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Seattle's climate: The effects of global warming and possible remedies

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Abstract. Global warming-induced climate change is a severe worldwide issue that has far-reaching effects on the ecology and biological evolution of the planet. Numerous experts study how the climate is changing globally and even in particular areas. This essay's topic is an analysis of Seattle's climate change using literature and data. To determine if Seattle's climate has altered recently, this thesis first examined the city's precipitation, temperature, sea level, and urban excessive heat from four different perspectives. Next, using data on climate change, examine the connection between climate change and global warming. The findings: There is a connection between global warming and climatic change in Seattle. The conclusion is that people continue to underestimate how much the environment is deteriorating due to societal development. For the sake of the planet and all life on it, humanity should strike a balance between environmental preservation and economic growth. Nonetheless, the goal of this thesis is to shed light on environmental changes occurring in Seattle and to identify and address issues that improve the planet.

Keywords: Seattle's Climate, Global Warming, environment

1. Introduction

The quality of human life has improved steadily since the start of the Industrial Revolution and the economy's ongoing growth. But as humankind advances, environmental pollution spreads throughout the world, making global warming the most formidable challenge. It brings with it a host of negative effects, including melting glaciers, more frequent extreme weather events, and the loss of many ecosystems' natural vitality, which can result in the extinction of certain species." Population surveys and meteorological information from a single Michigan county were used in these investigations. According to Study 1, 27% of the adult county residents said they had firsthand experience with global warming [1]. Of course, a growing number of individuals from all spheres of society, including scientists and business owners, are becoming more aware of these problems nowadays. Businesses aiming for even greater targets and zero emissions include Apple, Google, and Microsoft [2]. Nonetheless, identifying and evaluating issues has been made easier by examining climate change, and numerous academics have examined cities like Shanghai, Wuhan, Los Angeles, New York, and Seattle in particular. To provide an overview of the specific climatic changes in Seattle, this article primarily incorporates a number of significant climate aspects.

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2. Review Of Seattle's Climate in Light of Climate Change-Related Factors

2.1. Precipitation

The yearly precipitation in Seattle from 1948 to 2022 is seen in Figures 1 and 2. A graph that displays the average precipitation for each decade from the 1950s to the 2010s is created using these data.

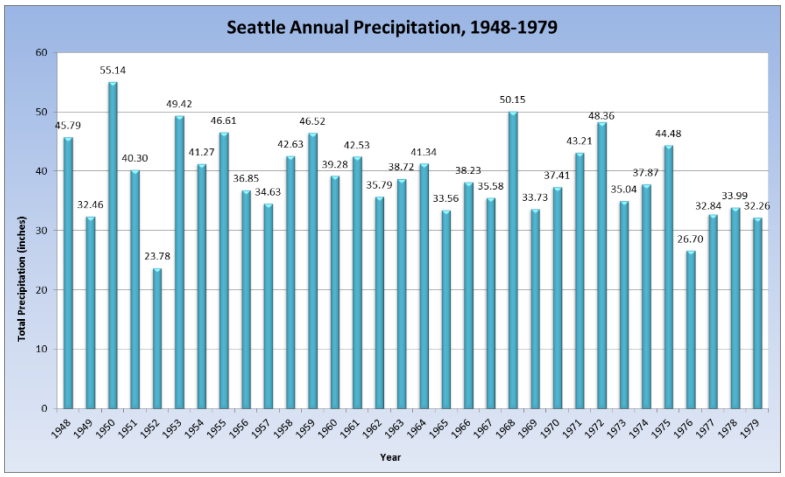

Figure 1. Seattle Annual Precipitation, 1948–1979 [3].

