

Forum: Environment

Issue: Combatting Biodiversity Loss due to Climate Change

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Introduction

Wildlife biodiversity is declining at unprecedented rates, and will continue to do so if immediate, effective action is not taken. The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), responsible for overseeing and reporting on the global biodiversity status, warns that the extinction rate of rare species is accelerating and will likely have severe impacts on communities around the world. These issues have recently been exacerbated by climate change, caused by the rapid industrialization of countries. The ever-increasing levels of pollution and greenhouse gases, often produced without consideration of biodiversity loss, have deteriorated the health of ecosystems, on which all species depend. The very foundations of the planet—the countless diverse species that depend on the environment—are in danger of being eradicated by threats they cannot stand up against.

Fortunately, the international community has recently become more aware of this global issue, and many have pledged their support, such as through signing the Paris Agreement. The UN asserts that it is not too late to make a difference – if local and global change is undertaken, biodiversity levels can still be restored and conserved. When considering the severity of climate change, it is clear that the introduction and reinforcement of effective systems of transformative change are essential to preserving a diverse, lively, and better world.

Definition of Key Terms

Biodiversity

Biodiversity is the culmination of all species and ecosystems of a region, as well as the variability between all living organisms. It includes the diversity within a certain species, such as the genetic makeup of an individual organism, the diversity between species, and the diversity of ecosystems. Biodiversity can be indicated by numerical values, or by the common measure of species richness.

Ecosystem

An ecosystem is the community of living organisms, including a multitude of distinct species, that live and interact in conjunction with the abiotic components within a specific environment. The biotic and abiotic components of an ecosystem are all interrelated through energy flow and mutual relationships. Examples of ecosystems on Earth include the desert, forest, marine, rainforest, savanna, taiga, tundra, coral, and grassland ecosystems. All ecosystems can be summed up in four principal categories: artificial, terrestrial, lentic, and lotic.

Greenhouse Gases

Greenhouse gases are any gases that have the ability to trap heat within Earth's atmosphere. When the sun emits sunlight, Earth's surface emits radiation; greenhouse gases absorb this energy and prevent it from escaping the atmosphere, essentially reradiating the heat back towards the surface and contributing to the Greenhouse Effect. The most important greenhouse gases are carbon dioxide, methane, water vapor, and nitrous oxide.

Climate Change

Climate change is a global phenomenon characterized by a long-term shift in the average conditions of the planet. Most commonly, it refers to how fossil fuels trap heat within Earth's atmosphere, leading to a rise in global temperature every year. Scientists predict that straying even 4 degrees away from Earth's original temperature could very plausibly lead to "a collapse in global food production, catastrophic droughts and floods, heatwaves and the beginning of ice-sheet melt that could eventually raise the sea level enough to wipe out many of the world's great cities."

Background Information

Climate change is an overwhelming problem, posing a huge threat to all UN member states, all individuals, and all animals. The factors that lead to climate change, as well as climate change itself, can have drastic consequences on the biodiversity of the planet. As of 2012, the International Union for Conservation of Nature (IUCN) Red List has categorized 3079 animals and 2655 plant species as endangered (EN) worldwide, as compared to the respective figures of 1102 and 1197 during 1998. These numbers are likely to continue increasing if negative industrially-motivated human pressures on worldwide biodiversity—such as excessive greenhouse gas emission, deforestation, and fossil fuel usage—are not addressed.

History

The appearance of the global issue of biodiversity loss is relatively recent, as it is primarily caused by human actions. Man-induced animal extinctions first became prevalent during the start of industrialization, which created many of the factors that currently fuel climate change. To create an effective solution for the mitigation of the issue at hand, it is imperative to have comprehensive knowledge about the history of biodiversity loss in relation to climate change.

The Industrial Revolution

Lasting from the 18th to 19th century, the Industrial Revolution was the mass transition to new industrial manufacturing processes in the United States and Europe. As cities urbanized, there was a large increase in CO₂ output due to the inefficient, yet numerous, factories. Though unforeseen at the time, it is clear in the present circumstances that the reliance on industrialization has exacerbated climate change and its consequent devastating biodiversity loss. Furthermore, it is generally agreed upon by scientists that the Industrial Revolution ushered in a phase of negative “environmental alteration”, which includes such actions as deforestation and habitat destruction. During the past 50 years, humans have altered ecosystems for the worse more quickly than in any other time period in human history: this is largely due to exponential population growth and society’s increasing demands for natural resources such as food, water, and fuel. Essentially, the Industrial Revolution facilitated an increase in climate change which led to biodiversity loss.

