter boxes, bioswales, permeable pavements, green streets and alleys, green parking, green roofs, urban tree canopy, and land conservation are several features of green infrastructure projects that focus on developing harmoniously with the environment.[63] Discussed in Chapter 3, Section 3, this method of development is ecologically beneficial while still maintaining the feasibility of economic growth. Ultimately, the solution to the climate crisis could be achieved through a cease of industrialized production and rapid urban expansion; this would mean shifting away from the system of capitalism. However, this is not feasible in actuality. Therefore, the development of green infrastructure must replace current developmental methods. Under this scope of sustainable development, environmental engineering, architecture, and urban planning are various methods that may lead to a new system of economic growth that prioritizes ecological preservation. Charleston has very few environmentally focused programs and legislation in place. This is primarily due to the political demographic of the region, which was discussed in the previous chapter. On the other hand, New York City has several programs and initiatives in place to mitigate the effects of climate change, which can be inferred based on the political demographic

[63] Environmental Protection Agency, *Green Infrastructure,* 2024.

of this metropolitan area. As discussed in Chapter 3, Sections 1 and 2, New York and Charleston are rapidly expanding cities that, by nature, require the continual development of various forms of infrastructure. Creating a Department of Green Infrastructure Development would allow each city to pursue such projects with relatively high success rates. This would include the implementation of green planning and limiting urban sprawl. Green planning is directly correlated to developing green infrastructure, as it is the preliminary planning that includes all of the necessary features of this developmental method. By limiting urban sprawl, metropolitan collectives become more eco-friendly due to transportation efficiency; less urban sprawl leads to a decrease in automotive reliance, which increases the number of individuals using public transportation as their primary method of travel. Additionally, congestion issues would most likely dissipate if alternate forms of travel were accessible to members residing within city limits. The City Council has the ability to create new departments or make alterations to existing departments. A similar approach to my previous policy recommendation could apply in this situation as well. The Department of Environmental Economics could be a subsection within the Department of Green Infrastructure Development, and vice versa, in order to alleviate potential budgetary restrictions. As previously mentioned, economic advancement and environmentalism clash in terms of core ideologies; however, this relationship can evolve if cities like Charleston and New York implement such governmental institutions. Through efficient management and adequate resource allocation, economics and the environment have the ability to grow alongside one another for the betterment of society.

c) *Environmental Justice Task Force.* Throughout this paper, the social implications of climate change were discussed, specifically in Chapter 4. Societal aspects of environmental crises are incredibly evident, although rarely discussed in mainstream media. Partially, this is due

to the fact that individuals most vulnerable to the effects of climate change are typically marginalized and disenfranchised communities. Faced with increasing environmental pressures, low-income individuals are not able to alter their economic status to alleviate some of the burdens they face on a regular basis. Especially in coastal cities, such as New York, gentrification occurs at an alarming rate, which negatively impacts these communities even further. Ecological solutions must include societal aspects if they are to create noticeable change that includes the fair treatment of every individual. That being said, social justice is a critical component when mitigating the effects of the climate crisis. Briefly discussed in Chapter 4, Section 2, the features of environmental justice are necessary to include when proposing ecological solutions. This form of justice consists of the attributes of social justice while expanding upon its interconnectedness to environmental conditions. In regard to the development, implementation, and enforcement of environmental laws, regulations, and policies, this elevated form of justice argues the importance of inclusivity and acknowledging fair treatment among all people, regardless of identity, when addressing environmental concerns. Following suit, my third policy recommendation is the establishment of an *Environmental Justice Task Force* within city governments. In conjunction with my previous recommendations, this task force would be a non-governmental entity, in the form of a non-profit, that works alongside governmental institutions to promote social justice and equitable development projects. As a non-profit, the need for governmental funding would be avoided, which dramatically improves the probability of implementation. For example, if a developer in the city of Charleston had a specific infrastructure project in mind, they would need to receive approval from the Department of Environmental Economics and the Department of Green Infrastructure Development before breaking ground. Additionally, the Environmental Justice Task Force would

inform the developer of any social ramifications that may ensue from their development project. Hence, urban expansion would include the previous features of my policy recommendations, with an emphasis on social justice and equitable solutions. Environmental injustices could significantly decrease if this methodological framework were incorporated into future developmental projects. Ecological solutions must be addressed using a multi-disciplinary lens to include the many visible and non-visible externalities associated with the climate crisis.

d) *50% Reduction in [Dirty] Energy Usage by 2035.* New York City and Charleston require exponential amounts of energy usage to power their electrical grid. As discussed in previous chapters, this significantly contributes to the emission of harmful greenhouse gases. Dirty energy sources encompass most forms of energy production that supply each city's electrical grid, this being the over-extraction of nonrenewable resources and fossil fuels. These methods of energy production are incredibly wasteful, environmentally destructive, and costly. Quite often, energy is wasted on empty public spaces and unused facilities. Requiring a *50% Reduction in Dirty Energy Usage by 2035* would incentivize developers to include clean forms of energy in future infrastructure projects, as well as updating current energy usage in established structures. Research and development, a critical component of environmental economics, has the ability to create new technological methods of clean energy usage through scientific advancement. Nonrenewable forms of energy, such as the burning of fossil fuels, have negatively impacted the environment in dramatic ways. As discussed in Chapters 1 and 2, greenhouse gases have exponentially increased atmospheric deterioration; nonrenewable energy is a significant catalyst of this phenomenon. Renewable, clean forms of energy include hydraulic, solar, and wind power. These methods of energy extraction collaboratively work alongside natural weather patterns to improve energy efficiency. Located along the coast, Charleston and New York City

could greatly benefit from these methods of energy production. While these projects remain costly, they offer significant economic returns in the long run. The governing institutions within each metropolitan area could require renewable sources of energy when developing new infrastructure projects. It is significantly more cost-effective to implement these sources of renewable energy at the beginning of developmental projects, as opposed to making alterations to existing infrastructure. Governmental subsidies could be provided in order to offset the initial cost of implementing such technologies. Furthermore, usage limits could be mandated in order to curb the amount of wasted energy. Unused or rarely occupied public settings and establishments could include energy timers that limit energy waste in vacant spaces; privatized spaces could incorporate this same methodological approach. The feasibility surrounding energy reduction remains uncertain—heavily reliant on technological advancement and clean energy development. However, including the recommendations listed above could satisfy the energy-reduction quota in a feasible manner while simultaneously creating the practical foundations of future sustainable energy usage. Although these policy recommendations tackle various issues, adequately amending ecological damages requires a multi-dimensional approach that incorporates these varying sectors of focus into a singular framework of climate adaptability. Throughout this paper, the similarities among vastly different urban collectives in terms of climate vulnerability shed light upon the severity of the environmental crisis and its sociopolitical implications; in order to truly evolve as a society, our relationship with the environment must evolve.

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