

Global Systems and Global Governance

1. The geography of Antarctica
2. Threats to Antarctica arising from climate change, fishing and whaling, the search for mineral resources and tourism and scientific research.
3. Critical appraisal of the governance of Antarctica including the UN, UNEP, International Whaling Commission, Antarctic Treaty, Protocol on Environmental Protection to the Antarctic Treaty and the IWC Whaling Moratorium.
4. The role of NGOs in monitoring threats and enhancing protection of Antarctica
5. Analysis and assessment of the geographical consequences of global governance.

Learning Objectives:

- * To be able to describe the human and physical geography of Antarctica
- * To be able to discuss threats to Antarctica
- * To be able to critically appraise the governance of Antarctica
- * To be able to name different non-governmental organisations protecting Antarctica
- * To assess geographical consequences of global governance

Key terms:

Antarctic Convergence

NGO

UN, UNEP, IWC

Global Common

Governance

Antarctic Treaty

Key Terms

Key term



Antarctic Convergence – A curve continuously encircling Antarctica where cold northward flowing Antarctic waters meet the relatively warmer waters of the sub-Antarctic

The **Antarctic Convergence** is

A **non-governmental organisation (NGO)** is

Governance is where

Moratorium is where

Antarctic Treaty is

Definitions

- Any non-profit group with a common interest, which is organized on a local, national or international level.
- A movement of political integration aimed at negotiating responses to problems that affect more than one state or region.
- A stopping of an activity for an agreed amount of time
- Collectively known as the **Antarctic Treaty System (ATS)**, regulate [international relations](#) with respect to [Antarctica](#), Earth's only continent without a native human population.

Global Commons - recap

Global commons are planetary resources so large in scale that they lie outside the political reach of any one state.

International law identifies four global commons: the oceans; the atmosphere; Antarctica; and outer space.

- It is the best long-term interest of individual states to collaborate on making sure that sustainable use of the oceans, and oceanic resources, is achieved over time.
- This is because the atmosphere and oceans deliver vital services to all human societies by, amongst other things, regulating climate and achieving transfers of heat and water from place to place. Damage them – and we all suffer the consequences.

According to professor Klaus Dodds:

“The management of global commons offers important insights into how our political world works through norms (e.g. what general conduct we expect, including cooperation and sharing of knowledge) and rules (e.g. what we expect to be followed, with the possibility of sanction if violations occur).”

‘Governance of the global commons is required to achieve sustainable development and thus human wellbeing. We can no longer focus solely on national priorities for economic development and environmental protection.’

(Johann Rockström, Director, Stockholm Environment Institute)



Global governance: Antarctica and the Southern Ocean

<https://discoveringantarctica.org.uk> Complete research preparation for this topic by browsing the website to find out more about this amazing place.

Task

- Write down 10 things you know, or think you know about the Antarctic region – be precise!
- What do you want to know about the region?

Antarctica as a global common

Antarctica is considered a global common as it is not owned by any one country, nor is it self-governing with its own parliament.

Antarctica fun facts:

- Antarctica is the southernmost continent on the planet.
- Antarctica is home to the location of the geographic South Pole.
- Antarctica is the largest desert on the planet – it receives very little precipitation.
- The continent's most well-known animal is the penguin. Antarctica is home to several species of penguins, including emperor, king, gentoo, southern rock hopper, chinstrap and adélie penguins.
- Antarctica is the only continent on Earth not to have an indigenous population.
- Anywhere between 200 to 4,000 persons live on Antarctica, varying at different times of the year. (The population of Antarctica is made up from scientists and researchers.)



An emperor penguin with two chicks in Antarctica.

Introduction to Antarctica

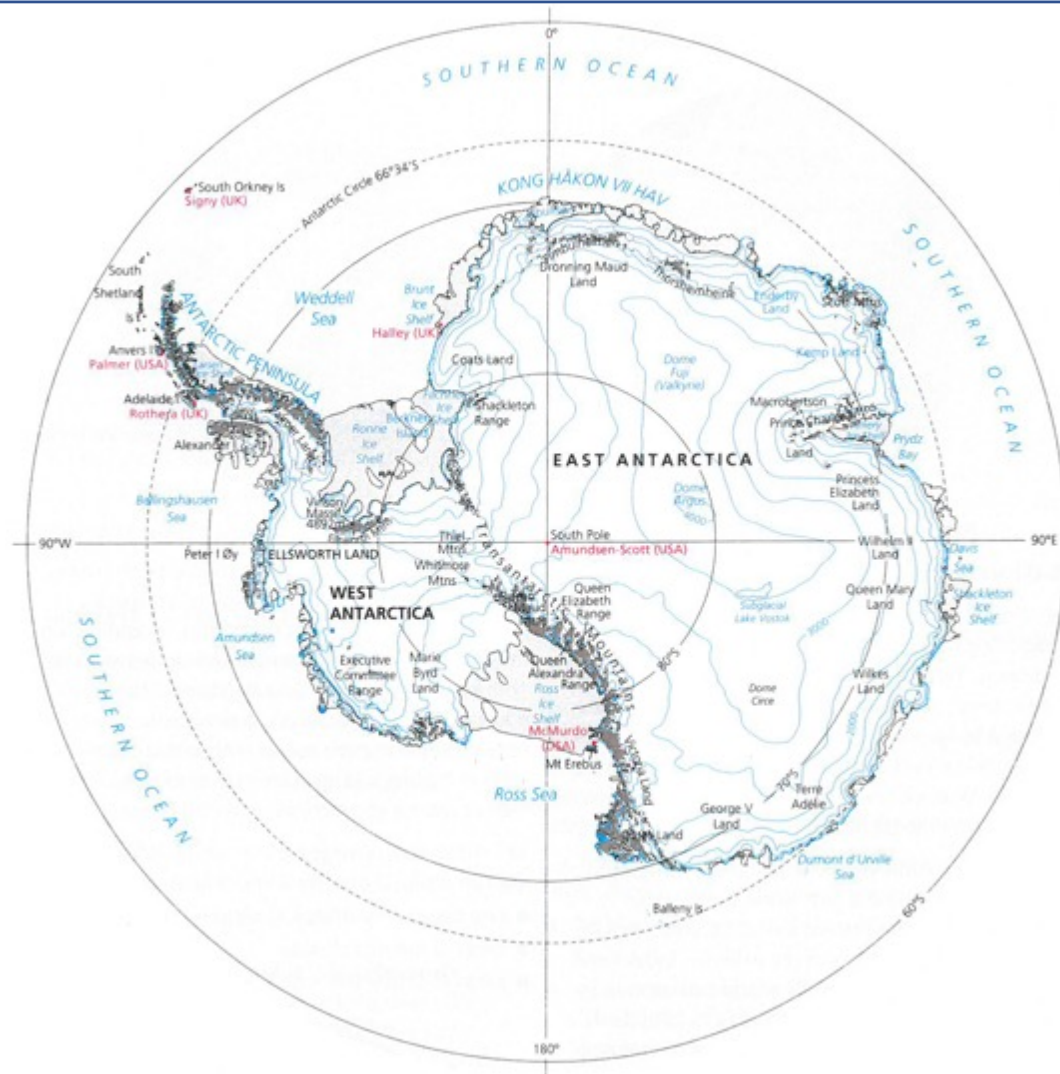
<https://www.youtube.com/watch?v=t3StWheKtq8>