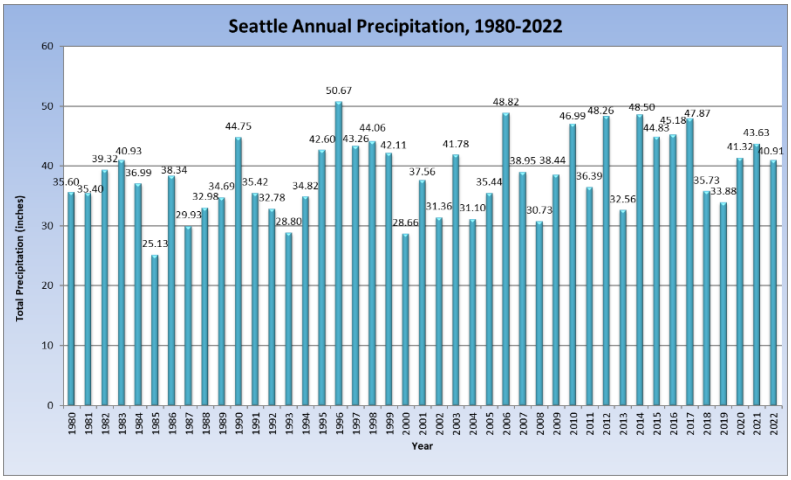

Figure 2. Seattle Annual Precipitation, 1980–2022 [3].

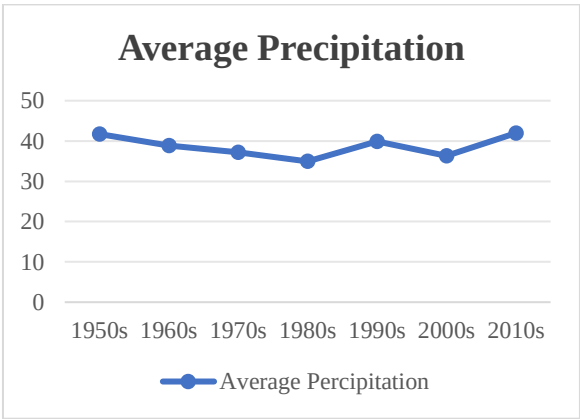

Figure 3. shows the average precipitation in Seattle from the 1950s to the 2010s.

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As Figure 3 illustrates, precipitation fell from the 1950s through the 1980s before abruptly increasing slightly in the 1990s. The events that took place in Seattle throughout the 1990s attracted attention to this phenomenon. Sadly, there isn't any evidence in the statistics or other research to support the idea that there are any factors directly influencing Seattle's precipitation changes. Still, there are a few theories: According to Karvonen, Andrew states that "since the late 1990s the municipal government has formally recognized the ecological function of urban creeks and made a concerted effort to improve water quality conditions and restore habitat." Additionally, the US National Marine Fisheries Service declared in March 1999 that the Endangered Species Act would classify eight wild salmon and steelhead populations in the Pacific Northwest as threatened, and a ninth population as extremely endangered. In 1998, one year before the ESA listing and two years before the year 2000, Paul Schell was elected mayor of Seattle. In contrast to the Promethean strategy of the previous century, he saw both of these impending catastrophes as a chance to create historic city government initiatives [4]. Three changes in Seattle throughout the 1990s are depicted in those sentences. The ecological government first recovers ecosystems and enhances the quality of the water. Furthermore, a greater number of species are listed as endangered marine animals by the US National Marine Fisheries Service. Finally, historic municipal government programs were launched by Paul Schell, the new mayor. According to my theory, the government's efforts to restore habitats and enhance water quality may have an impact on the water cycle's increased precipitation. The likelihood of severe heavy rainfall events rising is indicated by the statement, "Washington is also expected to experience more heat waves and more severe heavy rainfall events, despite relatively. [5]".

2.2. Temperature

Figure 4 illustrates how the temperature has been rising steadily since 1950. The graph displays the potential temperature. The temperature rises in tandem with the Representative Concentration Pathways, indicating a significant correlation between rising temperatures and heat emission.

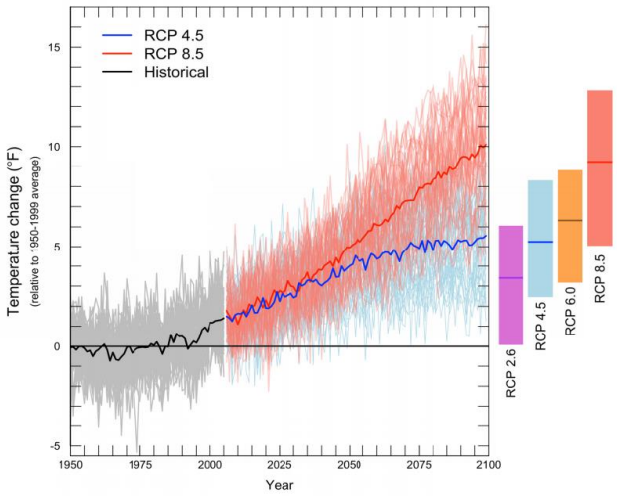

Figure 4. Warming is projected for the 21st century in all scenarios. The graph displays the Pacific Northwest's average annual temperature in relation to the average for 1950–1999 (gray horizontal line) [5].