The Millennium Ecosystem Assessment

The Millennium Ecosystem Assessment, a major report called for by the UN Secretary General about ecosystem change, was released in March 2005. It revealed the largely irreversible loss in biodiversity, emphasizing that the substantial loss of animal life could lead to drastic repercussions for human society. The report found that, due to human actions, an estimated 10-30% of mammal, bird, and amphibian species were being threatened by extinction. The World Wide Fund for Nature (WWF) made a statement about the report, warning that the Earth has been put under too much demand by mankind, and will be unable to recover if these demands remain unchanged.

Primary Sources of Greenhouse Gas Emission

As the world population increases, so does the need for energy. Fossil fuels are an easy and inexpensive solution. As of 2019, coal, oil, and natural gas currently supply around 32.6%, 23.7%, and 30.0% of the world’s energy, respectively. Its uses vary from sector to sector, from electricity to heating to transportation. Industry, transportation, and electricity generation are the

main uses of fossil fuels, with electricity generation using the most coal, transportation using the most petroleum (produced from the processing of crude oil), and industry using a mix of all three.

Temperature Increase

The Greenhouse Effect happens when greenhouse gases collect in Earth's atmosphere, trapping and sending heat back to the surface. These gases occur naturally; the Greenhouse effect keeps the planet habitable and the climate comfortable. Without it, many lifeforms would freeze in sub-zero temperatures. However, since the Industrial Revolution, human activities have released an unprecedented amount of greenhouse gases into the atmosphere. Since then, that amount has skyrocketed, and it has been predicted that greenhouse gas emissions have "increased 70 percent between 1970 and 2004". Moreover, carbon dioxide emissions, one of the major greenhouse gases, have increased by 80% in that time period. Thus, with greenhouse gas emissions far exceeding the natural range of what is enough to keep the climate stable, the Earth's surface temperature has started to rise.

The Intergovernmental Panel on Climate Change (IPCC) released their most recent report in 2007, emphasizing how, due to human activities, "Earth's average surface temperatures have risen about 0.74 degrees Celsius (1.33 degrees Fahrenheit) during the past 100 years". According to recent projections by IPCC, these numbers may increase by 1.6-4.3 degrees Celsius by the end of 2100. As a result, ice sheets and glaciers have begun to shrink, sea levels have fluctuated, precipitation patterns have begun behaving erratically, as well as various other problems that will prove detrimental to biodiversity.

Sea levels and biodiversity

Most of the excess heat reflected by greenhouse gases is absorbed by oceans, which cover a large portion of the Earth's surface. While the increase in global temperature on land is around 0.2 degrees, the mean global sea surface temperature has been "increasing by approximately 0.4°C since the 1950s". This has led to two major issues: increasing sea levels and decreasing marine biodiversity.

The IPCC predicted that sea levels would rise roughly 26-98 centimeters by the next century, mostly due to the melting of polar ice-caps and icebergs. Coastal ecosystems—such as mangrove forests and freshwater wetlands—are at risk of being flooded, and species may lose access to life-sustaining food and water. The disturbance caused by rising sea levels will greatly disturb biodiversity in these ecosystems, harming "potential CO₂ capture zones" and vital breeding grounds.

Marine species will also need to adapt to higher ocean temperatures. The ambient temperature of the ocean is one of the most important factors of sustaining biodiversity; in other words, a change in temperature will lead to a decrease in diversity distribution. Studies on fish and plankton have revealed

that climate change has already affected the oceans, with tropical regions “[experiencing] a loss of species due to elevated heat stress.” There are several other consequences of climate change on marine biodiversity, including water acidification, shifts in ocean circulation, stratification, etc.

Habitat loss

Forests

Deforestation is a primary cause of climate change, as well as a quintessential example of industrial-motivated habitat destruction. The loss of living trees decreases the amount of carbon dioxide that is absorbed, as “tropical trees alone are estimated to provide about 23% of the climate mitigation that's needed to offset climate change”. Therefore, greenhouse gases remain in the atmosphere and create a negative feedback loop. The carbon dioxide traps heat, the heat is not absorbed, more carbon dioxide is produced, and so on. Furthermore, deforestation is the destruction of complex ecosystems that harbour diverse species. Forests are biodiverse hot-spots, containing up to 70% of the Earth’s terrestrial animals and plants. However, it is estimated that, during the past few decades, severe deforestation has threatened more than 28,000 species with extinction.

