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Climate Change and Big Business: The Endless Cycle

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The Endless Cycle

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HCOM 475

P. Nguyen

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HCOM 475: SENIOR CAPSTONE
PROJECT PROPOSAL
ESSAY OPTION

1. Angela Steele

2. **Focus:** I'd like to research the effects of climate change/global warming, analyze how businesses profit (for example sunscreen, agriculture, and fossil fuel companies). How does it all connect? Is there hope for a better future? Are there plausible solutions?

3. **Alignment with Common Theme:** The theme is Crisis and Opportunity. The crisis I intend to analyze is climate change, and the opportunity is business. I'd like to look at how companies benefit off of the warming of our Earth, and the opportunities they have to mitigate their impacts.

4. **Purpose**: I intend to gain more knowledge about climate change and big businesses.

5. **Capstone Title**: Climate Change and Big Business: the Endless Cycle

6. **Working Summary**: Because we are warming the Earth, many problems arise. Increased climate pollutants can be seen, including methane, carbon dioxide, nitrous oxide, black carbon, and many more. This leads to varying environmental issues, as well as health issues. I'd like to focus on case studies of the agricultural industry, fossil fuel industry, and sunscreen industry to show their numerous effects on the environment, as well as solutions, and opportunities for them to improve.

7. **Sources**: Address each of the following:

   - I will have to have knowledge of how climate change works and the history of it, as well as which companies may profit, and the models of some big businesses. My minor is environmental studies, so I will incorporate knowledge gained in my current ENSTU class.

- ➢ I will consult published journals, scholarly peer-reviewed articles, books, news articles and websites, as well as my environmental studies professor.

8. **Next Steps**: I will spend time conducting thorough research and start brainstorming early. As I fine tune my paper, I will present it to Dr. Nguyen for him to critique.

9. **Timeline**: Provide a detailed (and realistic) timeline for completion of each step required to meet the project's expectations.

   Sun. September 29 – final project proposal due
   Wed. October 9 – project title & abstract/summary due
   Mon. October 28 – project draft due
   Mon. December 23 – final bound portfolios due

   Research begins: ASAP
   Brainstorm – collect final thoughts **by October 20**
   Write first draft – October 20 (*at the latest*)
   Revisions – November 3-December 22

Climate Change and Big Business: The Endless Cycle

Introduction

Climate change, as it stands, is a large topic. As it relates to business, it grows exponentially, yet relates to every single one of us. Before the nineteenth century, climate cycles were mostly naturally occurring. Unfortunately, in recent years anthropogenic (human) causes have been introduced. The largest problem is carbon dioxide, which is produced from numerous human activities but largely from the burning of fossil fuels, and leads to massive warming effects on our planet. That's where business comes in: industries, such as agribusiness and the sunscreen industry, seek multi-million dollar profits off of the warming atmosphere. The aim of this project is to analyze the relationship between the climate change crisis and business opportunities. Using published journals, scholarly peer-reviewed articles, books, news articles and websites, as well as knowledge gathered from my environmental studies class, I intend to examine the many facets of this broad topic. To provide context, I will investigate three case studies: agriculture, fossil fuels, and sunscreen. In total, this study will unveil many climate concerns, business opportunities, and hopefully solutions.

Background

If we go back in time to around the 1950s, we will hit the Great Acceleration, a time of economic growth following World War II. This is where we truly begin to see humanity's enormous imprint on the planet. When the production and consumption of

goods exploded, that led to an increase of fossil fuel burning. This acceleration is seen in almost every aspect of our lives: water use, fertilizer consumption, population, gross domestic product (GDP), motor vehicles, and more. Why is this important? The Great Acceleration increased the rate of carbon dioxide, and by the 1980's, there was already a notable rise in global temperatures, thus leading to most of our problems today.

Fast forward to 2019, and we see the effects of these early temperature shifts: climate change. To understand the basic idea, think about a blanket. Picture the atmosphere as a blanket warming up a body (the planet's surface) by trapping some of the heat energy radiating off of it, preventing the heat from escaping into the rest of the room (space). This is the central idea to the greenhouse effect, which is when greenhouse gases in the atmosphere trap heat energy rising from the Earth's surface. The greenhouse effect has been contributing to climate change naturally for hundreds of years, so why is it bad? The natural warming of our planet is not a problem. The issue is that Earth's natural climate cycle is being accelerated due to human activity. According to NASA's Global Climate Change page, "Over the last century the burning of fossil fuels like coal and oil has increased the concentration of atmospheric carbon dioxide (CO_2). This happens because the coal or oil burning process combines carbon with oxygen in the air to make CO_2." Essentially, the burning of fossil fuels (i.e. oil and coal) has increased the amount of carbon dioxide in the atmosphere. This is extremely problematic. Carbon dioxide has one of the longest lifespans of the greenhouse gases, so

long that when referring to global warming potential, or a gas's ability to trap heat, scientists compare other gases to it.