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2.3. Sea level

Figure 5. Puget Sound encircles Seattle of the United States map of Washington State [6].

Seattle is one of the American cities on the West Coast that is close to Puget Sound, as seen in Figure 5. Sea level rise is greatly impacted by global warming. As a result, one may take Puget Sound's sea level into account when calculating the impact of global warming.

The global climate system is experiencing changes like as warming, increasing sea levels, decreasing snow and ice, shifting ocean chemistry, and shifting climate extremes. Many of these changes, both globally and in the western United States, have human causes [5].

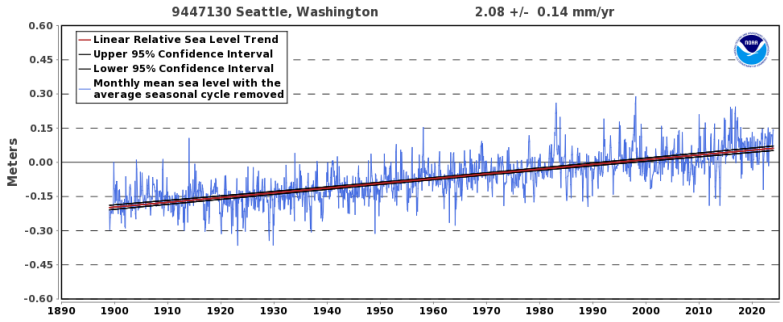

Figure 6. Warming is projected for the 21st century in all scenarios. The graph displays the Pacific Northwest's average annual temperature about the average for 1950–1999 (gray horizontal line) [7].

Figure 6 illustrates how the water level is progressively rising over time. The sea level is between -0.30 and -0.15 meters at 1900; by 2020, it will be between 0.00-0.15 meters.

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2.4. Severe Heat in Urban Areas

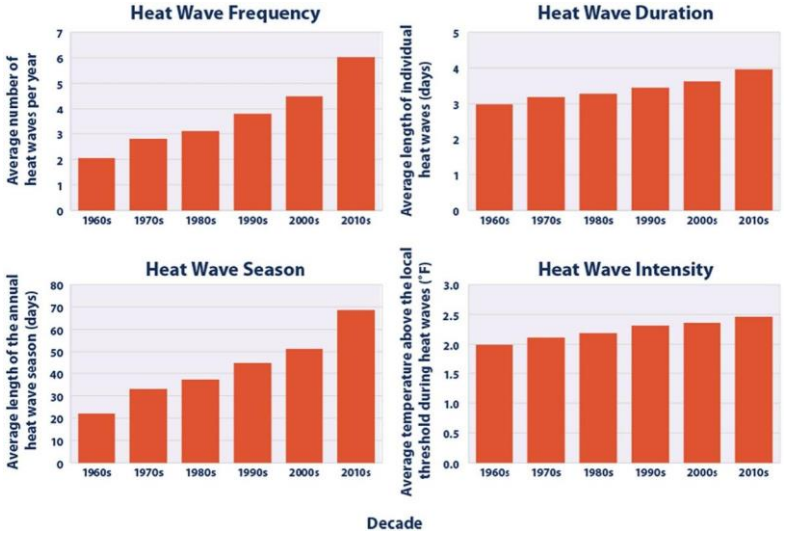

Figure 7. shows the characteristics of heat waves in the US by decade, from 1961 to 2019 [8].

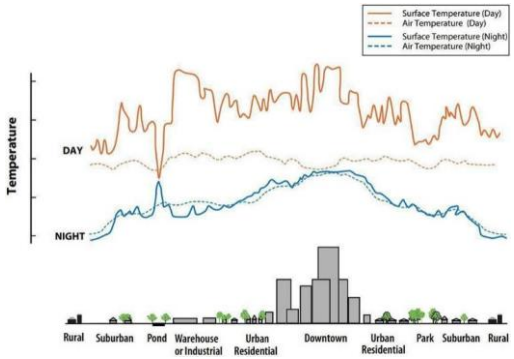

Figure 8. Surface and Atmospheric Temperature Variations [8].