Coral reefs

The phenomenon of coral bleaching is when corals “expel their zooxanthellae, a symbiotic photosynthesizing alga that lives within the coral tissues and provides it with essential nutrients”. Corals with low amounts of zooxanthellae show signs of whitening, slower nutrient production, stunted growth, and even an increased vulnerability to diseases. As coral bleaching occurs when corals undergo stress from environmental factors, including aforementioned high ambient ocean temperatures and pollution, the onset of climate change has largely increased the number of cases of coral reefs experiencing this phenomenon. Ocean acidification also poses a challenge for coral ecosystems because “it makes it harder for corals to build their skeletons”. In 1998, 2002, and 2006, the Great Barrier Reef was found to have gone through major bleaching events, resulting in the deaths of a significant number of corals.

To conclude, not only does climate change damage coral reefs, it also damages their ecosystems and the organisms living within them.

Weather extremities

Climate change has resulted in weather extremities, ranging from extended periods of seasons to droughts to floods. Researchers from the University of Queensland found, through the analysis of 519 studies on the relationship between weather extremities and wildlife, over “100 cases of significant

population decline and 31 cases of local extirpation”. Though most of these cases were temporary, the researchers warned that the rise of extreme events caused by climate change could permanently destroy species. The following are several examples of weather extremities and their effects on biodiversity.

Firstly, the frequency and intensity of natural disasters, such as fire or cyclones, will either force native species to migrate or eradicate them—the abundance of rare or slow-growing species will suffer. In turn, rapidly colonizing species will be favored while biodiversity growth is impeded, in many cases meaning that “weed” species will spread and dominate areas affected by weather extremities.

Secondly, erratic rainfall patterns have had major impacts on biodiversity as well. It is highlighted in many studies that “decreased rainfall and consequent lower river flows in both regions... have a major impact on aquatic biota”, as species that are dependent on stable water quality and quantity are threatened.

Thirdly, extended periods of drought have led to the dying off of many land species, because they significantly reduce the availability of resources such as food, water, and shelter.

Fourthly, acid rain can affect animal habitats and plant diversity. The effects of acid rain on habitats is primarily seen in aquatic environments, wherein acidic rain water leaches aluminum from the soil and releases it into moving water. Several types of marine animals and almost all types of plants, including trees, are sensitive to aluminum and pH levels; therefore, excess amounts of acid rain can kill off various species.

Major Countries and Organizations Involved

The United Nations Environmental Program (UNEP)

In 1972, the United Nations Conference on the Human Environment created the United Nations Environmental Program to lead international efforts in combating climate change. The organization acts as a guide for the nations of the UN, alongside other willing NGOs, and has been helping governments “reduce carbon emissions and deforestation rates.” The UNEP was one of the first to recognize the threat of climate change, and remains a key organization in the fight to adapt policies to mitigate the global issue of climate change and its effects.

The Intergovernmental Panel on Climate Change (IPCC)

The Intergovernmental Panel on Climate Change is a body of the UN, dedicated to assessing the scientific aspects of climate change. According to its official website, the IPCC releases reports to

provide policymakers and scientists with “regular scientific assessments on climate change, its implications and potential future risks, as well as to put forward adaptation and mitigation options”.

World Meteorological Organization (WMO)

The World Meteorological Organization (WMO) is an agency of the United Nations responsible for facilitating global efforts on solving issues related to climatology, hydrology, and other fields of science. Originally, the WMO belonged to the International Meteorological Organization—a group formed in 1873 to share research regarding climatology—but eventually reformed during the World Meteorological Convention of 1947 to put emphasis on weather related crises. The group encourages the unrestricted exchange of data between nations, and also “collaborates with nongovernmental partners and other international organizations on matters related to environmental protection, climate change, resource manager, and socioeconomic development”.

The United States of America

The United States of America is the second largest contributor of climate pollution on the planet. However, the government has had mixed attitudes in addressing greenhouse gas emissions; most notably, the Trump administration has pulled the USA out of the Paris Agreement, disregarding previous efforts to adopt more climate change policies. Furthermore, as of 2020, the United States has increased crude oil, coal, and gas exports and become the largest producer of fossil fuels. It is clear that the current administration will roll back any previously made climate change policies that may potentially hinder the growth of the economy.

The Trump Administration has also taken little into consideration regarding biodiversity loss. In 2019, a proposal was made to cut funding for the Environmental Protection Agency (EPA) by 26%. Though the proposal was denied by Congress, the environmental justice program aimed at protecting biodiversity and mitigating climate change is “vulnerable to losing all governmental funding”.

