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English 21003: Group Research Paper

Ocean Acidification Mitigation through Renewable Energy

Introduction

Ocean Acidification occurs as the pH of the Earth's oceans decreases, caused by the uptake of carbon dioxide (CO_2) from the atmosphere. Ocean Acidification is both a detrimental environmental and anthropogenic issue— or in other words— it is an environmental change influenced primarily by humans. Over the past century, this problem has specifically been perpetuated by the burning of fossil fuels. It has also been perpetuated by other human activities such as tropical deforestation and altered land use. Due to this process taking place at a rate ten times faster than anything experienced in the last 300 million years, marine life has not had the time or ability to adapt to the rapid changes. According to the International Union for Conservation of Nature (IUCN), some of the threats provoked by Ocean Acidification include structural and functional alterations in ecosystems, threatened food security and fishing industries, and decreased natural shoreline prevention. If taken into consideration immediately, nonetheless, this process can be reversed as the uptake of CO_2 in oceans can be reduced— or even eliminated. One of the best ways to take action against this contributing factor to climate change is by reducing the use of fossil fuels; our findings highlight the overall potential of renewable energy sources such as biomass, wind, and solar energy in decreasing Ocean Acidification.

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Methods

As the human population has increased over the decades, so has the demand for energy production across the planet. This relationship between the growing human population and energy production has led to the dramatic increase in the emission of fossil fuels into our atmosphere. As stated by a 2016 study, "The dominance of fossil fuel-based power generation (Coal, Oil and Gas) and an exponential increase in population for the past decades have led to a growing demand for energy resulting in global challenges associated with a rapid growth in carbon dioxide (CO_2) emissions" (Owusu et al). Our current energy consumption is undeniably exacerbating issues surrounding Ocean Acidification; consequently, there has to be "...a paradigm shift in energy production from fossil fuels to alternative energy sources if we are to mitigate the effects of anthropogenically induced climate change" (Inger et al).

In order to combat this issue while also providing energy to sustain the ever growing human population, renewable energy can serve as a safe and effective alternative. Renewable energy comes in many forms, such as through solar, hydro, and wind power. It is much safer for the environment because it does not emit as much carbon dioxide into the atmosphere as fossil fuels such as coal and gas do (Inger et al), which are directly responsible for Ocean Acidification. If there is an increase in renewable energy use, the rate of Ocean Acidification in our world's oceans will be

alleviated as less carbon dioxide being emitted into the atmosphere would result in lesser carbon dioxide absorption in the ocean water. Ultimately, this will result in a lower likelihood of our oceans becoming acidic.

Results

Such research on the increased use of renewable energy sources and its link to decreased Ocean Acidification can be clearly depicted as an indirect relationship. As the global population starts to use more sources of renewable energy, CO_2 emissions decrease, leading to a decrease in the pH levels of oceans: this is defined as being less acidic. On the right, Figure 1 from a study by the NOAA PMEL Carbon Program exhibits the increasing levels of atmospheric carbon dioxide and its link to seawater CO_2 and seawater pH levels. As shown, an increase in atmospheric and seawater CO_2 leads to a decrease in seawater pH, contributing to Ocean Acidification.

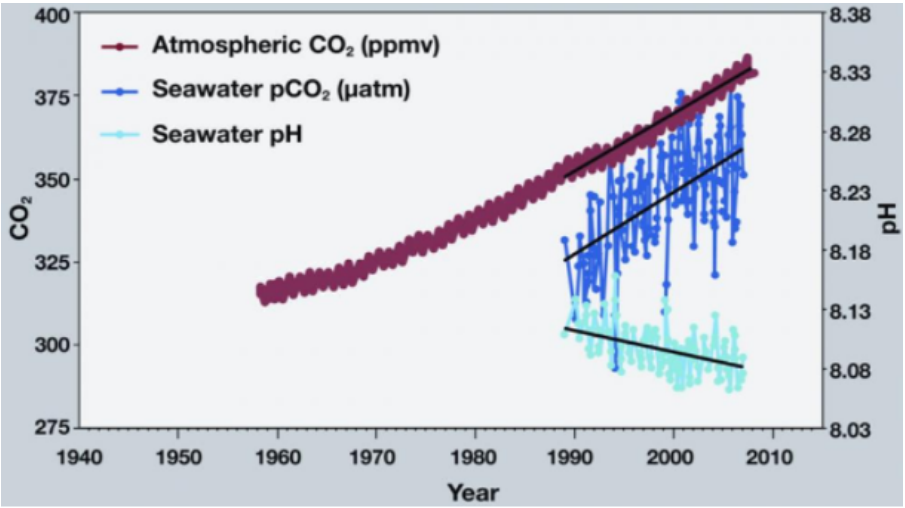

Figure 1 (NOAA PMEL Carbon Program)

The graph in Figure 2 also indicates how the problem of Ocean Acidification is

becoming worse over time as it has risen gradually over the past several decades. Moreover, it can be inferred much of the energy sources used during this period were nonrenewable, which resulted in the decrease in seawater pH levels.