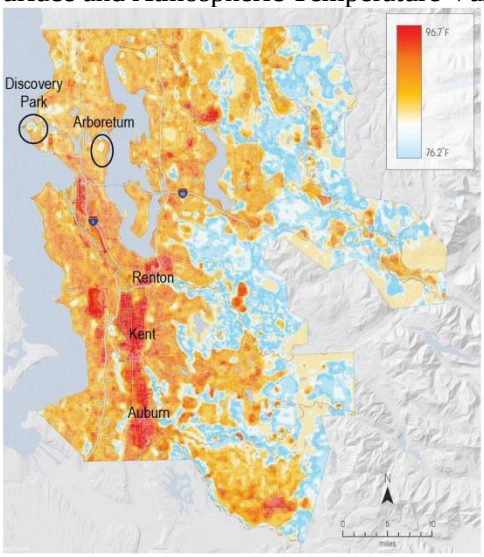

Figure 9. Area-Wide Predictions for the Evening (7–8 pm) [8].

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In Washington, urban heat is acknowledged as a major issue that impacts the entire planet. Furthermore, a strong urban heat island effect results from dense urban living without green spaces.

The population residing in urban heat islands has increased along with urban expansion and growth. The five largest urban counties in Washington State—Clark, King, Pierce, Snohomish, and Spokane—have had over 65% of the state's population growth in the past ten years. Populations that are more vulnerable to intense heat are responsible for a portion of that expansion. The metro counties of Washington are home to the bulk of individuals 65 and over (around 58%); their population has doubled in the last 20 years, from 393,000 in 2000 to 785,000 in 2021 [8].

Extreme heat exposure is influenced not only by the urban environment but also by certain occupations and people who are outside on hot days, such sports and homeless people. In the United States, extreme heat is thought to be the cause or a contributing factor in 120,000 occupational injuries annually. Workers who perform physical labor may experience heat fatigue, heat cramps, or more severe and potentially fatal types of heat-related illnesses (HRI) include kidney damage and exertional heatstroke after prolonged exposure to the heat. A worker's heat load is influenced by environmental conditions. Heat transmission can also be impacted by air movement, ventilation, clothing worn, and exposure to direct sunlight, in addition to ambient temperatures and humidity. Workers may be exposed to dangerously high temperatures both indoors and outdoors, particularly if they are wearing coveralls or other personal protective equipment that reflects heat away from the body and insulates metabolic heat [8].

3. Possible Remedies

It is demonstrated that practically all nations manifestly fail to meet their individually efficient emission limits and do not balance the individual marginal costs and benefits of reducing their greenhouse gas emissions. Consequently, it is demonstrated that the solution cannot be found exclusively in legally enforceable agreements reached at international conferences, in contrast to the dominant literature on global warming which emphasizes the global public benefit factor. Instead, our study indicates that nationally implemented economically sound abatement measures can result in significant reductions in emissions [9].

Any nation's government should put a lot of effort into it, for example, by enacting stringent laws, conducting frequent, sporadic spot checks, imposing fines, etc. To reach efficient emission levels, everyone needs to put in their best effort. To assemble a maximal number of plants. Green plants can therefore efficiently absorb heat and CO2.

More people may choose not to utilize transportation, which is bad for the environment, as a result of this move. The health of the ocean is impacted by the extraction of fuel from its deepest recesses. Oceans are essential for controlling global warming. Making everyone on Earth aware that Earth needs a rescuer is the most crucial thing to do. People are more likely to succeed in the things they trust or want to pursue, which is why it is so crucial. If the government believes that global warming is a significant issue, it will work hard to impose restrictions on businesses and individuals. If all nations view global warming as an urgent issue, they will unite to tackle this worldwide concern that affects everyone, including future generations of people. Japan will thereafter refrain from throwing radioactive waste into the sea.

4. Conclusion

Overall, this thesis mostly discusses the ways that global warming is affecting Seattle's climate and possible responses from the public sector, private sector, and individual citizens. The reason for the abrupt increase in precipitation in Seattle during the 1990s is not explored in this thesis. Moreover, the precise actions required to enable these potential fixes. In the coming years, research on how to bring these potential answers to fruition and improve the state of Mother Earth will likely take precedence over efforts to raise public awareness of environmental protection.

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