In order to prevent an extreme drop in biodiversity rates, the United States of America must immediately take action against climate change. Mitigating a global issue such as this requires unanimous, international cooperation; the second largest producer of greenhouse gases in the world must not fail to reduce emissions.

The People’s Republic of China

The People’s Republic of China is the biggest contributor of climate pollution on the planet, in terms of production and consumption: around one-fourth of the world’s greenhouse gases and one-half of the world’s coal supplies are produced in China. Fortunately, policymakers have stepped up and taken giant leaps to reduce carbon emissions. China’s national carbon market, which systematically reduces

market-based emissions, was established in December 2017. The market currently covers up to 7,000 state-owned factories, which are responsible for almost half of the country’s greenhouse gas emissions.

During international conferences, China has been an active supporter of climate change negotiations. The country has also pushed for developed countries to aid developing countries in the creation of greenhouse gas policies.

China is the world’s “leading investor in wind turbines and other renewable energy technologies”, having invested an estimated 34.6 billion dollars in renewable, clean energy sources. The Chinese government has asserted the importance of the shift from fossil fuels to clean energy: more wind turbines and solar panels are created in China than in any other country. Furthermore,

Though China has been the leading producer of greenhouse gases throughout past years, the state’s willingness to undertake diverse solutions has shown that it plays a large role in the fight against climate change.

Timeline of Events

Date	Event
Jan 9 th , 1969	The National Environmental Policy Act, which ensures that the US government considers environmental effects when undertaking federal action, is established.
June 5 th , 1972	The United Nations Environmental Programme (UNEP) is founded after the Stockholm Conference on the Human Environment.
Jan 1 st , 1973	The Endangered Species Act is established to protect endangered species and ecosystems.
December 11 th , 1997	The Kyoto Protocol, an agreement between 37 industrialized countries to reduce greenhouse gas emissions, is adopted.
February 16 th , 2005	The Kyoto Protocol is officially set into practice.
2012	Greenland is discovered to be losing 280 billion tons of ice annually.
November 4 th , 2016	The Paris Climate Agreement is officially effective

2016	Coral bleaching of the Great Barrier Reef results in the death of 29-50% of its corals.
July 6 th , 2017	The Sustainable Development Goals are adopted by the UN.
2019	Global amounts of carbon dioxide reach 415 parts per million
July 31 st , 2019	Over 60% of Greenland's ice sheets experience melting.
December, 2019	Australia experiences one of the worst bushfires in its history; more than 1 billion animals were killed.

Relevant UN Treaties and Events

- United Nations Decade on Biodiversity, 22 December 2010, **(A/RES/65/161)**
- Kyoto Protocol, 16 February 2005
- Paris Climate Agreement, 4 November 2016
- United Nations Millennium Declaration, **(A/RES/55/2)**
- Implementation of Agenda 21, the Program for the Further Implementation of Agenda 21 and the outcomes of the World Summit on Sustainable Development, 9 February 2004, **(A/RES/58/218)**
- Outcome Document of 2010 MDG Summit, 10 October 2010, **(A/RES/65/1)**
- Future We Want, 11 September 2012, **(A/RES/66/288)**
- Oceans and the Law of the Sea, 18 April 2013, **(A/RES/67/78)**

Previous Attempts to solve the Issue

United Nations Framework Convention on Climate Change (UNFCCC)

The United Nations Framework Convention on Climate Change (UNFCCC) is an international convention with the ratifications of 197 nations. It seeks to prevent potentially harmful human interference with the climate and environment by creating intergovernmental policies. Climate change is its primary concern, and the convention's ultimate objective is to "stabilize greenhouse gases" in order to allow ecosystems and biodiversity to recover from the past few decades. The UNFCCC also provides a framework that all participating members have to commit to—industrialized countries have to submit annual reports about their climate change policies, including data about their total greenhouse gas emissions, during the convention to be evaluated by experts. So far, the UNFCCC has been successful

in its many attempts to help mitigate global climate change, effectively tackling many aspects of the issue.

The European Union Emissions Trading Scheme was drafted by the UNFCCC in the January of 2005 and is one of the largest emission-related policies ever launched. It places restrictions on close to half of the greenhouse gas emissions of the European Union (EU).

The Cancun Agreements were created during the sixteenth meeting of the UNFCCC. The agreements are a package of policies aimed at helping developing nations all over the globe move towards a more sustainable society. These policies include the Green Climate Fund, the Technology Mechanism, and the Cancun Adaptation Framework.

