



HMUN 2025

Installing measures to protect the vulnerable ecosystems in the Antarctic region

UNEP

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Forum: United Nations Environment Programme

Issue: Installing measures to protect the vulnerable ecosystems in the Antarctic region

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Introduction

The only region in the world without permanent human residents is the Antarctic Region, yet it contains a vast majority of biological variety and is the most fertile environment on Earth. The Antarctic Region is an isolated area near the South Pole of the Earth. The outlying position of the Antarctic Region is often a cause for concern due to its significant part in maintaining climate change and, therefore, perpetuating the tidal current. The Antarctic region is the source of around 60% of the amount of freshwater supply on Earth. It has an essential role in energy balance, absorbing minimum heat energy while reflecting the majority into space.

Nevertheless, the Antarctic Region faces a wide range of threats, slowly becoming more vulnerable day by day. The unrestricted increase in human activities, from excess levels of fishing to the use of fossil fuels, marine pollution, and climate change, cause various threats to this region. These threats cause the glaciers to melt, causing an abnormal rise in sea levels and simultaneously causing temperatures to increase in the ocean. This not only becomes a threat to the community of various species located in the region but affects the sea levels globally, causing a threat to all species no matter where they are located. The Antarctic Region is an important region located in the South Pole of the Earth. The Antarctic Region contains the South Pole, East Antarctica, Antarctic Peninsula, the Ross Sea, and the Ross Sea and West Antarctica. The significance of this region to the world is immaculate and has caused territorial disagreements for years. However, this region is very vulnerable and in need of immediate measures to protect its environment.



Figure 1- the Antarctic region

Definition of Key Terms

Climate Change

The result of the long-term fluctuations in the global temperature by natural and human-induced causes, from deforestation to excess levels of fishing. The topographic structure of the Antarctic Region caused a significant increase in the temperature of the area, causing the glaciers to melt and the ocean to get warmer, simultaneously causing changes in marine ecosystems.

Global Warming

It is the abrupt increase in the temperature of the Earth caused by the Greenhouse Effect. Global warming is the change in average temperature beginning from the 1850s. It is caused by the extreme heat that is trapped near the surface of the Earth.

Greenhouse Effect

The process where the heat from the sun is trapped in the atmosphere, gradually concentrating near the surface of the Earth. It can cause climate change and extreme global warming.

Greenhouse Gas

Carbon dioxide, nitrous oxide, methane, and water vapor are examples of greenhouse gases. They can absorb the infrared radiation in the atmosphere, therefore heating it, where the **Greenhouse Effect** occurs.

Invasive Species

Invasive Species are the species that have the ability to harm their new ecosystems. The cold temperatures in the Antarctic Region act as a limitation for these species, yet the increase in temperature has allowed them to spread as nonnative organisms, causing harm to the environment and other species.

Continental Drift

The moderate movement of continents through the Earth's geological measure. Including the fact that all plates of continents have drifted apart from one another in millions of years.

Ecosystem Resilience

The ability of a certain ecosystem to recuperate from the effects like extreme increases in temperature, pollution, destruction of habitat, and contamination caused by climate change and global warming. The ecosystem of the Antarctic region is made up of very specific species, showing a limited number of diverse species, causing the resilience to be gradual.

CAMLR Convention

Commission for the Conservation of Antarctic Marine Living Sources is a commission against the severe effects of unsystematic maritime harvests causing degradation of the ecosystem, including the species living in it. It was established as a precautionary measure aiming to conserve marine life against the extreme effects of the harvests on April 7th, 1982.

IUU Fishing (Illegal, Unregulated and Unreported)

IUU Fishing is all activities against the set rules of fishing, violating protected areas under any treaty, these rules apply to the hunting seasons and quotas for fish. One of the most hunted species in the Antarctic region is the krill. The actions that apply under the IUU fishing jeopardize the ecosystem in the Antarctic Region.

Madrid Protocol (Environmental)

The Madrid Protocol is a crucial system, applied internationally, that aims to ease trademark registrations in various locations globally. It aims to offer a centrally managed way to secure various registrations for the trademarks of different jurisdictions. Each member country has the authority to approve any application related to the protocol, paying equal fees as member countries.

The Antarctic Treaty

Signed on December 1st, 1959, aiming to maintain peace in the Antarctic Region to give freedom to scientists in the region. All observations must be shared among the countries who have signed the treaty, allowing them free access to all results.

International Maritime Organization (IMO)

The International Maritime Organization is one of the United Nations agencies. It aims to manage marine transportation with the least amount of environmental damage.

The Convention for the Conservation of Antarctic Seals (CCAS)

The Convention for the Conservation of Antarctic Seals aims to protect the ecosystem of the Antarctic Region. Against the hunting of seals in the region for the economic benefit of countries. It is one of the most important measurements in the Antarctic Region.

The Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR)

After the application of CCAS, the issue of marine resources gained importance. The question of the exploitation of marine resources explored how the IUU fishing in the area, especially for krill, caused the amount of food resources for other species in the ecosystem to depreciate. This depreciation caused the species in the ecosystem to lessen in number, causing a disruption in the ecosystem of the Antarctic Region as a whole. Therefore, measurements were taken, and The Convention on the Conservation of Antarctic Marine Living Resources was signed.