- An outline of the contemporary geography, including climate, of Antarctica (including the Southern Ocean as far north as the Antarctic Convergence):
 - to demonstrate its role as a global common and
 - illustrate its vulnerability to global economic pressures and environmental change.

The Geography of Antarctica

<https://vimeo.com/146062752>

Antarctica - It is the harshest, coldest and windiest continent on Earth.



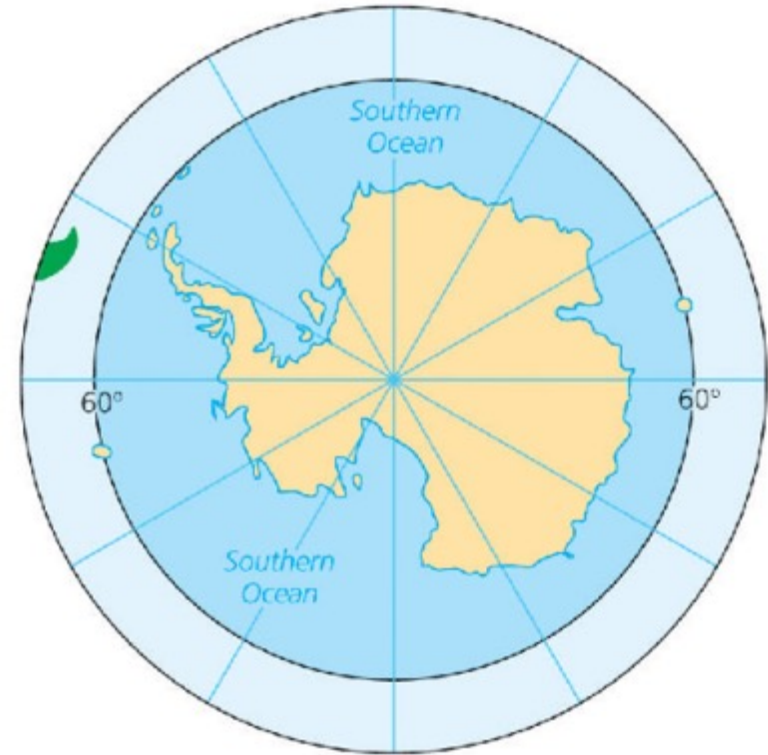
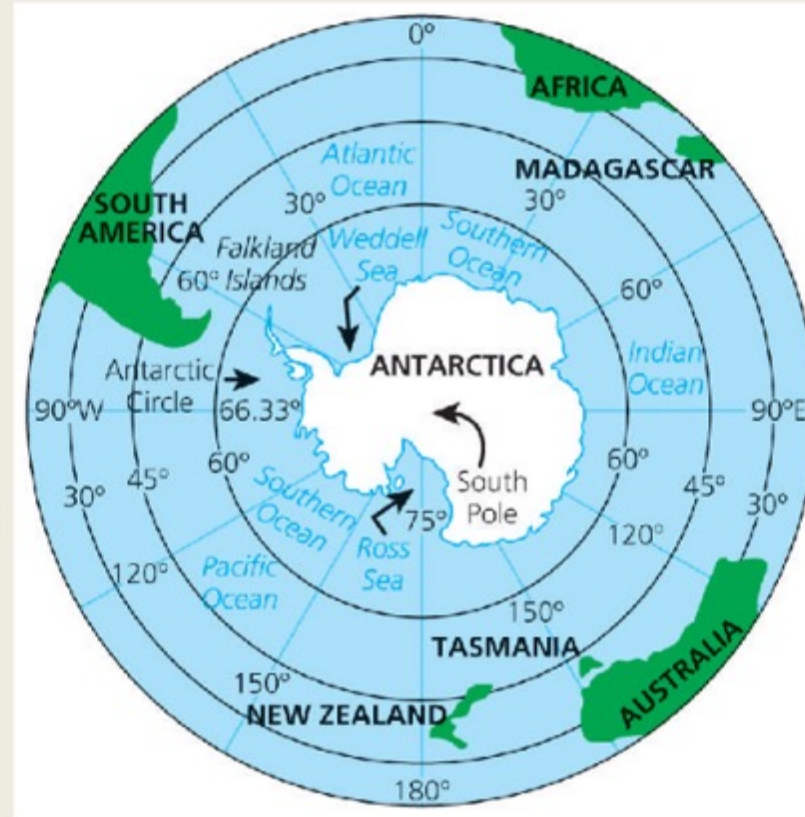
Location and geography



Describe the geography of Antarctica. Think about:

- Size.
- Shape.
- Location (latitude).
- Coastline.
- Ice and land.
- Ocean.

