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## Rising temperatures, shrinking habitats: How climate change is reshaping global ecosystems

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### Abstract

Rising global temperatures are causing climate change, which is drastically changing ecosystems around the world and leading to a loss of biodiversity and habitat. Species that depend on ecosystems like coral reefs, polar regions, tropical forests, and mountain habitats are being driven to extinction, forced to adapt, or displaced as a result of rising temperatures. The science underlying climate change, its effects on ecosystems, and the ripple effects on biodiversity, ecosystem services, and human civilization are all examined in this essay. The study looks at how both plant and wildlife are being impacted by climate-induced changes, including habitat degradation, altered migration patterns, and the disruption of food webs. It also emphasizes the fragility of crucial habitats. In response, the study highlights the significance of adaptation strategies like ecological restoration, protected area creation, and community-based conservation initiatives, as well as mitigation strategies like cutting greenhouse gas emissions and putting sustainable land use practices into place. In the end, it emphasizes how urgently concerted international action is required to prevent additional harm, repair ecosystems, and boost resilience in order to guarantee the long-term sustainability of both ecosystems and human well-being.

**Keywords:** Climate, temperature, ecosystem, biodiversity, habitat destruction, wildlife

### Introduction

The effects of climate change are becoming more apparent worldwide, so it is no longer a remote concern. The main contributor to the current climate crisis is the extraordinary increase in greenhouse gas emissions brought on by human activities such as the burning of fossil fuels, deforestation, and industrial processes. Global temperatures are gradually rising due to greenhouse gases like carbon dioxide and methane trapping heat in the atmosphere. Sea levels are increasing as a result of the melting of glaciers and polar ice brought on by the warming climate, endangering coastal areas (Church *et al.*, 2013) <sup>[1]</sup>. climate change is linked to an increase in the frequency and intensity of heat waves, droughts, and storms (Mann *et al.*, 2017) <sup>[2]</sup>; ecosystems are disrupted; and human health is at risk due to increased disease transmission and heat-related illnesses (Patz *et al.*, 2014) <sup>[3]</sup>.

These changes are causing quick and frequently irreversible alterations to the world's ecosystems, from rainforests to coral reefs. This essay will concentrate on how many species' habitats are becoming smaller as a result of warming temperatures and related climate changes. It will also look at how habitat loss affects ecosystem services and biodiversity, both of which are critical to human well-being. Lastly, we'll look at the crucial tactics required to lessen these impacts and encourage global adaptation.

### The science of climate change and habitat loss

Anthropogenic Greenhouse Gas (GHG) emissions have greatly increased the Earth's surface warming caused by the natural process known as the greenhouse effect. Because of human activity, atmospheric concentrations of CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O have increased dramatically since the Industrial Revolution, magnifying the greenhouse effect and raising average global temperatures.

### Greenhouse gas emissions

The main source of CO<sub>2</sub> emissions is the combustion of fossil fuels for industry, transportation, and energy. The extraction of fossil fuels and agricultural activities, particularly the raising of cattle, are the main sources of methane, a more powerful GHG.

Industrial operations and agricultural fertilizers are the main sources of nitrous oxide emissions.

### Temperature rise

According to predictions, if current emission rates continue, the world average temperature might rise by an additional 2-4 °C by 2100, having already increased by roughly 1.1°C since pre-industrial times. This warming is not uniform; for instance, the Arctic is warming at a rate known as Arctic amplification, which is around twice the global average. The distribution and phenology of species are altered by this temperature increase (Parmesan and Yohe, 2003) <sup>[4]</sup>, and the probability of extinction is increased (Thomas *et al.*, 2004) <sup>[5]</sup>.

### Effect on habitats

Ecological balance can be upset by even modest temperature rises. Particularly at risk from habitat loss are species that are well acclimated to certain climates, as those found in the Arctic or atop mountains. Climate change causes habitat loss and coastal erosion (Nicholls *et al.*, 2011) <sup>[6]</sup>, marine biodiversity disturbs (Hoegh-Guldberg & Bruno, 2010) <sup>[7]</sup>.