General Overview

With its one-of-a-kind ecosystem and its ecological ubiquity on a global basis, the Antarctic Region is a very important region in the world. Since it is a very different environment than the rest of the world with harsher conditions, it acts as a source for crucial information on various research on climate change and global warming and the various unfamiliar species in their natural habitat. Dating back a few thousand years, the human effect on the world has caused various problems to the environment, including global warming and climate change, which directly affect the Antarctic Region, destroying the ecosystems of the region, both directly and indirectly. Human activities and natural effects have caused this vulnerable region to need immediate action to reach environmental resilience.

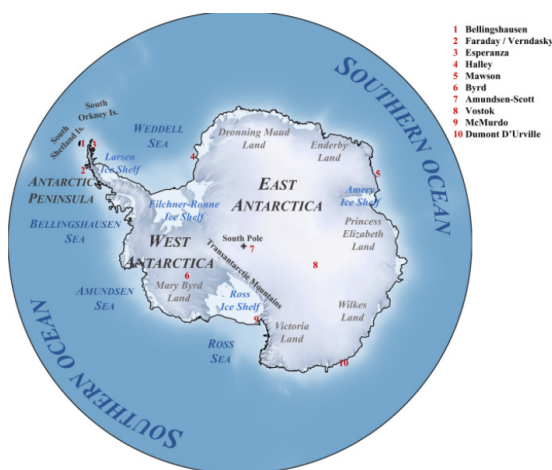


Figure 2 - Southern Ocean

Historical Background

The Antarctic Region has been one of the most closely observed regions of the past century. Beginning with the first-ever claim made on the sovereignty of the Antarctic Region by the United

Kingdom, the Antarctic Region has been desired by many countries for research and economic purposes. The countries aimed to claim their own territories. The Antarctic Treaty was signed in 1959; the treaty was the beginning of the history of the region in global governance. The treaty established the region as a demilitarized region. The region, therefore, begins to be used as an area open to scientific research and development along with ecosystem observations. With the increasing global warming and climate change, the demand for scientific research in the area increased, while the ecosystem was immensely affected poorly. The Madrid Protocol, which was established later on in 1991, was established to remind all member states that the Antarctic Region was a natural sanctuary



Figure 3 - Antarctic treaty: countries

that could only be used for scientific research under the rules of The Antarctic Treaty. Convention on the Conservation of Antarctic Marine Living Resources, Convention for the Conservation of Antarctic Seals, and the Madrid Protocol (The Protocol on Environmental Protection), collectively known as the Antarctic Treaty System, aimed to maintain peace in the Antarctic Region among nations. Superficially, the direct effects of human activities were therefore minimized by the enforcement of The Antarctic Treaty System. However, the indirect effects of human activity on the Antarctic Region weren't fully reduced. Human activities cause a range of issues, from climate change to global warming, therefore affecting the melting of glaciers, the increase in sea levels, and the appearance of the greenhouse effect. These issues require the unification of nations not under a treaty but under mutual regulations. Over the past couple of years, along with the scientific research in the region, there has been a small but destructive amount of tourism to the region. The transportation needed for people to reach the region caused an increase in greenhouse gas, causing the heat to promptly concentrate near the Earth's surface, heating the surface and the oceans. The increasing temperature also caused the glaciers and the icebergs to melt, causing a rise in sea levels.

The Effects of Human Activity in the Antarctic Region

There are various challenges the Antarctic Region faces. Due to climate change, the temperatures are rising all around the world, although the Antarctic Region is one of the regions that is most rapidly heating up. It causes an extreme amount of icebergs and glaciers to melt, causing a rise in sea levels. The melting of ice also causes a loss of land and the habitat of many animals, including polar bears and penguins. In the long run, the rising amount of sea levels will also begin to

affect other continents and human habitats. Polar bears and penguins are definitely not the only animals affected by climate change. The extreme rise in heat causes an increase in the temperature of the ocean, disrupting the ecosystem from within and causing the extinction of various species. Marine Pollution is another significant issue affecting the Antarctic Region. This pollution type can be affected by a variety of sources, from microplastics in the oceans to transportation. The pollution causes the marine ecosystem to degrade, killing various species in the ocean, including in the Antarctic Region. Human activity in the Antarctic Region also affects the region's environment. From tourist visits every now and then to the scientific research centers that are built on land, human activity, even if it is monitored to cause the minimum amount of harm to the environment, has various effects on the ecosystem of the Antarctic Region, ranging from global warming to climate change. To summarize, all these indirect and direct effects of human activity and natural effects cause global warming and climate change, causing sea levels to rise and ice to melt (glaciers, icebergs), leading to a loss in the biodiversity in the Antarctic ecosystem.



Figure 4 - Penguins

Timeline of Key Events

Date

Event

1908

The first-ever claim was made on the sovereignty of the Antarctic Region when the United Kingdom's formal claim with the Falkland Island Dependencies Letters of Patent.