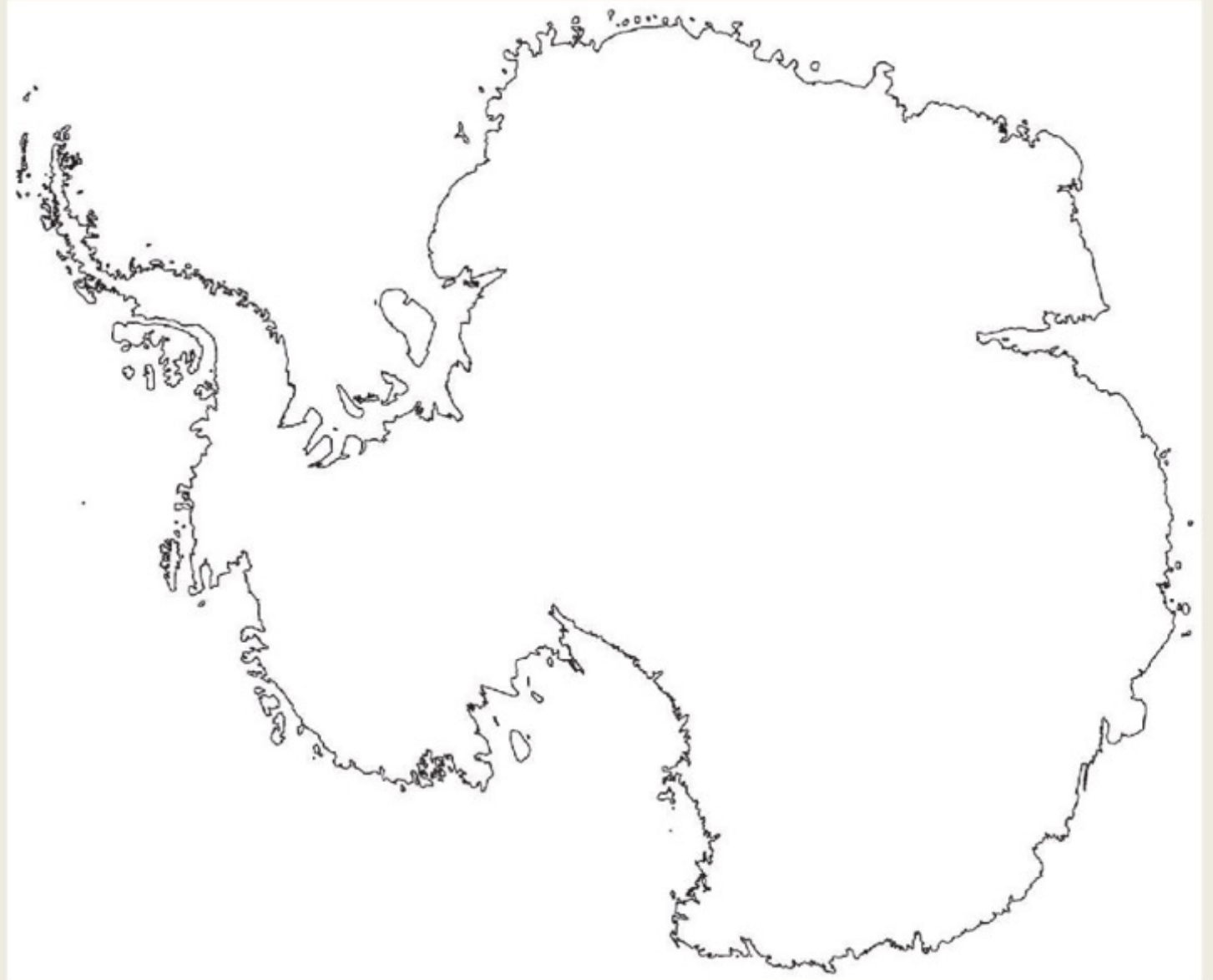
TASK: Using the handout on 'Antarctica: A Global Common', complete the following sections in the booklet.



Physical geography



- East Antarctic Ice Sheet
- West Antarctic Ice Sheet
- Transantarctic Mountains
- Ross Ice Shelf
- Ronne Ice Shelf
- South Pole
- Southern Ocean
- Antarctic Peninsula
- Ross and Weddell Sea
- 60° South line of latitude
- Mount Vinson



Convergence and current



The Antarctic Convergence is a meeting of cold water flowing north from the continent and warmer waters further north.

Question: Explain why the warm water doesn't flow southwards.

The mixing of the warm and cold water causes upwelling.

Question: Explain why this upwelling is important for krill.

The Antarctic Circumpolar Current is a movement of water in an eastwards direction. It is the largest surface current in the world.

Question: Why does this current move eastwards?

There is a smaller Antarctic current closer to the continent that flows the opposite way, to the west.

Task: Draw a sketch map of Antarctica to show the two different flows of water.

The Climate of Antarctica

<https://www.antarctica.gov.au/about-antarctica/weather-and-climate/weather/>

Antarctica is the coldest, driest, windiest and highest continent. Temperatures vary with altitude, latitude and proximity to the sea (Figure 7.29). Mean annual temperatures range from below $-40\text{ }^{\circ}\text{C}$ in the interior to around $0\text{ }^{\circ}\text{C}$ in summer and from $-10\text{ }^{\circ}\text{C}$ to $-20\text{ }^{\circ}\text{C}$ in winter around the coast. The interior receives less than 50 mm of snow per annum.