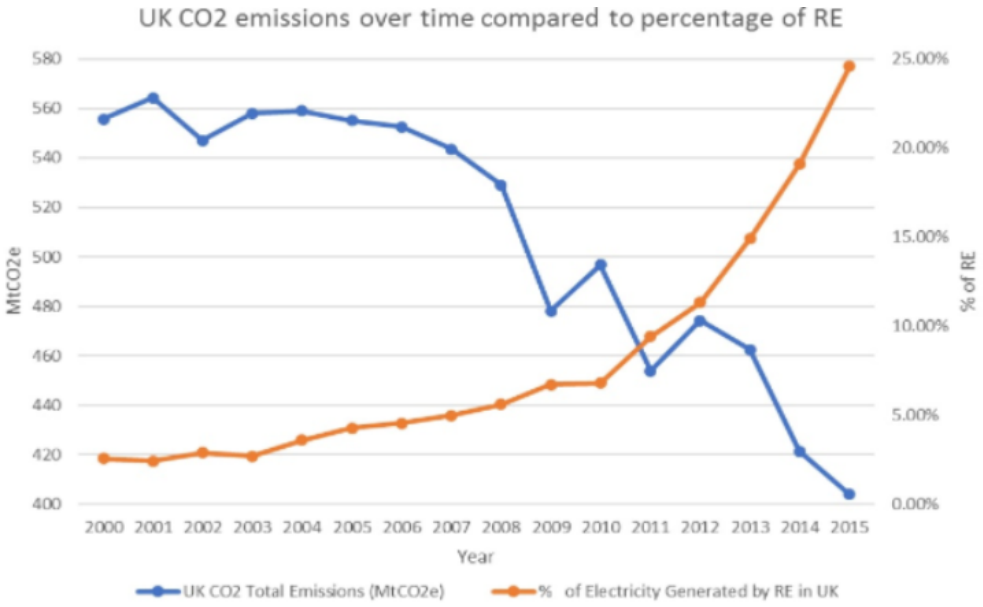

Figure 2 (Carbon Brief)

Figure 2, or the image above, indicates the correlation of CO_2 emissions and percent energy generated by renewable energy sources in the UK. The graph shows lower emissions of CO_2 as energy generated by renewable energy increases. This indicates how using renewable energy sources such as hydro, wind, and solar power can decrease potential CO_2 levels in the atmosphere and thus decrease Ocean Acidification. With more renewable energy used, the global population will be burning less fossil fuels and using less coal and gas to produce energy. This correlation also shows where ocean pH levels would begin to increase as renewable energy overtakes

the total number of CO_2 emissions.

Discussion

The results from the cited studies showcase that the more fossil fuel (Coal, Oil, Gas) based power we have, the higher the CO_2 emissions are in our atmosphere. This undoubtedly worsens the issue of Ocean Acidification— and an increased demand for energy only perpetuates these global complications.

The goal of the study was to investigate the impact of renewable energy and its potential connection to the decrease of Ocean Acidification. More specifically, we examined pH levels and the CO_2 levels of seawater in their relationship to both renewable energy and non-renewable energy. Based on the research, we can see that as the usage of non-renewable energy rose over the years, Ocean Acidification worsened because the pH levels of seawater decreased. Additionally, we realized that a solution for Ocean Acidification lies in transitioning to more renewable energy sources, such as hydro, wind and solar power— which can all decrease global CO_2 emissions— and prevent further Ocean Acidification. A rise in renewable energy would result in less fossil fuels being burned, leading to a massive drop in the production of non-renewable energy sources.

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It was hypothesized that the more renewable energy we globally used, the more our global CO_2 emissions would decrease, which in turn would mitigate the issue of Ocean Acidification. The analysis from the Methods and Results sections allow us to draw accurate conclusions on the significance of global energy sources. All the research elucidates the fact that non-renewable energy sources play a significant role in decreasing the pH levels of the seawater, which is why one can conclude that Ocean Acidification will ultimately improve as the world transitions to renewable energy sources.

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