Antarctica is the most southern continent in the world, containing the South Pole and stretching an area of 14 million km$^2$. The majority of Antarctica is covered in ice, making it the largest ice sheet in the world - it holds 90% of all of the Earth's surface freshwater.

**Climate and Environment**

- The Antarctic’s climate is entirely unique, and is one of the most extreme environments on the planet.
- Antarctica is the coldest place on Earth, with temperatures averaging the $-40°Cs$ ($-49°C$ average at the South Pole, although coastal areas are warmer).
- Antarctica is also one of the driest places on Earth. Coastal areas of Antarctica receive the most precipitation, averaging at around 400 mm - 600 mm+ a year.
- Inland however, there is barely any precipitation, and some places average under 50 mm of precipitation a year. To put this into perspective, the UK's average annual rainfall is 5 times larger than Antarctica's, yet Antarctica is 58 times bigger than the UK.

Antarctica is so dry that it can be considered a desert, making it scientifically speaking the largest desert in the world. The McMurdo Dry Valleys in Antarctica are thought to have not seen rain in nearly 2 million years! These areas of Antarctica are entirely snow-free.

The winds of Antarctica are very strong, known as katabatics, or katabatic winds. These winds are strongest in the steepest areas of Antarctica. Gales of 60-70 mph are known to occur around 40 days in the year. The highest wind speed ever recorded in Antarctica was 199 mph (327 km/h).
As Antarctica is in the Southern Hemisphere, its winter occurs during our summers (March to October). As Antarctica is also at the bottom of the Earth, 6 months of the year is dark, 6 months of the year is constant sunlight (at the South Pole).

Due to the cold, harsh conditions, the ecosystem is not very biodiverse. Only hardy plants such as mosses and lichen can grow, and there are hardly any land animals (only insects). The Southern Ocean, though, is diverse in marine life, with lots of fish, krill, penguins, seals and whales.

Natural Resources
Including the marine life, Antarctica is rich in natural resources like fossil fuels and minerals. Large reserves of oil are located in the Southern Ocean, and iron ore deposits are rich in the Transantarctic Mountains.

Vulnerability as a Global Common
Due to the environment and the resources in Antarctica, the idea of this hub of resources being a ‘common’ for all makes it vulnerable. This is especially true due to the demand in resources such as fossil fuels, minerals, and fish.

The climate of Antarctica is also incredibly fragile; it is highly adapted to the extreme environment, meaning a change in something like temperature could have many devastating knock-on effects to the ecosystem. Therefore, Antarctica is even more vulnerable to climate change, meaning the shared responsibility of Antarctica must consider the world’s emissions and contributions to global warming.
The major threats to Antarctica are:

<table>
<thead>
<tr>
<th>Climate Change</th>
<th>Fishing and Whaling</th>
<th>Mineral/Resource Exploitation</th>
<th>Tourism and Scientific Research</th>
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</table>

**CLIMATE CHANGE**

Due to the Antarctic being a fragile cold environment, a change to the temperature will obviously have devastating effects.

- **Warmer sea and atmospheric temperatures** melt ice sheets, causing **huge icebergs to calve** into the sea. Melting ice sheets also cause **sea levels to rise**, which causes global flooding.
- **Animals and plants** are affected by changes in temperatures as they are highly adapted to the cold environment. **Invasive species** that are adapted to higher temperatures could grow and colonise the environment. **Migration patterns** of certain animals have also been disrupted by the higher temperatures, and some species (like the Adélie penguin) have even **declined** due to warmer temperatures. This also affects the Antarctic **food chain**.
- **CO2** is released into the atmosphere that is **stored** in ice sheets, which causes global temperatures to rise **more**, enhancing global warming on the Antarctic.
- The **Albedo Effect** (the process of white surfaces - in this case ice - reflecting solar radiation back into the atmosphere) is **lessened** due to less ice sheets, meaning more heat is absorbed into oceans. This has caused a rise in ocean temperatures, enhancing the devastating effects.

**FISHING AND WHALING**

Antarctica is under threat from **unsustainable fishing**, which disrupts the **food chain** of the fragile environment. **Overfishing** removes vital animals in the already small food chain, such as overfishing of **krill** which removes other marine animal food sources. Krill is the most fished marine animal, with **150–200,000 tonnes** fished annually, and the majority of this being Antarctic Krill. Despite regulations, there are still reports of **illegal, unreported, and unregulated (IUU) fishing**. This fishing is unsustainable and causes **wide scale marine habitat damage**.