The contributions that humans have made to climate change are vast. We see impacts from differing aspects of our daily lives, whether we choose to think about it or not. Some examples of big contributors to climate change include agriculture, the fossil fuel industry and sunscreen companies.

Agricultural Problems

Agribusiness, as it has been called, is booming in the United States. There are many parts to this giant industry, most notably dairy, beef, and crops. If we break these giants down, there are many aspects of their work that contribute to climate change. As estimated by the National Cattlemen's Beef Association, the amount of beef consumed in the U.S. per capita was 57.2 lbs in 2018, leading the value of beef imports to be around $8.332 billion. Dairies bring in a significant amount of money as well. Nestlé, one of *Dairy Foods* Magazine's top 100 dairy companies, made $91.4 billion in sales for 2018. As for crops, the average net cash farm income is estimated at $81,900, which seems low but is actually up 11.4% from 2018.

Within the dairy and beef industries, methane emissions are a huge problem, as well as deforestation. Cows, themselves, contribute to these issues. These large animals have four stomachs to digest their food. Within this complex digestive system, the main cavity is known as the rumen. It contains bacteria that break the fibrous cuisine down.

As a biproduct of this process, the bacteria produce methane. Methane is a potent climate pollutant with a global warming potential of 30. This means that for every one molecule of carbon dioxide, methane is 30 times better at trapping heat in the atmosphere.

Emissions arise when the cow burps, or passes gas. Because the demand for meat and dairy is so high in the United States, there are numerous farms, meaning numerous cows. To be specific, according to the U.S. Department of Agriculture, as of January 1, 2019, there were roughly 90 million head of cattle. This adds up to a massive amount of methane emissions. *National Geographic* did a study that found cow burps account for 26% of America's methane emissions. While these green giants may be the most noteworthy, they are not the only producers. Sheep, goats, buffalo, and camels also burp methane, and, like cows, are known as ruminant animals.

Agriculture practices also heavily rely on deforestation. This occurs when farmers clear lands of trees and natural grasses to plant crops or make room for livestock grazing. In fact, roughly 30% of farmland's sole purpose is to grow grain for animal feed (NPR). Deforestation is widely accepted globally, and has been for years. It is, however, almost entirely problematic. Deforestation leads to increased emissions of carbon dioxide, methane, and nitrous oxide, and in some cases, large amounts of black carbon particles. Nitrous oxide is a greenhouse gas emitted by industrial fertilizers used in plantation agriculture, and black carbon is an air particle that traps heat, and is

known to cause numerous consequences for human health. Common processes to clear forest land include bulldozing, cutting, pulling tree roots, stumping, and controlled burns (Farm Practice Land Clearing).

All of these methods remove plants, hence the whole purpose of land clearing, and this is detrimental. Plants are a form of carbon sequestration, known as carbon sinks. Carbon sinks are natural systems that capture and store atmospheric carbon dioxide. Plants use photosynthesis to capture and utilize carbon dioxide for growth, in return producing oxygen. Removing these natural carbon sequestration systems takes away a vital resource in the race to remove carbon dioxide from the atmosphere. In addition, depending on the tactic of land clearing used, differing climate pollutants will be released. Black carbon is released from incomplete combustion (burning) and any form of removing plants will increase carbon dioxide levels. Nitrous oxide and methane are results of agricultural processes, and levels are rising because of increasing land clearing, "…Nitrous oxide emissions increased by 10% of the global total between 2000-2005 and 2010-2015," according to the International Institute for Applied Systems Analysis.

In an article from *The Ecologist*, it was stated that, "…clearing land for agriculture causes rainforest deforestation at the rate of forty football pitches a minute." Climate change and food production are tangled in a nasty cycle: as the Earth warms up, farmers are forced to clear more land to grow food due to the challenging conditions.

Agricultural Solutions

As previously stated, agriculture is a hefty industry in the United States, bringing in millions of dollars each year. With this money, agricultural businesses have the power to rethink their carbon footprint. Looking at the agricultural issues previously addressed, (carbon dioxide, methane, black carbon, and nitrous oxide) there is plenty of room for improvement. Solutions have been presented to the agricultural community, offering a plethora of opportunities for change and profit.