1911

The first person reached the South Pole. Named Roald Amundsen. Showing it was possible to reach the territory and doing scientific research in the region was possible.

26 August 1946 - February 1947

Operation Highjump by the United States. Aimed to begin Little America IV, a search base in the region.

1 December 1959	The Antarctic Treaty was signed. The Antarctic Region was accepted as a region free for scientific research under the rules of the treaty by the twelve nations that signed the treaty.
11 February 1972	The Convention for the Conservation of Antarctic Seals (CCAS) was signed.
11 March 1978	The Convention for the Conservation of Antarctic Seals (CCAS) became effective.
1 August 1980	The Convention for the Conservation of Antarctic Marine Living Sources (CCAMLR) was signed.
7 April 1982	The Convention for the Conservation of Antarctic Marine Living Sources (CCAMLR) came into force.
4 October 1991	The Madrid Protocol was signed.
1 April 1996	The Madrid Protocol came into force. Minimizing the destructive effects of human activities on the Antarctic Region.
2009	The Convention for the Conservation of Antarctic Marine Living Sources begins its operations on the initial marine protected area in the region.
2021	The use of destructive fuels was banned from use by the International Maritime Organization in the region.
2023 - present	The extension of marine protected areas is still discussed, with technological monitoring and scientific research.

Major Parties Involved

United States

Being one of the leading countries for scientific research in the region. The United States is a signed member of the Antarctic Treaty with the aim of doing scientific research in the area. It studies the effects of climate change, global warming, and the variety of the dynamics of ice and continental shifts in the Antarctic Region. The United States supports the newly formed and the extensions of marine protected areas.

Russia

Russia was one of the countries that was interested in the Antarctic Region first. Russia has concerns about newly addressed marine protected areas in the region. It is one of the countries in the search for marine species like krill. Russia has an It doesn't support the newly formed marine protected areas along with other extensions of marine protected areas.

Australia

The Australian Division is the vast majority compared to the divisions of other countries. Australia is one of the territories supporting a grand amount of scientific research. The Australian Antarctic Territory was given to Australia by Great Britain; it has even been known as a part of "Terra Australis." Australia is known to support the newly formed marine protected areas and the extensions of marine protected areas.

New Zealand

The Ross Sea Region was known as an extension of the Southern Ocean, where countries including New Zealand, the United States, Great Britain, Japan, and Norway did scientific research and observations. New Zealand is one of the significant parties operating in the Antarctic Region. Supports the newly formed and extensions of marine protected areas.

The European Union (EU)

The European Union is known for giving financial aid to support the countries in the union that are a part of the scientific research done in the Antarctic Region. Supports the newly formed and extensions of marine protected areas. The European Union has had various types of research located in the Arctic Region. However, their interest in the Antarctic Region is recent.

World Wildlife Fund (WWF)

The World Wildlife Fund aims to regulate the ecosystem of the region, supporting the newly formed and extensions of marine protected areas while researching and observing the environment. It aims to reinstate ecosystem resilience. Even though there is no human population in the region except for research, along with a very limited land population, the World Wildlife Fund still operates in the area for the limited life there is, such as birds.

Possible Solutions

Expanding Marine Protected Areas

Marine Protected Areas are organized in order to minimize the effects of human activity like illegal, unregulated, and unreported fishing and pollution in scientific research areas. The majority of the region is still not under Marine Protected Areas. They are undetected and not being used for scientific research, indicating no detection of the effects of climate change, global warming, or any type of pollution whatsoever.

Tourist Regulations

The recently increasing demand to visit the Antarctic Region has been one of the reasons for increased pollution around the region. Transportation is the vast reason for pollution and, therefore, biodiversity loss. Tourists can visit the region with regulations in place, but more sustainable and environmental solutions should also be found. If it isn't possible, then there should be regulations established to minimize the newly formed excessive human activities that might cause any type of harm to the Antarctic Region.

Reinforcing Agreement Internationally

Reinforcing past agreements internationally is always important. Even if there aren't any issues, if there is a problem that can possibly relate to a treaty, it should be reinforced. For example, reinforcing The Antarctic Treaty. Most treaties were signed years back. Some countries have changed stances, and some parts of the treaties are not up to date.

International Cooperation in Waste Management

Waste management is foremost when it comes to preventing any further issues related to climate change since it is one of the most important reasons for its appearance. Climate change causes great disruption in the Antarctic Region therefore, international cooperation in waste

management is needed. If there isn't cooperation and agreement among countries, it is quite impossible to reach the intent of changing the global environment for the better, therefore altering the Antarctic region environment for the better as well. For example, global cooperation can be done through conferences.

Organizing Funds to Support Possible Sustainable Technological Improvements

Different types of technological devices are used in scientific research done in the Arctic Region, from satellite control to infrared cameras that operate underwater. It is possible to imagine a more sustainable way of operating in the region. New funds to improve technological development could possibly help new discoveries and minimize the damage done to the environment. It is possible to get these funds from organizations like the World Bank or from campaigns, including simple but effective social media campaigns.

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