### Feedback loops in the climate system

A few climate system feedback mechanisms worsen habitat loss and hasten global warming. For example:

#### Melting ice and albedo effect

The Earth's albedo, or reflectivity, is decreased when glaciers and polar ice caps melt. A large portion of the sun's energy is reflected by snow and ice, but when they melt and are replaced by darker land or water, more solar radiation is absorbed, which causes additional warming.

#### Permafrost thawing

Methane, a powerful greenhouse gas, is released into the atmosphere in significant quantities as permafrost thaws in the Arctic and sub-Arctic regions. Consequently, the warming process is accelerated and additional habitat deterioration is facilitated.

### Key ecosystems affected by climate change

#### Coral reefs

Known as the "rainforests of the sea," coral reefs support a wide variety of marine life and offer vital services like fisheries, tourism, and coastal protection. However, there are two primary risks to coral reefs, making them one of the most vulnerable ecosystems to climate change:

#### Coral bleaching

Corals eject the symbiotic algae (zooxanthellae) that live in their tissues when water temperatures rise by just 1-2°C above usual. Coral bleaching results from the loss of these algae, which use photosynthesis to supply corals with nutrition. Although they may withstand short-term bleaching events, corals frequently die after extended exposure to high temperatures.

#### Ocean acidification

A large amount of the CO<sub>2</sub> released into the atmosphere is absorbed by the oceans. Ocean acidification results from the pH levels dropping as a result of this. The existence of coral reefs is further threatened by acidification, which hinders

the ability of marine creatures, including corals, mollusks, and plankton, to form calcium carbonate shells and skeletons.

### The polar areas

The most severe consequences of climate change are being felt in the polar areas, particularly the Arctic.

### Loss of sea ice

The Arctic's sea ice is melting at a startling rate due to rising temperatures. The marine ecology is also being impacted by this ice loss, in addition to animals like polar bears who rely on sea ice for breeding and hunting (Stroeve *et al.*, 2012) <sup>[8]</sup>. For example, as the ice melts, ice algae a major source of food for tiny marine life are melting as well. Human societies like fishing, industry, and coastal villages are also impacted by this sea ice loss (Eicken and Others, 2009) <sup>[9]</sup>.

### Species endangerment

As their habitats melt away more quickly than they can adapt, species like the Arctic fox, walrus, and polar bear are facing habitat loss. Jet streams and weather systems in the mid-latitudes are being impacted by the consequences of Arctic warming, which is also having an impact on global weather patterns.

### Forests in the tropics

By absorbing carbon and sustaining biodiversity, tropical rainforests like the Amazon are essential for controlling the planet's temperature. However, both deforestation and climate change pose a serious threat to them.

### Temperature and precipitation changes

Droughts are occurring more frequently in tropical places as a result of warming temperatures and changed rainfall patterns. Droughts make forests less resilient, which raises the possibility of forest fires and tree death.

### Deforestation

The effects of climate change are being exacerbated by the ongoing loss of tropical rainforests for logging, urbanization, infrastructure development (Seto *et al.*, 2011) <sup>[11]</sup> and agricultural expansion (Hansen *et al.*, 2013) <sup>[10]</sup>. The capacity of rainforests to absorb CO<sub>2</sub> and sustain the species that rely on them is diminished as they disappear.

### Biodiversity loss

Over half of all species on Earth live in tropical forests. Due to habitat destruction and fragmentation (Fahrig, 2003) <sup>[12]</sup> and overexploitation, species lose their habitats when the forest shrinks and fragments, increasing their risk of extinction.

### Ecosystems in mountains

Because many species at higher elevations have nowhere to go when temperatures rise, mountain ecosystems are especially sensitive to climate change.

### Glacier retreat

At previously unheard-of speeds, glaciers in mountain ranges including the Alps, Andes, and Himalayas are retreating. For many areas, glaciers serve as essential freshwater reservoirs, and their disappearance would jeopardize billions of people's access to water.

**Changing habitats**

A large number of species in mountain ecosystems have evolved to survive in frigid, high-altitude environments. These animals are compelled to relocate higher up the mountain as temperatures rise. However, many species threaten extinction if they are unable to move since mountain tops are scarce and offer little suitable habitat.