Of the many possible solutions, two of them are technological advancements and ecosystem management. Technology can help to improve multiple aspects of the global climate change issue. Within agriculture, systems can be put in place to capture methane and burn it for heat and electric power. Anaerobic digesters are an example of a technological advancement that captures methane and burns it, and converting this powerful climate pollutant into energy. An anaerobic digester works by breaking down manure without oxygen and,

> "As the bacteria 'work,' they generate biogas. The biogas that is generated is made mostly of methane, the primary component of natural gas. The non-methane components of the biogas are removed so the methane can be used as an energy source" (How Does Anaerobic Digestion Work).

This solution would both help mitigate the methane problem, as well as reduce the need for fossil fuels within heating and electricity on farms.

Ecosystem management solutions include reducing controlled burns and land clearing in general, banning the burning of open field agricultural waste, and switching from inorganic fertilizers to organic ones. Additionally, water management strategies such as drip and solar irrigation will help prevent agricultural runoff and overwatering.

A consumer-based solution for the meat portion of the agriculture industry is to simply stop eating meat. When people refuse to buy meat products, it lowers the demand for these products on the market. With a lower demand, there is no longer a need for as many cows and other methane-producing animals.

The Fossil Fuel Industry

Fossil fuels are involved in many facets of our daily lives. They include natural gas, coal, and oil, and are used in transportation as well as heat production and electricity. With the use of these fuels comes various problems. The first is that the transportation and electricity sectors in the United States are the two largest producers of carbon dioxide. Data from the United States Environmental Protection Agency, EPA, shows that emissions of carbon dioxide, methane, and nitrous oxide accounted for about 28.9% of greenhouse gas emissions, and the electricity sector accounted for about 27.5% in 2017.

Transportation giant ExxonMobil announced their 2018 earnings to be at an estimated total of $20.8 billion U.S. dollars (ExxonMobil). With this enormous figure, one would think that they are investing a portion into alternative energy research, or

varying ways to minimize their carbon footprint. What they are doing instead is quite the opposite. PolluterWatch, a part of the Greenpeace organization, states, "ExxonMobil alone is responsible for 3.22% of the world's total fossil fuel emissions". This is not the fossil fuel industry as a whole, it is just ExxonMobil, and they are not working to minimize this number, either. In fact, they are spending millions of dollars in an attempt to cover up their emissions. PolluterWatch also mentioned that ExxonMobil spent over $33.7 million from 1997-2015 on groups that deny the existence of climate change or impede policy solutions. Since 2007, the year when Exxon announced they would stop funding climate change denial, the oil company has given $454,000 to the American Legislative Exchange Council (Alec), according to *the Guardian*. This council is an ultra-conservative lobby group, and "…has hosted seminars promoting the long-discredited idea that rising carbon dioxide emissions are the "elixir of life", and was behind legislation banning state planners in North Carolina from considering future sea-level rise" (Goldenberg).

Why is it so bad that they deny climate change? There would be no problem if ExxonMobil solely denied this phenomenon. They would only be making themselves look bad, considering the fact that numerous studies show the existence of climate change. But instead, the company is not only denying the existence of the climate disaster, but also paying lobbyists to impede the progress of bills directed towards helping the climate change initiative (Goldenberg).

Additionally, they have been caught hiring their own scientists to conduct studies showing their effects on climate change are minimal. The Stanford Research Institute, now known as SRI International, conducted climate change research for the American Petroleum Institute (API) in the 1960's and 1970's. According to Scientific American, API learned of potential climate change risks as early as 1968, but "…Exxon CEO Lee Raymond said in November 1996 that climate science was unsettled" (Hulac).

Solutions for the Fossil Fuel Industry

The first, and most basic solution for fossil fuel companies would be for them to realize that denying the science of climate change is only hurting their reputation and to stop funding organizations to create incorrect data. Furthermore, these billion dollar companies could easily invest in alternative solutions. Investing in research for alternative energy provides jobs, as well as the possibility for more money if the alternative energy sources are successful. For example, the Environmental Defense fund found that the renewable energy sector employs 777,000 people, which is roughly equivalent to the United States telecommunications sector. They also found that, "solar and wind energy jobs outnumber coal and gas jobs in 30 states, including the District of Columbia" (McKeon).

If these business giants refuse to invest their money into research for renewable energy, then the next best thing is for them to implement it in their own buildings. It may not be as big of a contribution, but it is a contribution, nonetheless. Additionally,

they could set long-term targets to reduce their emissions. These implementations not only help the environment, but also lessen costs that these companies would normally be paying for energy use.