Whaling and sealing are also huge threats to the Antarctic ecosystem, and even past events are still having detrimental consequences to this day. Whaling began as far back as the 18th century, and although there are currently bans on almost all whaling, whale populations still stay at reduced and endangered levels from the damage previously done in the past. Whales are slow breeders, meaning the ecosystem has been damaged for the long-term.

“Whale catches by year from the 1909-1910 Antarctic whaling season to 2000-2001 by species. Humpback Whales were targeted initially until the technology was developed to target faster swimming Blue Whales, as the Blues declined, the next biggest species[...]’ was targeted, and so on. (Large dip corresponds to WWII.) (Source: https://www.coolantarctica.com/Antarctica%20fact%20file/wildlife/whales/whaling1.htm)

MINERAL AND RESOURCE EXPLOITATION
All mining is banned in Antarctica, and any mineral/fossil fuel exploitation would be extremely difficult due to Antarctica’s location and thick ice. However, with a fossil fuel crisis looming within the century, the demand for more resources may lead to exploitation being possible. The exploitation of minerals and resources poses major threats to the habitat.

- Oil exploitation disrupts the habitat through the infrastructure that comes with it, e.g. drilling and pipelines.
- Oil spills also cause catastrophic damage to Antarctica, as the fragile ecosystem cannot remove the oil quickly, causing long term damage.
- Metal and mineral exploitation damages the environment through mining and quarrying, scaring away wildlife and causing damage beyond repair. Currently, Antarctica is protected from this exploitation, but this is not to say it will be in the future.
- The use of fossil fuels also contributes to global warming, further affecting Antarctica’s ecosystem.
TOURISM AND SCIENTIFIC RESEARCH

Tourism in Antarctica is growing industry due to the demand for ‘extreme tourism’. Over 37,000 visited Antarctica in the seasons of 2009-2010, the majority of these on cruises. Tourists are more frequently travelling to Antarctica by air and sea, which threatens Antarctica directly through the effects of ships, and through fossil fuel emissions. Sea ice destruction and cruise ship crashes are major contributors to environmental destruction as tourist numbers increase. For example, the MS Explorer crash in 2007 left a mile long diesel spill, which disrupted penguin breeding grounds.

Tourists in Antarctica may disrupt the ecosystem by trampling plants and scaring wildlife away. Any litter dropped will stay in the nutrient cycle for a long time, as decomposition is slow. Any foreign objects brought in by tourists may also enter and disrupt the food chain, bringing a risk of invasive species with it.

Scientific research in the Antarctic is very important, as a lot of environmental data is collected here. With scientific research, though, brings scientific equipment and facilities. Research bases have been constructed around the Antarctic, which have changed the natural environment and, if not handled properly, may threaten to disrupt it. For example, dogs such as Huskies used to be an integral part of assisting with scientific research, e.g. companionship, transportation etc. These dogs were sometimes fed seals and penguins when there was no food available, and also brought the threat of infecting seals. Dogs have now been permanently removed from the continent, but this is just one example of how scientific research must be sustainably managed, or it threatens the Antarctic.

The Governance of Antarctica

Antarctica is threatened by a range of issues, and its status as a global common may enhance its vulnerability. Therefore, Antarctica is governed by global institutions that ensure it is sustainably managed as a global common.

The UN has the potential to lead an important role in protecting the Antarctic, as it has the ability to set global laws and regulations in order to protect the Antarctic. However, for decades the UN has noticeably had little to do with the protection of the Antarctic.

The main UN organisation associated with Antarctic protection is the UN Environment Programme (UNEP). However, this organisation has had little influence on the Antarctic specifically. The UNEP has attended ATS meetings and contributed to some reports, but its legislation and goals do not cover the Antarctic.

Although the UNEP does not work to protect the Antarctic directly, their work indirectly contributes to the governance of Antarctica. The UNEP’s legislation and research into global environmental problems, such as ozone depletion and global warming, work to protect Antarctica from the effects of these issues.
The International Whaling Commission (IWC) was set up under the International Convention for the Regulation of Whaling in 1946. The IWC enforces regulations on its 89 member states; all regulations have influence over whaling in the Southern Ocean (Antarctica). Roles of the IWC include:

- Setting ‘catch limits’ and other rules such as hunting restrictions to regulate how many whales can be caught etc.
- Working with the Scientific Committee in order to research and study whaling.
- Co-ordinating conservation work through yearly meetings and other means.
- Providing funds for research and conservation.