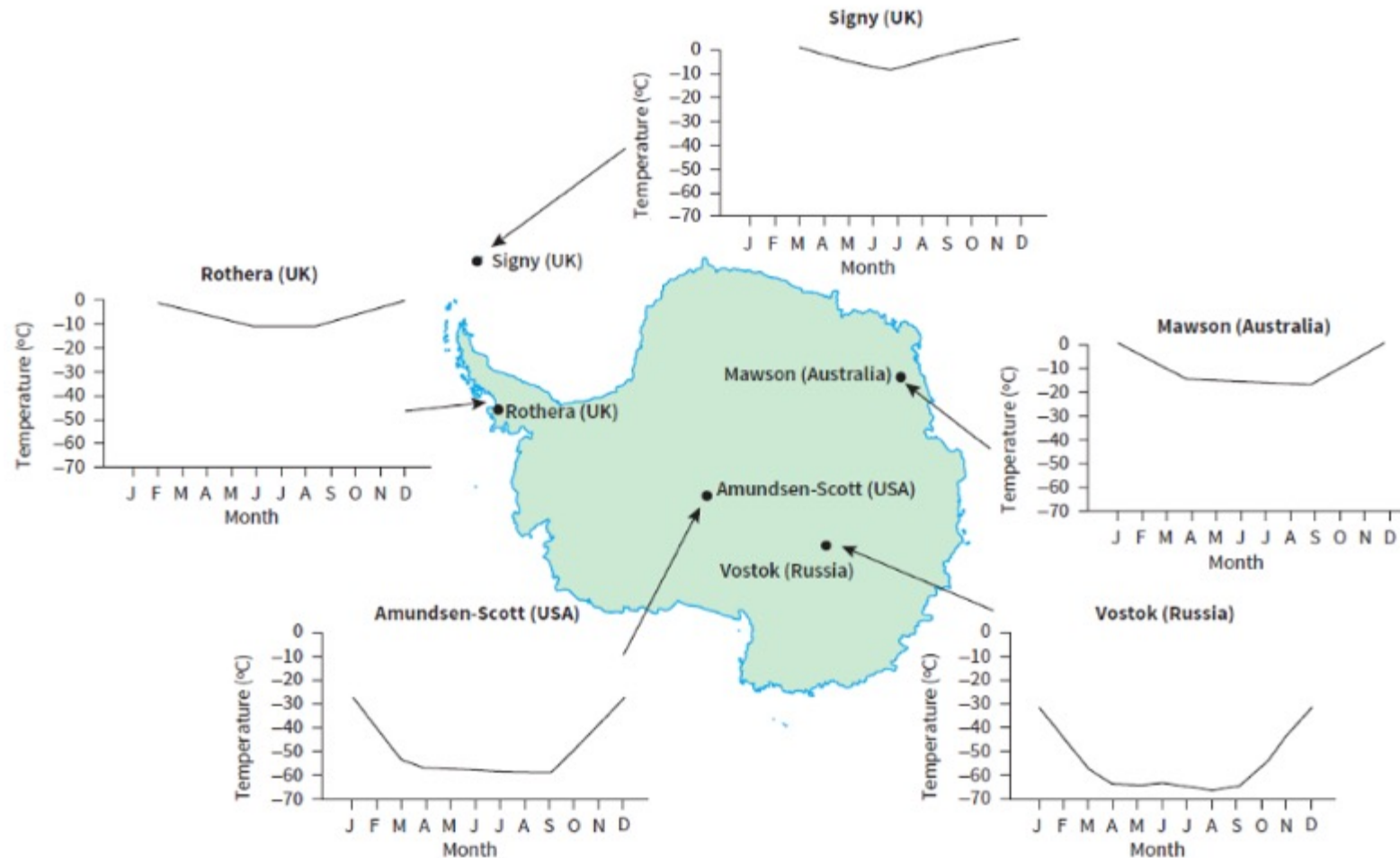


Figure 7.29 Variations in temperatures around Antarctica.

The Climate of Antarctica

- Refer to 'Climate' on page 335 of the Hodder VLE textbook.
- Complete Tasks 1-2.
 - Task 1 - use the blank map of Antarctica in your booklet
 - Task 2 - Using figures 1,2 and 3, analyse characteristics of the climate of Antarctica.[6 marks]

Climate of Antarctica



For each photograph, describe the physical geography shown and then explain why it is like this.