Problems with the Sunscreen Industry

Last but not least, sunscreen companies. Sunscreen companies exploit the environment. The Earth is warming, which means we need to wear more sunscreen, right? Well, not entirely. If we are worried about skin cancer, the best options are to wear protective clothing and reduce our sun exposure. For marketing purposes, though, these big corporations play on the fact that skin cancer may be more prevalent due to the warming temperatures, and the idea that Americans do not want to limit their fun in the sun. So, companies like Coppertone and Banana Boat target seemingly innocent advertisements toward summertime and freedom, while knowingly producing harmful formulas and ignoring environmental warming concerns in order to make a profit. In addition, there are many harmful chemicals, not only harmful to us but also to the environment.

Have you ever stopped to think about what is in your sunscreen? According to a study conducted by NOAA researchers, oxybenzone, an ingredient found in over 3,500 sunscreens and skin care products, "...showed four major toxic effects in early, developing coral: increased susceptibility to bleaching; DNA damage (genotoxicity); abnormal skeleton growth (via endocrine disruption); and gross deformities of baby

coral"("Skincare Chemicals and Coral Reefs"). That is not the only damaging aspect to skin care. There are many, many more chemicals that harm corals as well as other sea life. Benzophenone-2, or BP-2, is a commonly used additive in sunscreens, lotions, fragrances, and soaps. This chemical, when introduced to corals can increase, or at the very least, induce the rate of mutation by causing DNA damage. As harmful as it is, this substance is almost never filtered from municipal wastewater treatment facilities, and as a result, is frequently expelled in waters near coral reefs. Ingredients in skin care products do not simply stay on skin. Each time we shower, bathe or swim, the products we use wash off and enter our waterways. This includes lotion, sunscreen, makeup, and even chapstick.

Sunscreen companies such as Banana Boat and Coppertone have not switched any ingredients to help mitigate these damaging effects. These companies only have their sights set on the opportunities that climate change presents regarding profits. Coppertone Sport is one of the top selling sunscreen brands in the United States so far in 2019, bringing in $87.2 million ("Leading Suntan Lotion and Oil Brands in the U.S. 2019"), yet they are still using ingredients with little to no research behind them. While they may have introduced a mineral sunscreen with a main ingredient of zinc oxide, it is unclear if the zinc oxide they use is non-nano. If it is nano-zinc oxide, this means that the particles are small enough for corals and other animals to ingest, making it unsafe for coral reefs and all marine life associated with them. Banana Boat is also on the list of

top sunscreen brands, cashing in at $34.9 million, and they use ingredients with little to no research behind them, as well. As of now, with the profits that they are making, it is evident that Coppertone and Banana Boat have no real motivation to change. Looking into the future, hopefully Coppertone and Banana Boat's parent companies, Bayer and Edgewell Personal Care, will alter their ingredients for a healthier climate. If not, they will continue to decrease marine life populations.

How Sunscreen is Harming the Oceans

There is an endless cycle happening. The climate heats up due to excess carbon dioxide, so we slather on extra sunscreen to prevent skin damage. However there is carbon dioxide released in almost every step of the process of producing, transporting, consuming, and wearing sunscreen. Even in the steps where there is no CO2, there are other harmful chemicals. Tragically, we are adding to climate change and continuing the cycle.

As carbon dioxide builds up in the atmosphere, it leads to ocean acidification, coral bleaching, and decreased overall oxygen amounts. Ocean acidification is a decrease in the pH of the Earth's oceans; caused by the intake of carbon dioxide from the atmosphere. There are a series of chemical reactions that occur, making the water more acidic. This is specifically problematic for calcifying organisms such as oysters, clams, sea urchins, shallow and deep water corals, and calcareous plankton because these changing acidity levels make it difficult for them to build their shells. This may

seem insignificant to us, but looking at it from a different perspective, these small creatures are food sources for many of the sea creatures that we consume. For example, if they die out, we may lose many North Pacific salmon. In addition, many non-calcifying organisms, such as fish, are losing their ability to detect predators. The increased acidity makes it more challenging to distinguish between the "smell" of predators and that of their own species. These factors and more decrease the likelihood of survival for multiple sea creatures.