The Kyoto Protocol

The Kyoto Protocol was adopted by the international community on December 11th, 1997, and came into force on February 16th, 2005. The protocol is essentially a treaty which extends onto the frameworks outlined by the UNFCCC, with member states recommitting to their goals of reducing greenhouse gas emissions and protecting the environment. However, though the protocol was widely accepted, there have been various criticisms about its effectiveness.

Firstly, some environmental economists claim that the cost of enforcing the regulations called for by the protocol outweighs its benefits, and that the treaty is a “highly inequitable and inefficient agreement which would do little to curb greenhouse gas emissions”. Secondly, several officials criticized the protocol for its bias against developed countries; it was labelled “discriminatory and not universal, since the main sources of carbon dioxide emissions like the USA, China, India, Brazil, Mexico and Korea, as well as a number of developing countries, did not impose any restrictions on themselves.”

Ultimately, the Kyoto Protocol failed to achieve its goal of significantly impacting greenhouse gas emissions worldwide.

United States Aid's Biodiversity Policies

The United States Aid's Biodiversity Policies were implemented in the United States to curb biodiversity loss and promote environmental conservation. The policies integrated mechanisms that regulated human threats to ecosystems, further supporting “enabling conditions for biodiversity”. United States Aid also aims to expand its reach into international conferences to increase acceptance of conservation laws. The Biodiversity Policies have shown to be result-oriented and scientifically-based; however, it would be more beneficial towards achieving the primary goal of extenuating climate change if more nations could adopt similar policies.

Possible Solutions

Increased Reforestation

Governments or NGOs could give aid to rural communities who depend on logging and other forest products for survival. Social and agroforestry programs could also be established; for example, in Gujarat, India, the local community “played a lead role in the production of more than 600 million tree seedlings”. Such programs, if implemented in a multitude of communities, would help recover the loss of tree life from deforestation and perhaps have an impact on greenhouse gas absorption.

Forest Conservation Policies

Currently, there are already millions of hectares of land set aside as nature reserves; yet, this is, as evaluated by wildlife biologists, “not sufficient to ensure preservation of the unique germplasm and wildlife resources of the Region or the survival of the many endangered species”.

Thus, an increased number of protected spaces—such as national parks and wildlife refuges—within forests must be established in all countries. Furthermore, the level of security within new and pre-existing and protected areas should be strengthened to reduce instances of illegal logging. Greater numbers of patrolling rangers, advanced security cameras installed in areas of high criminal activity, human motion detectors installed in high density destruction areas—these are all plausible steps that could be taken. Nations could follow by the example of The Amazon Regional Protected Areas (ARPA) program, which addresses deforestation by expanding and consolidating areas under strict protection.

Increased Regulation of Greenhouse Gas Emissions

Several countries have enacted restrictions in cities that only allow electric cars to drive in certain areas. These “eco-friendly” traffic zones can limit the amount of greenhouse gases emitted by the state and encourage citizens to switch to more environmentally beneficial means of transportation. Furthermore, factory gas emissions should also be regulated to reduce the industrial chemical-based gases released into the atmosphere. These regulations can be enforced with incentives or penalties.

The Continuation of Successful Projects

Projects addressing biodiversity loss that are currently in operation should be continued, or implemented on an international scale. For example, the Asian Species Action Partnership (ASAP) which aims to address the endangerment of animals in Asia; the Southeast Asia Initiative, which has been effective in eliminating a percentage of deforestation; the National Institute for Space Research

(INPE), which monitors deforestation and climate from space; the Amazon Environmental Research Institute (IPAM), a governmental research institution focusing on forests, climate, and natural resources; to name a few.

Recommitment to Agreements

There have been a number of solutions proposed in the past that scientists agreed would have reduced the adverse impacts of climate change on biodiversity. However, as time has passed, nations have fallen behind and ceased their commitment to international treaties and regulations. Even worse, several nations have discontinued their participation in climate change conventions. It is essential that these nations cooperate with the rest of the UN to propose a solution that is satisfactory to all. If climate change is to be mitigated, the international community must recommit as a whole and understand the imminent threat to the world's ecosystems.

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Appendix

I. Further Reading:

- United Nations Framework Convention on Climate Change: <http://unfccc.int/2860.php>
- Intergovernmental Panel on Climate Change: <http://www.ipcc.ch/>
- UN Gateway to Climate Change: <http://www.un.org/wcm/content/site/climatechange/gateway/>