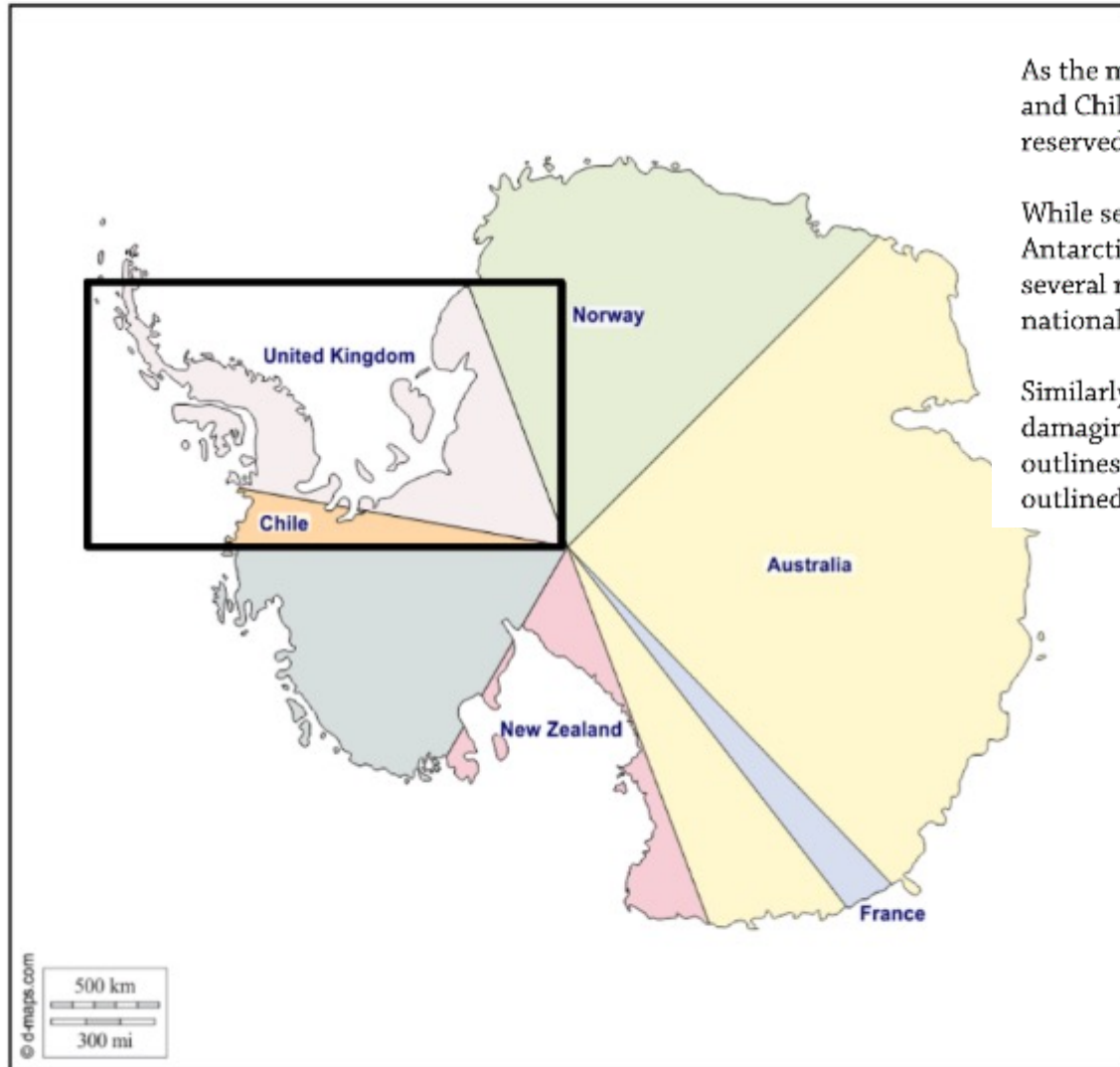
© Kevin Schafer / Alamy Stock Photo



© Andreea Dragomir/123RF

Who governs Antarctica?

The short answer is no one, although the long answer shows it is a little more complicated than that. In reality, a few different countries have 'claimed' sections of Antarctica, known as territories. There are some disputes over certain territories, for example the UK, Argentina and Chile have all claimed parts of the same region and their territories overlap. Take a look at the map below to see which countries have claimed territories.



As the map shows, there is one section that is unclaimed. The section in the box is where the UK, Argentinian and Chilean territories overlap and are disputed. Other countries that either have an interest zone or have reserved their right to make a claim are Brazil, Peru, Russia, South Africa and the USA.

While several different countries technically have claimed territories in Antarctica, none of them governs Antarctica in a conventional sense (i.e. in the same way that nation states are governed). There are, however, several research stations on Antarctica, which are home to researchers and scientists (of many different nationalities) throughout the year.

Similarly to most countries, there are, however, rules and regulations in place to protect Antarctica from illegal or damaging activity. These include the international agreement of the Antarctic Treaty System, ATS). The ATS outlines rules and regulations consisting of laws from several treaties and protocols on Antarctica (this is outlined in more detail in the 'Protection of Antarctica' section of this resource).

Watch the video and then summarise what you think are the most significant threats

<https://www.youtube.com/watch?v=X3uT89xoKuc>

Threats to Antarctica

Antarctica (including the Southern Ocean as far north as the Antarctic Convergence) is a global common. It is also vulnerable to global economic pressures and environmental change. The main threats to Antarctica:

- climate change
- fishing and whaling
- the search for mineral resources
- tourism and scientific research.

Threats to Antarctica: Climate Change and Scientific Research

Antarctica is experiencing climate change. For example, since the 1960s rainfall and snowmelt have increased in the Marguerite Bay Area of the Antarctic Peninsula. There has also been a decline in snow cover in the area. These characteristics (more rainfall, more snowmelt and reduced snow cover) are characteristic of the Antarctic Peninsula as a whole. Temperatures have risen by about 2.5 °C and the period of snowmelt has extended by up to three weeks. The warming found in the Antarctic Peninsula does not extend to the upland interior.

The Intergovernmental Panel on Climate Change (IPCC) has predicted that global mean air temperatures will rise by 2 °C by 2100. The range of predicted rise is between 1.5 °C and 3.5 °C, depending on computer model. Sea levels are predicted to rise by about 50 cm (estimates range from 15 cm to 90 cm). Other changes could include increased variability in weather events, with more extreme events. As the climate warms, there is likely to be:

- increased snowfall in central Antarctica
- increased rainfall in coastal margins
- increased melting of low-lying snow and of snow in the Antarctic Peninsula
- a reduction in sea ice around Antarctica
- the collapse of ice shelves around the Antarctic Peninsula.

In 2015 NASA reported that Antarctica was gaining more ice than it had lost. However, some places such as the Antarctic Peninsula and West Antarctica were losing ice while other areas were gaining, such as the eastern part and the interior. Researchers from Germany suggested that ice in West Antarctica could be unstable enough to cause sea level rise of between 1 and 3 m.