Ocean acidification also plays a part in coral bleaching. Coral bleaching is the process of algae leaving its coral host. Algae and corals have a symbiotic relationship, meaning they depend on each other to survive. The algae are the coral's primary food source and produce oxygen, and the coral provides a protective environment, along with compounds that the algae need for photosynthesis. When the coral becomes stressed, the algae leave. This depletion of algae is due to temperature changes of ocean water, pH changes, and pollution. According to an article called "Climate Change", by the Great Barrier Reef Foundation, "Changes in the ocean's chemistry can decrease the capacity of corals to build skeletons, decreasing their capacity to create habitat for the Reef's marine life," essentially accelerating the bleaching events. The coral can survive for short periods of time without algae, but if the coral polyps go for too long without algal cells, the coral will die.

These issues are not only detrimental to the planet, but to humans as well. With the reduction of healthy coral reefs and surrounding ecosystems, we lose a large portion of the oxygen we breathe every day. Earth's oceans work similarly to forests, except larger. They are huge carbon sinks, meaning that they absorb carbon dioxide and release oxygen. A piece from Business Insider stated that up to 85% of the oxygen in the air we breathe is produced by ocean plants. Polluting the oceans and continuing on the 'business as usual' climate change path will significantly affect our oxygen on this planet, not to mention the sporadic weather events and added warming effects it will also cause.

Sunscreen Solutions

Some states are creating regulations that ban the use of chemicals such as oxybenzone and octinoxate. Legislation such as this is a big step in the fight for healthy coral reefs, and for mitigating climate change. Hawaii, with a large amount of their money coming in from tourism, was the first to do this, "in a 2017 study, National Oceanic and Atmospheric Administration scientists found that 56 percent of the Big Island's coral was bleached, as was 44 percent of West Maui's corals, and 32 percent of Oahu's reefs" (Belluz). Statistics such as this show the urgent nature of this issue. This is why regulations are beginning to come into place.

Following the widespread ban on oxybenzone and octinoxate, some sunscreen companies are beginning to reformulate their products. It is not only environmentally

intelligent, but also economically. This reformulation not only gives the companies a good reputation among nature lovers, leading to more profits, but also allows them to market their brands in more places. With harsh bans on chemicals becoming more frequent, sunscreen companies are forced to rethink their products to stay in business. Florida has already enacted a ban, and the Caribbean island of Bonaire as well as the archipelago nation of Palau in the Pacific are set to follow suit in the upcoming years 2020 and 2021 (McMahon).

Some brands, such as the popular sunscreen giant Sun Bum, have already taken these regulations into consideration. They began removing oxybenzone and octinoxate, as well as developed a non-nano form of zinc sunscreen. In a statement regarding the removal of oxybenzone and octinoxate on their Frequently Asked Questions Page, the company states, "There was just no way we could take the chance of hurting the living and breathing reefs that create the waves we surf on…not to mention our little fishy friends we love" (Sun Bum "FAQ").

Conclusion

Industries, such as agribusiness and the sunscreen industry, seek multi-million dollar profits off of the warming atmosphere. As indicated, there are ways to combat the harmful effects of large businesses. The next step is for companies to see the impact that their sector has on the environment and implement practices to mitigate these

effects. In addition, global collaboration between companies directly involved, the research community, and governments is necessary to establish a long-term solution.

Annotated Bibliography

"Annual Report 2018." *Nestlé Global*, Nestlé, 2019, www.nestle.com/investors/annual-report.

Nestlé is a public company, so this source is directly from Nestlé itself. It provides an overview of Nestlé's revenue in 2018. It provided information on their estimated sales, products, and brands. I used this to document the amount of money the Nestlé company makes in a year.

"Cattle: Inventory on January 1 by Year, US." *United States Department of Agriculture National Agricultural Statistics Service*, United States Department of Agriculture, 28 Feb. 2018, www.nass.usda.gov/Charts_and_Maps/Cattle/inv.php.

This source provides an estimation of how many cattle are in the United States. I used it to point out the large amount of methane there is because of this enormous concentration of cattle.

"Climate Change." *Great Barrier Reef Foundation*, Great Barrier Reef Foundation, 2019, www.barrierreef.org/the-reef/the-threats/climate-change.

This article provides an overview of climate change effects on the world's oceans, corals, and more specifically the Great Barrier Reef. It describes the effects that climate change will have on reefs, including sea level rise, increasing frequency of extreme weather events, ocean acidification, and rising sea temperatures. I used this source to provide information on ocean acidification.

"Corals." *NOAA National Ocean Service Education: Corals*, National Oceanic and Atmospheric Administration, 2017, oceanservice.noaa.gov/education/kits/corals/coral02_zooxanthellae.html.

