Research essay - final draft

Since the start of the Industrial Revolution, the average global temperature has gradually risen due to rapid population growth and an increase in the burning of fossil fuels. In the last decade, climate change has become even worse. Human activities such as transportation and electricity generation have aggravated the situation by increasing greenhouse gas emissions. Not only do emissions pollute the environment, but they also endanger wildlife. The excess amount of greenhouse gas emissions have resulted in climate change, in turn causing a mass extinction event.

According to the United States Environmental Protection Agency, "transportation is the largest source of greenhouse gas emissions in the United States, followed by electricity generation." Human activities are the main driving forces of excess greenhouse gas emissions. Since the late 20th century to 2015, net greenhouse gas emissions have increased 43 percent worldwide. Major greenhouse gases include carbon dioxide, methane, nitrous oxide, and fluorinated gases. Carbon dioxide has had the greatest impact on Earth since 1990. CO_2 is mostly emitted through the burning of fossil fuels such as electricity generation, and solid waste. These greenhouse gases have a devastating impact on Earth. As stated in an article by Sarah Fecht, published on Columbia Climate School, "carbon dioxide and other greenhouse gases act like a blanket or a cap, trapping some of the heat that Earth might have otherwise radiated out into space". Fecht explains that the Earth's surface absorbs some of the sunlight's energy and reradiates it as infrared waves. These infrared waves will travel back into space if uninterrupted. However, CO_2 and other greenhouse gases absorb energy at a variety of wavelengths between 2,000 and 15,000 nanometers, which overlaps with the infrared waves that are approximately 700 to 1,000,000 nanometers. These greenhouse gases absorb the infrared waves and re-emit the energy in various directions. Fifty percent of the re-emitted energy returns back to Earth, contributing to the greenhouse effect. As such, the surfeit emission of carbon dioxide, methane, and other greenhouse gases lead to an increase in the average global temperature. Ecosystems will be thrown out of balance, endangering hundreds of species in that environment and also humans, who rely on many of these species in our daily lives.

The accelerating greenhouse effect has sharply increased the number of endangered species. Species such as giant pandas and blue whales experience a difficult time adapting to the rapidly changing environment, or even lose their habitats. Within a decade, dozens of species will go extinct. According to the International Union for Conservation of Nature (IUCN), "Climate change currently affects at least 10,967 species on the IUCN Red List of Threatened Species, increasing the likelihood of their extinction". For example, the Bramble Cay melomys, a kind of rodent, are the first reported mammals to have gone extinct as a direct result of climate change. The rodents lived on a tiny sand island in the Torres Strait, a strait between Australia and the Melanesian island of New Guinea. According to a BBC news article discussing the extinction of the Bramble Cay melomys that took place in 2015, the rise of ocean levels, flooding, and extreme weather have led to dramatic habitat loss, thereby affecting the mortality of the melomys. Extreme weather events and heavy precipitation not only killed the Bramble Cay melomys directly, it also wiped out melomys' source of food. Habitat loss and food scarcity caused the melomy population to decline rapidly, and therefore resulted in their extinction. The threats faced by the melomys will happen to many other threatened species in the next decade. Another ecosystem that is being threatened by global warming is coral reefs. In March 2021, IUCN published an article regarding the issue of coral bleaching, explaining that when corals experience a change in

temperature, they expel the symbiotic algae living in their tissues. This algae is responsible for the color of coral reefs. Without the algae, bleaching occurs, where corals turn white. A rise of one to two degrees celsius in ocean temperatures can lead to coral bleaching, leading to the destruction of coral ecosystems after a prolonged period of time. The Great Barrier Reef in Australia and reefs in the Northwestern Hawaiian Islands have all gone through their worst bleaching in recent years. For instance, "the bleaching of the Great Barrier Reef in 2016 and 2017 killed around 50 percent of its corals". In addition, coral reefs are crucial for marine biodiversity. As stated in the IUCN article, they support one quarter of the fish species like seahorses, triggerfish, and also many other marine animals. Destruction of coral reefs will undoubtedly endanger the lives of other marine species, and contribute to the current mass extinction event.

Despite the fact that climate change is endangering the survival of various species, there are practical ways to reduce greenhouse gas emissions and decelerate the rate of global warming. According to Resources for the Future (RFF), a nonprofit organization that conducts independent research regarding environmental, energy, and natural resource issues, there are three main policies to reduce greenhouse gas emissions: carbon pricing, technology subsidies, and performance standards. Carbon pricing policy requires companies to pay a price for each ton of carbon emissions they release. Business owners or decision makers would seek different ways to reduce the amount of carbon they release in order to pay less tax. For example, companies could buy more advanced machines that have a higher energy efficiency. Secondly, technology subsidies provide businesses a financial incentive in exchange for a particular economic activity. RFF says, tax credits have been an efficient method to encourage "companies and households to build, produce, or consume technologies and products that have low or zero emissions". The third major policy to reduce greenhouse gas emissions is performance standards, which "are a broad set of policies that set benchmarks that firms must meet". For instance, in each industrial sector, governments can set a boundary or benchmark for power generation, the amount of low-carbon energy sources, fuel economy, and more. In addition to the policies regarding the reduction of greenhouse gas emissions, investments from the government should support maintaining wildlife. For example, the IUCN says that governments should invest in sustaining and restoring coral reefs, and in genetic selection research of heat-resistant coral reefs.

By reducing greenhouse gas emissions, the average global temperature would not rise as much, nor would the current mass extinction event be so catastrophic. However, if people do not act immediately, the National Wildlife Federation estimates that "30 percent of the world's species will be on a path to extinction by 2050". Simply by turning off the light when you exit a room, or bringing a reusable bag when you buy groceries, you are saving the animals you love.

Biodiversity is essential to the maintenance of Earth's ecosystems. Not only does a lack of biodiversity harm other species, it further affects human health and the global economy. Since humans rely on plants and animals to maintain human ecosystems, mass extinction would lead to a global crisis. As such, government leaders should enforce policies not just to prevent a mass extinction event, but also to sustain the prosperity of human society.