Threat	Summary of issues
Climate Change	<p>Antarctica's ice sheets are 4km thick in places. Part of the West Antarctic Ice Sheet (WAIS) is believed to be under grave threat from climate change. Global average surface temperature has risen by around one degree Celsius since 1900. Findings in Antarctica are even more extreme: temperature in the Antarctic Peninsula (an 1800-km-long westward extension of the continent) has risen by 2-3°C over the last 50 years and the winter temperature of the surrounding waters is thought to have risen by as much as 10°C. This is drastically modifying the marine food web as the population of ice algae declines. Algae is the base of a food chain that sustains krill and, in turn, higher organisms such as birds, seal, penguins and, ultimately, whales.</p>

https://www.youtube.com/watch?time_continue=7&v=HEoaVz8fnew&feature=emb_logo short video – climate threats SKY news

<https://www.youtube.com/watch?v=YzcFZLx0UHU> 2016 threat of warmest year

https://www.youtube.com/watch?v=PXDUQd1I_h8 1 hour video on climate change impacts on Antarctica and rest of the world

Flipped classroom lesson: impacts of climate change on Antarctica



Ice melt and sea level rise

Negative ecological impacts

Impacts

Positive impacts

Negative ocean acidification

NASA has been monitoring ice break ups on Antarctica [NASA: Antarctica's Larsen B Ice Shelf](#)



Antarctica's Larsen B Ice Shelf is likely to shatter into hundreds of icebergs before the end of the decade, according to a new NASA study. ***Credits: NSIDC/Ted Scambos***

Threats to Antarctica: Fishing and Whaling

<https://vimeo.com/72501672> The Ross Sea and Ice Shelf Ecosystem

<https://www.youtube.com/watch?v=yMxY4c5Sels> David Attenborough on whales in Antarctica

Fishing and whaling

The waters off Antarctica are high in marine productivity, especially for Antarctic krill. This is because cold, northward flowing Antarctic water meets with the relatively warmer subantarctic water (the Antarctic Convergence). The cold water sinks below the warmer water, while an associated zone of upwelling and mixing creates waters rich in oxygen and nutrients. The Southern Ocean has had a number of species that have been over-exploited such as seals in the early 1800s and whales in the 1900s. Krill prefer colder water so the richer, more productive seas are to be found closer to Antarctica. Earlier uncontrolled fishing led to the establishment of the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) in 1982, which regulates Southern Ocean fisheries.

CCAMLR

Over-fishing of krill removes a major supply of food for predators such as seals, whales, seabirds and carnivorous fish living in the Southern Ocean. It is uncertain what the impacts of over-fishing on krill would be, as many of their predators are long-lived with long reproductive cycles. Fortunately, the total allowable catch (TAC) for krill in the South Atlantic section is 1.5 million tonnes and the actual catch is below 100 000 tonnes. The former Soviet Union used to take a large share of the krill TAC, but Russia has reduced its activities in the South Atlantic and Japan tends to concentrate on species higher up the food chain.

Krill.....

The CCAMLR and the Antarctic and Southern Ocean Coalition (ASOC) have expressed concerns about the amount of unreported and illegal fishing in the Southern Ocean. For example, the use of long-line fishing for the Patagonian toothfish (renamed the Chilean sea bass to tempt consumers) is depleting stocks and killing many thousands of seabirds each year.

ASOC

Whaling in Antarctic waters has a long history. Humpback whales were caught first due to their large numbers. As technology improved, whalers went further out to sea and blue whales became the main target species. Whaling stopped during the Second World War but resumed afterwards and, by the early 1950s, the blue whale population had been decimated. Whalers then turned to fin whales, whose numbers collapsed within a decade. In 1982 the International Whaling Commission (IWC) banned commercial whaling globally. The former Soviet Union and Japan continued commercial whaling until 1986/7, and Japan continues to kill around 300 minke whales a year for what they claim are scientific purposes. Overall, it is believed that some 1.3 million whales have been killed in the Southern Ocean.

IWC

International Whaling Commission (IWC)

The IWC is the global body responsible for the conservation of whales and the management of whaling. It was established in 1946, its purpose being to provide for the proper conservation of whale stocks and the orderly development of the whaling industry.

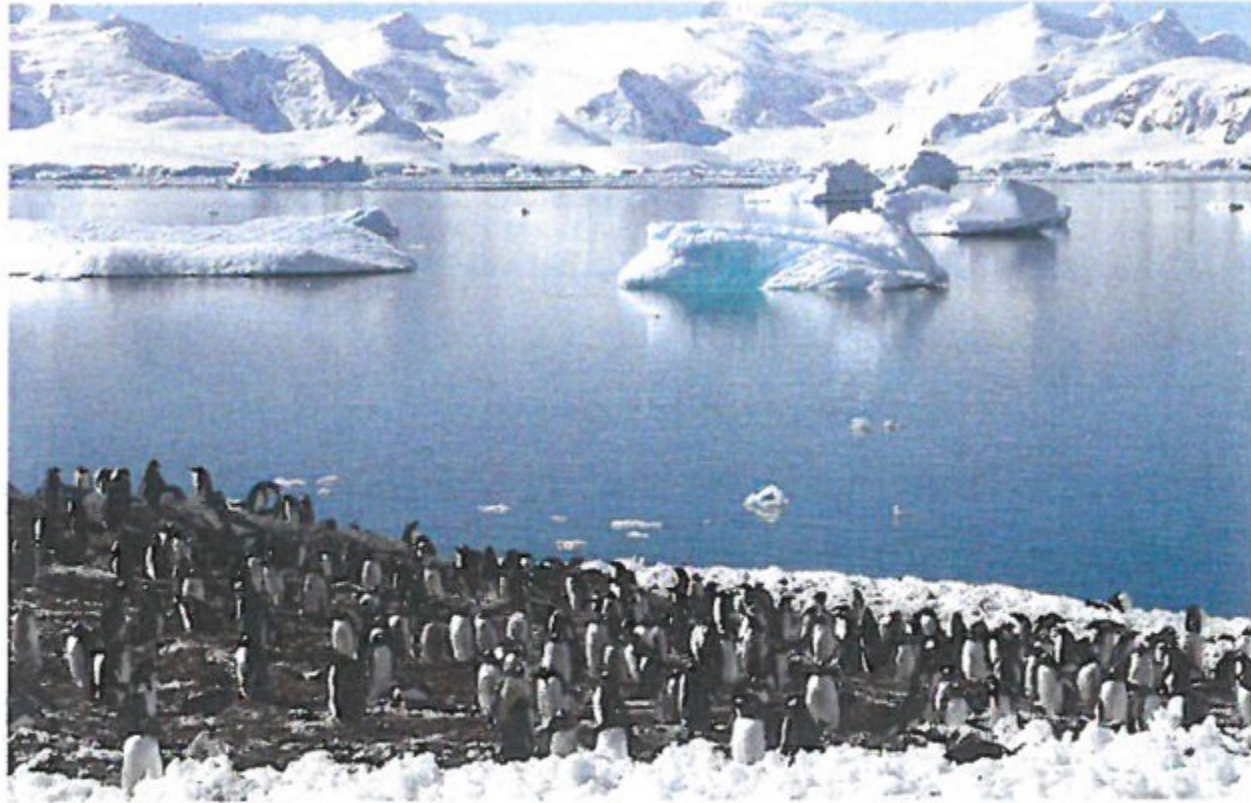


Figure 7.47 Part of the Southern Ocean Whale Sanctuary

The main duty of the IWC is to keep under review the measures laid down by the Whaling Convention, which governs the conduct of whaling throughout the world. These measures provide for:

- complete protection of certain whale species
- designated specified areas as whale sanctuaries (for example, The Southern Ocean Whale Sanctuary, Figure 7.47)
- established limits on the numbers and size of whales which may be taken
- prescribed open and closed seasons and areas for whaling
- prohibition on the capture of suckling calves and female whales accompanied by calves
- compilation of catch reports and other statistical and biological records.

In addition, the Commission encourages, co-ordinates and funds whale research, publishes the results of scientific research and promotes studies into related matters such as the humaneness of killing operations.

Threat	Summary of issues
Fishing and Whaling	<p>Whaling in the Antarctic waters still happens, but only at a very restricted level following the banning of commercial whaling in Antarctic waters in 1987.</p> <p>Excesses of previous generations – whalers drove four species close to extinction in the early 1900s – have now been curbed. Japan still kills 200-400 minke whales each year, allegedly for scientific purposes although the meat is later sold. Fish stocks have partly recovered after a collapse caused by overfishing in the 1970s. The <u>Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR)</u>, negotiated by Antarctic Treaty parties, helped establish quotas (total allowable catches) and created a complex system of fishing zones in the Southern Ocean to help manage the problem of overfishing. However, illegal fishing still takes place.</p>

The Future of Fishing Conference



- Create a conference to be attended by all the members listed opposite. (Some characters are animals!)
- The meeting should be chaired by a pupil who remains independent.
- Start the conference by generating an aim.

Stakeholders:

- Norwegian and Icelandic fishermen
- Japanese fishermen
- Russian fishermen
- British fishermen
- A whale
- A seal
- Krill
- Environmentalists e.g. Greenpeace
- Chairman of IWC
- Fish eating members of the public

Threats to Antarctica: Mineral resources

Mineral resources

Some scientists believe that Antarctica may contain a similar quantity of rich mineral deposits to South America or southern Africa. However, no large area of mineral resources has, as yet, been identified. Nevertheless, some gold, silver, iron and coal has been discovered there. The Environmental Protocol to the Antarctic Treaty came into force in 1998 and bans commercial mining activity in Antarctica. Indeed, there would be many problems in trying to develop Antarctica's resources, including:

- very low temperatures, making the functioning of machines difficult
- remoteness and large distances involved
- lack of daylight hours
- lack of water
- high wind speeds
- high set-up costs.

Nevertheless, these are not impossible conditions.

Trying to exploit offshore oil and gas deposits would be difficult on account of the depth of the continental shelf (500–1000m), stray icebergs and seasonal growth of sea ice. Since oil was discovered on the Falklands Plateau, there may be a greater chance of oil being found under the continental shelf of Antarctica.

Mineral exploitation in Antarctica is controversial. Although there are mineral occurrences in Antarctica, none are known in commercially viable quantities. The technical, economic and environmental difficulties of extracting minerals are immense.

Coal, oil, copper, silver, gold and titanium are known to lie beneath the Antarctic wilderness. However, since 1991, the **Protocol on Environmental Protection to the Antarctic Treaty** has banned all mineral resource activities (other than for scientific research).