This site describes the mutually beneficial relationship between corals and the algae that live in their tissues. It explains how essential these algae are for corals to survive. This source helped me describe the necessary nature of these algae living on the corals, and how ocean acidification and coral bleaching are absolutely horrific for them.

"ExxonMobil Earns $20.8 Billion in 2018; $6 Billion in Fourth Quarter." *ExxonMobil News Releases*, Exxon Mobil Corporation, 1 Feb. 2019, 8:00 AM, news.exxonmobil.com/press-release/exxonmobil-earns-208-billion-2018-6-billion-fourth-quarter.

This website allows for a look at the annual revenue of transportation giant ExxonMobil. For this paper, I used this website to show that the ExxonMobil corporation makes billions of dollars, and that they can afford to use some of that for renewable energy research.

"ExxonMobil." *PolluterWatch*, Greenpeace, polluterwatch.org/exxonmobil.

This source provides an overview of the history of ExxonMobil, the corporation's spending habits, their emissions, pollution, and more. I quoted this source when

I stated, "ExxonMobil alone is responsible for 3.22% of the world's total fossil fuel emissions."

"FAQ." *Sun Bum*, Sun Bum, 2019, www.trustthebum.com/pages/faq.

On their Frequently Asked Questions (FAQ) page, Sun Bum has a question that asks about Oxybenzone. The company's answer describes what it is and shows how they are trying to be environmentally conscious. I used this source to describe a sunscreen company actively involved in making their products reef safe.

"Farm Practice Land Clearing." *British Columbia Ministry of Agriculture*, Province of British Columbia, 2014, www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/agriculture-and-seafood/agricultural-land-and-environment/strengthening-farming/farm-practices/870218-41_land_clearing.pdf.

This source describes land clearing processes for agriculture, as well as various methods used, and legislation involved. For this paper, I used this source to explain how each method releases greenhouse gases and other pollutants.

"Industry Statistics: Beef Industry Overview." *NCBA: National Cattlemen's Beef Association* , National Cattlemen's Beef Association , 2019, www.ncba.org/beefindustrystatistics.aspx.

This source provides data that describes statistics from the beef industry in the United States. I quoted this source when I wrote, "the amount of beef consumed in the U.S. per capita was 57.2 lbs in 2018, leading the value of beef imports to be around $8.332 billion." The purpose of this was to show the large amount of meat consumed, as well as the profits that the industry enjoys.

"Leading Suntan Lotion and Oil Brands in the U.S. 2019." *Statista*, Statista, 2019, www.statista.com/statistics/301160/suntan-lotion-and-oil-brands-sales-in-the-us/.

This website is a compiling of data showing the leading sunscreen brands in the U.S. for 2019. It shows their annual revenue and allowed for me to compare their profits with their motivation to change their ingredients.

"Net Farm Income Projected to Increase 4.8% in 2019." *Ag Equipment Intelligence*, Lessiter Media, 4 Sept. 2019, www.agequipmentintelligence.com/articles/3207-net-farm-income-projected-to-increase-48-in-2019.

This source received its data from the U.S. Department of Agriculture. It provides the viewer with graphs and data about the net farm income forecast. I used this to provide information regarding the income of farms, specifically crops.

"Ocean Acidification." *NOAA, National Oceanic and Atmospheric Administration*, National Oceanic and Atmospheric Administration , 2013, www.noaa.gov/education/resource-collections/ocean-coasts-education-resources/ocean-acidification.

This source is the National Oceanic and Atmospheric Administration, which is extremely reputable and provides accurate information. In this case, the website looks at ocean acidification. I used it in the section where I described ocean acidification.

"Reef-Safe Sunscreen: What You Need To Know." *Chasing Coral*, Chasing Coral, Exposure Labs Production, June 2017, www.chasingcoral.com/2018/05/23/reef-safe-sunscreen-need-know/.

This communicates the effects of sunscreens on coral reefs, and how reef-safe sunscreens help. It also provides a list of reef safe sunscreens available for purchase. I used this when describing the effects of sunscreens on coral reefs.

"Skincare Chemicals and Coral Reefs." *National Ocean Service* , National Oceanic and Atmospheric Administration, 21 Oct. 2019, oceanservice.noaa.gov/news/sunscreen-corals.html.

This page on the NOAA website explains the frequency that chemicals which are harmful to coral reefs appear in skin care products, as well as how they enter the ocean. It mentions oxybenzone, which I used in my paper.

"Sources of Greenhouse Gas Emissions." *EPA*, United States Environmental Protection Agency, 13 Sept. 2019, www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions.