Some examples of the work the IWC has done:

- Introduced a Whaling Moratorium in 1982, banning all commercial whaling on all species and all populations until further notice. Norway and Iceland still commercially whale which has been agreed by the IWC, and the Russian Federation objected to the moratorium, but have not exercised the objection.
- The IWC’s Scientific Committee created a system called the Revised Management Procedure (https://iwc.int/rmp) which estimates sustainable catch limits using past and present research, and complex algorithms.
- In 1994, a Southern Ocean Whale Sanctuary was set up, banning all commercial whaling in the area. Sanctuaries focus on the protection of calves and females.
- Enforcement of the International Observer Scheme, which allows countries to observe other countries' land-based whaling stations to make sure they are complying with IWC regulations.

There are several criticisms of the IWC, as well as incidences in which the IWC's potential lack of authority has been shown:

- Member states choose freely to be in the IWC, and they can also opt out. The IWC can enforce no penalties for members leaving, such as when Japan made the decision to leave in 2018.
- Countries can object/ not abide by the IWC’s regulations, such as Norway and Iceland who still take whales commercially (although the IWC somewhat regulates this by receiving information on all catches and any scientific data collected)
- Countries can exploit loopholes in regulations, which has lead the IWC to be criticised regarding how constructive its regulations are. For example, until recently Japan exploited a loophole that allowed the country to commercially whale in Antarctic waters for ‘scientific research’ purposes, although this was widely doubted as research. Japan has now left the IWC, meaning whaling in the Southern Ocean would be in direct defiance of international conservation law.
The Antarctic Treaty System (ATS) is a collection of agreements that work to protect the Antarctic through global governance. The Antarctic Treaty originally operated without any institution, but in 2004 the Secretariat of the Antarctic Treaty was established. Here are two of the main agreements summarised, including the original treaty:

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<tr>
<td>● 53 parties (countries) to the treaty</td>
<td>● Bans all activities relating to mineral resources, aside from for scientific purposes. This means there can be no mining or fuel extraction on the continent.</td>
</tr>
<tr>
<td>● Treaty states Antarctica should only be used for peaceful means</td>
<td>● Established the Committee for Environmental Protection, an advisory body that provides advice and recommendations to members.</td>
</tr>
<tr>
<td>● Antarctica can be used for scientific research, but all research has a right to be shared and cooperated on</td>
<td>● Created and added to regulations that were set out in the original treaty, including additions to waste management and marine pollution.</td>
</tr>
<tr>
<td>● All stations and operations can be inspected at any time</td>
<td></td>
</tr>
<tr>
<td>● Antarctica is not any country’s territory, it is a global common</td>
<td></td>
</tr>
<tr>
<td>● Nuclear activity is banned</td>
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</tbody>
</table>

**Issues and Criticisms**

- The Treaty is not mandatory, meaning countries can choose not to sign it.
- Inspections do not occur often
- All decisions must be unanimous. If any country does not ratify a modification/amendment to the treaty within two years, it cannot go forward.
The Convention on the Conservation of Antarctic Marine Living Resources is a treaty created in 1980 to protect marine life populations, especially krill.

- Within the convention, the Commission on the Conservation of Antarctic Marine Living Resources was established, who meet annually to discuss the management of fisheries and other issues.
- Within the Commission is the Scientific Committee, who provide advice and scientific information.
- CCAMLR are responsible for researching, monitoring, and conservation of the Southern Ocean.
- They have created an Ecosystem Monitoring Program, which detects and records changes in the ecosystem, and analyses the effects of commercial fishing.

**The Influence of NGOs on Antarctic Governance**

ASOC was formed in 1978 after concerns over secret negotiations between parties of the Antarctic Treaty. Some parties were secretly negotiating a framework for mineral and gas prospecting in Antarctica, which would obviously have detrimental environmental effects on the continent. Originally, ASOC’s purpose was to convince governments to prevent this mineral exploitation, as well as allowing NGOs to participate in the governance of Antarctica. ASOC did this by bringing these secret negotiations into the public eye.

ASOC was granted observer status in 1991, meaning the organisation can go to annual meetings for the Antarctic Treaty System. ASOC presents a strong voice for the NGOs, as well as conducts campaigns and projects to ensure Antarctica is protected.

**ASOC’s main focuses are:**

- Overall environmental protection in Antarctica
- Monitoring and extending marine protected areas
- Wildlife conservation
- Krill conservation
- Climate change and the Antarctic
- Antarctic governance

**Charities**

Charities such as Greenpeace and WWF work to enhance the protection of Antarctica by:

- Collecting data and information independent of governments, to monitor the reliability and accuracy of other data.
- Reporting on issues, and releasing findings to the public and governments. This can spread awareness on issues in Antarctica and boost donations.
- Creating petitions, lobbying, and campaigning for change. These petitions must be discussed by governments once they have reached a certain number of signatures.