**Consequences of habitat loss****Biodiversity decline**

One of the main causes of the decline in biodiversity is habitat loss brought on by climate change (Thomas *et al.*, 2004) <sup>[5]</sup>. Many species find it difficult to migrate to new habitats or adapt when ecosystems change. There is a greater chance of extinction for those that are unable to adapt to climate change.

**Species extinctions**

The International Union for Conservation of Nature (IUCN) claims that species declines worldwide are a result of climate change. Particularly vulnerable are species with limited geographic ranges or high levels of specialization. The loss of habitat brought on by global warming has affected animals such as the golden toad, the polar bear, and the mountain pygmy possum. Climate change will cause species to go extinct 100-1000 times quicker than they would naturally (Barnosky *et al.*, 2011) <sup>[13]</sup>.

**Ecosystem service disruption**

As biodiversity declines, ecosystem services are diminished. For instance, agricultural output is at risk from the decline of pollinator species, like bees, brought on by habitat loss and climate changes. In a similar vein, the disappearance of coastal wetlands diminishes their capacity to act as a storm buffer and shield coastal communities from rising sea levels.

**Social and economic effects**

There are serious economic repercussions from habitat loss and biodiversity degradation. Food, water, medicine, and raw materials are just a few of the many services that ecosystems offer to sustain human livelihoods. Thus, sectors including forestry, tourism, fishing, and agriculture may be directly impacted by ecosystem collapse.

**Food security**

Global food security is impacted when ecosystems like forests, wetlands, and coral reefs are destroyed. Reduced agricultural output and limited access to fresh water can result from declining fisheries and pollinator populations.

**Human migration and conflict**

Social instability, especially in susceptible areas, can result from habitat loss. Communities that rely on these ecosystems for resources may experience economic hardship as a result of ecological degradation, which could result in migration and displacement (Raleigh, 2011) <sup>[14]</sup>.

**Strategies for mitigation and adaptation****Strategies for mitigation**

Reducing greenhouse gas emissions, stopping deforestation, and promoting sustainable land management techniques are essential to lessening the impact of climate change on ecosystems.

**Renewable energy transition**

Reducing emissions requires a move away from fossil fuels and toward renewable energy sources like solar, wind, and geothermal.

**Carbon sequestration**

Reforestation and afforestation, as well as the preservation of forests and wetlands, are important methods for sequestering carbon and preserving biodiversity.

**International policy and cooperation**

To guarantee that countries work together to cut emissions and move toward a low-carbon future, international accords such as the Paris Agreement are essential.

**Strategies for adaptation**

Adaptation refers to methods that assist organisms and ecosystems in adjusting to the changes that are already taking place.

**Ecological restoration**

Restoring damaged ecosystems, including wetlands or forests, can improve biodiversity resilience and partially undo the harm brought on by climate change.

The establishment of wildlife corridors and protected areas facilitates migration and makes it easier for species to adjust to changes brought on by climate change.

**Encouraging biodiversity conservation**

Specific conservation initiatives, including aided migration for species unable of adapting or captive breeding programs for endangered species, can help protect species that are at risk.

**Conclusion**

The growing consequences of climate change are changing ecosystems around the world. As temperatures rise, many species' vital habitats are becoming smaller. The effects of climate change are severe, immediate, and widespread, ranging from the melting of polar ice caps and the bleaching of coral reefs to the destruction of tropical forests and the extinction of mountain species. In addition to endangering the existence of innumerable species, these changes also interfere with the intricate webs of ecosystem services that humans rely on, including food, clean water, air, and climate regulation.

Ecosystems worldwide are under unprecedented stress as a result of habitat loss and ongoing temperature increases. Ecosystems that formerly flourished are being forced past their natural limits, and species that cannot adapt fast enough are in danger of going extinct. The ensuing loss of biodiversity and the deterioration of ecological processes that are vital to human cultures are not hypothetical; they are now occurring. The basic integrity of the biological and ecological processes on our planet is in jeopardy as habitats disappear. Given the urgency of the issue, swift and decisive action is required in two crucial areas: adaptation and mitigation.

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