This source explains the differing sources of greenhouse gases in the U.S. and the amounts of each. I used this most heavily when describing the transportation and energy sectors.

"The Causes of Climate Change." *NASA*, NASA, 30 Sept. 2019, climate.nasa.gov/causes/.

This is the main website for a breakdown of climate change science. As an example, it describes the greenhouse effect. I used this in my introduction as well as background.

"What Is Coral Bleaching?" *NOAA's National Ocean Service*, National Oceanic and Atmospheric Administration, 15 Mar. 2010, oceanservice.noaa.gov/facts/coral_bleach.html.

This website describes the process of coral bleaching. It is different from ocean acidification. I used this when describing coral bleaching and the mutually beneficial relationship between coral and algae.

Belluz, Julia. "Hawaii Is Banning Sunscreens That Kill Coral Reefs." *Vox*, Vox Media, 2 July 2018, www.vox.com/2018/7/2/17525496/hawaii-banning-sunscreen.

This shows the connection between sunscreen and coral reef deaths, as well as Hawaii's bill to ban certain sunscreen chemicals. I used this source for the section on Hawaii's legislation.

Goldenberg, Suzanne. "ExxonMobil Gave Millions to Climate-Denying Lawmakers despite Pledge." *The Guardian*, Guardian News and Media, 15 July 2015, www.theguardian.com/environment/2015/jul/15/exxon-mobil-gave-millions-climate-denying-lawmakers.

This is a report done by Suzanne Goldenberg, from *The Guardian*, in which she writes about ExxonMobil's climate denial, paying lobbyists, and promotion of disinformation campaigns. I used this when writing about ExxonMobil and how they use their money.

Hamilton, Jon. "How California's Worst Oil Spill Turned Beaches Black And The Nation Green." *NPR*, NPR, 28 Jan. 2019, www.npr.org/2019/01/28/688219307/how-californias-worst-oil-spill-turned-beaches-black-and-the-nation-green.

I used this source for my synthesis essay. It provides an overview of the Santa Barbara oil spill of 1969, and the aftermath. This article was incredibly interesting to me during the course and was one of the factors leading to writing my capstone on environmental issues.

Hulac, Benjamin. "Tobacco and Oil Industries Used Same Researchers to Sway Public." Scientific American, Springer Nature America, Inc, 20 July 2016, www.scientificamerican.com/article/tobacco-and-oil-industries-used-same-researchers-to-sway-public1/.

This source highlights examples of when oil companies hire their own researcher to create data and sway the public. It also compares tobacco and oil industries, but for the purpose of my paper, I focused solely on oil industries hiring their own scientists.

International Institute for Applied Systems Analysis. "Nitrous oxide levels are on the rise." ScienceDaily. ScienceDaily, 18 November 2019. www.sciencedaily.com/releases/2019/11/191118110816.htm

This source provides an overview on the greenhouse gas nitrous oxide. It also links nitrous oxide with agriculture practices. I used this source to gain knowledge about this gas in relation to agriculture.

Loria, Kevin. "The World's Oceans Are in Even Worse Shape than We Thought." *Business Insider*, Business Insider, 5 Jan. 2018, www.businessinsider.com/new-studies-show-oceans-losing-oxygen-rapid-coral-bleaching-2018-1.

This Business Insider article discusses the terrifying current state of the world's oceans due to coral bleaching. Additionally, it explains how oceans contribute to a large portion of the oxygen we breathe. I used this source to describe the dire nature of this ocean crisis: ocean plants contribute to 85% of the oxygen we breathe, so if we lose these plants, we lose oxygen.

McKeon, Natalie. "Clean Energy Is Building a New American Workforce." *Environmental Defense Fund*, Environmental Defense Fund, Jan. 2018, www.edf.org/energy/clean-energy-jobs.

This article is from the Environmental Defense Fund, and describes the extremely positive effects that renewable energy is having on the economy. Clean energy is adding thousands of jobs. In my paper, this source was used as a way to communicate that clean energy is worth spending money on. It gives back jobs in return for the money spent, and costs less in the long run.

McMahon, Shannon. "What Travelers Need to Know about Sunscreen Bans." *USA Today*, Gannett Satellite Information Network, 18 Apr. 2019, www.usatoday.com/story/travel/destinations/2019/04/18/sunscreen-bans-hawaii-key-west-bonaire-palau-mexico/3497701002/.

This is an article which lets readers know which travel destinations have bans on sunscreen chemicals, and which places have upcoming bans. It is a resource that I used to communicate the future of sunscreen companies: they need to rethink their ingredients or they will not be sold in certain places.

Ramanathan, Veerabhadran, et al. *Bending the Curve: Climate Change Solutions*. EScholarship, University of California, 2019.

This is a textbook from the climate change course I took this semester. It provides a detailed look into all aspects of climate change and the environment, including

the social, economic, and legislative aspects. I used this source to gain general knowledge before I began writing my capstone paper.

Walz, Henriette. "Agriculture and Deforestation." *The Ecologist*, The Resurgence Trust, 27 Sept. 2019, theecologist.org/2019/sep/27/agriculture-and-deforestation.

Deforestation is a huge part of agriculture, and according to Henriette Walz, we need to seriously rethink certain practices. This article provides an overview of global ramifications, production and certification, land rights, and solutions. I did not quote this source; I only used it for knowledge.

Wei-Haas, Maya. "Burp by Burp, Fighting Emissions from Cows." *National Geographic*, National Geographic Society, 3 Aug. 2015, www.nationalgeographic.com/news/2015/08/150803-cows-burp-methane-climate-science/.

This article describes cow and other farm animal burps and why the physiological processes that allow them to produce methane. In addition, it explains why methane is terrible for the Earth, and possible solutions that have been presented. I quoted this work when I discussed a cow's digestive system, and why they produce methane.

Synthesis Essay

This semester, our capstone class had two themes: crisis and opportunity and culture and community. Throughout the first half of the semester, we had multiple readings dedicated to either one or both of the themes. Within each class, two people were assigned readings from the list to analyze and present on. My partner and I were given an excerpt from *Coastal Sage*, by Thomas J. Osborne, and the NPR article, "How California's Worst Oil Spill Turned Beaches Black And The Nation Green" by Jon Hamilton. Due to my passion for saving the environment in which we live, I focused on the second reading, "How California's Worst Oil Spill Turned Beaches Black And The Nation Green."

This article focuses on the Santa Barbara oil spill of 1969, which was, at that time the largest oil spill in U.S. waters. This spill itself, along with the damage it caused to surrounding ocean waters and sea life, created a huge crisis. The oil and gas was under such an enormous amount of pressure that it opened five gashes in the seabed. Oil from these slits would eventually amount to cover an area close to the size of Chicago. Within these waters were multitudes of sea creatures and plant life that were harmed or killed, "'right where we're sitting right now you transformed from this ecosystem of amazing richness, amazing biodiversity, amazing biological activity into a sort of

Armageddon of blackness,'" says Douglas McCauley, a marine biologist at the University of California, Santa Barbara.

This spill launched the beginnings of the environmental movement as we see it today. As terrible as it sounds, a catastrophe of this nature was almost necessary to open people's eyes to the horrific nature of the fossil fuel industry, and to create additional and harsher legislation in favor of environmental causes. It allowed for an opportunity of growth to emerge out of this crisis.

This article is also a factor in what propelled me into my research paper topic, "Climate Change and Big Business: The endless Cycle." Because of my passion with environmental causes, I wanted to explore an issue that could educate people, and potentially help to change stubborn minds about the extent to which climate change exists. At first, I was unsure about what to focus on, given that this topic is so vast. I then decided that because climate change is so massive, I could not focus on a single facet, and I would need to include multiple aspects. As for the format, I originally wanted to make a creative piece. I have a deep love for photography, so I would have compiled a photo journal depicting the destruction and healing of nature due to climate change. However, I settled on a research paper because of my thirst for knowledge regarding this topic. Another factor in my decision was the years of practice I had spent

perfecting the art of writing research papers within my Humanities and Communication courses. I feel strong within this genre of writing.

The sectors I incorporated were deliberate. I chose agriculture because the school I attend is California State University, Monterey Bay, and we have agriculture right here in our backyard. I chose the sunscreen industry because I was curious as to the exact effects that it has on the environment. Furthermore, I play water polo for CSUMB, thus sunscreen is a recurring part of my daily routine. Lastly, I chose the fossil fuel and automotive industry because this is a huge contributor to many of the impacts we see within climate change.

I am currently enrolled in an environmental studies course here at CSUMB, called Science and Policy of Climate Change. While I initially had a curiosity about the topic of climate change, my initial drive to write this paper stemmed from this class. This is also where I gathered most of my knowledge and sources for this project.

This has been a research and passion project for me. By presenting the facts about this enormous topic, which affects everyone, I hope to open people's eyes to the damages we have caused our planet and the solutions that are presently available to help mitigate what we have done. It is also my hope that people can begin to love the environment as much as I do.