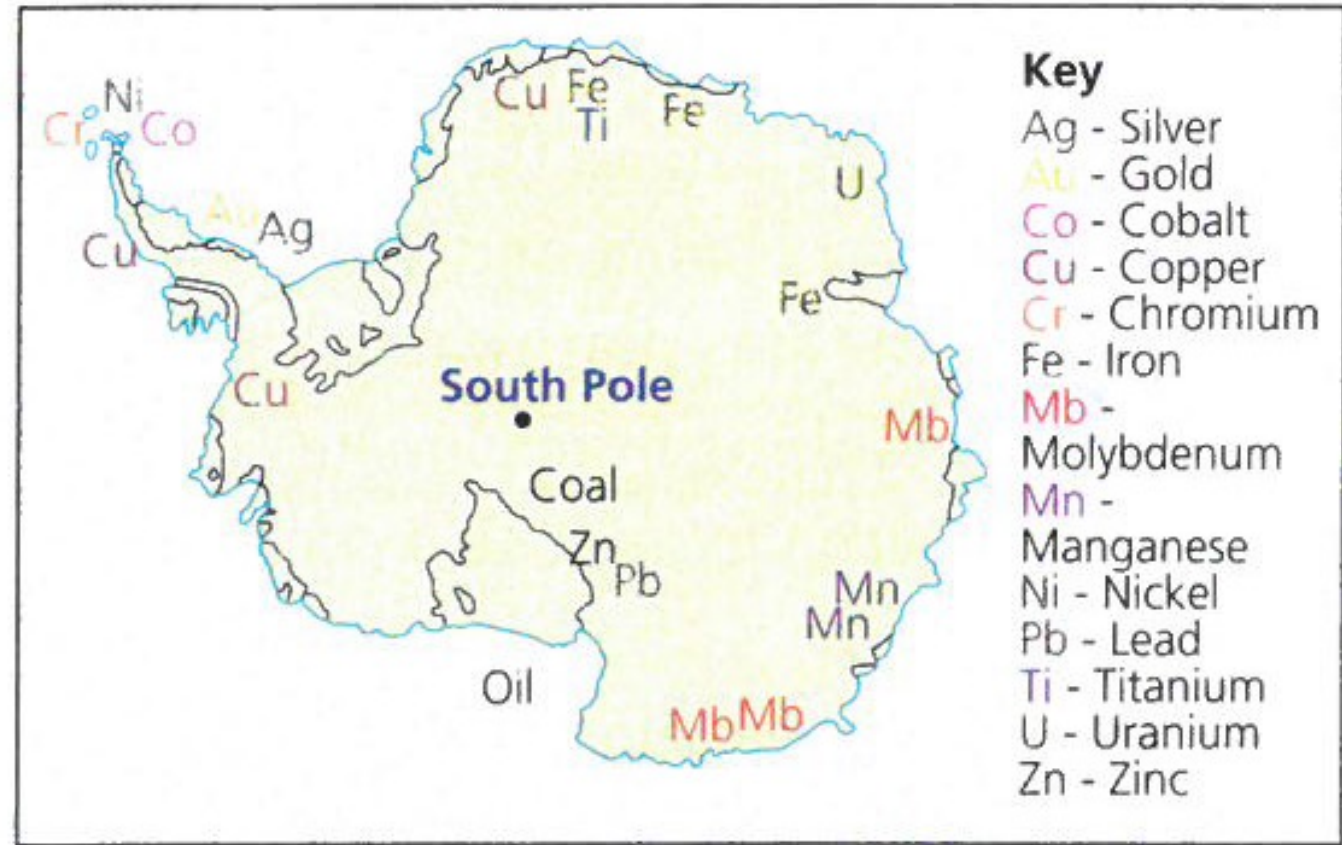


Figure 7.44 Mineral map of Antarctica showing known deposits of minerals

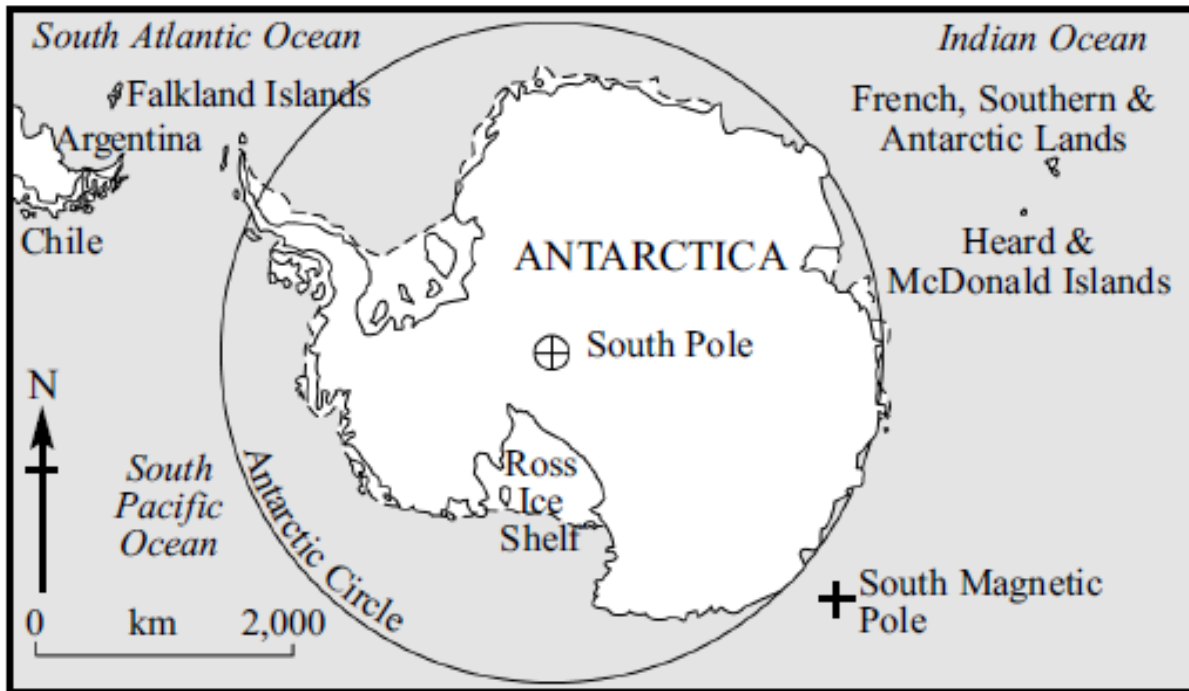
Threats to Antarctica: Tourism

- The first tourist ship arrived in 1958. Since then tourism has increased slowly, catering mainly for a small up-market sector of adventure travellers and natural history lovers. Numbers have been limited mainly by the formidable expenses arising from Antarctica's remoteness. As a destination, it does have a number of in-built regulators:
 - the season runs from mid-November to mid-March when weather and ice conditions are best and wildlife most spectacular
 - only small sections of the Antarctic coast are accessible (the South America sector is the most visited) with around 70 permitted landing sites
 - the Antarctic Treaty (1959) and the later Protocol on Environment Protection set out regulations and guidelines for all activities in Antarctica, including tourism
 - all captains of tour ships are required to observe these and other ground rules laid down by the International Association of Antarctic Tour Operators (IAATO) when taking parties ashore



Figure 7.30 Antarctica's dramatic scenery.

Tourism: good or bad?



- Issues:
 - How to protect the wilderness while giving people the opportunity to experience its beauty for themselves
- It has been stated that tourism will inevitably lead to the degradation of the Antarctic environment and should be stopped.
- An alternative argument is that everyone has the legal right to visit the continent and that visitors will become advocates for protecting the continent.

In 1991 the International Association of Antarctica Tour Operators (IAATO) was set up. This organisation draws up guidelines on the numbers of people allowed to visit the continent at one time. Since 2011 ships cannot use heavy fuels to visit Antarctica and since 2013 a new Polar Code limits the number and size of ships visiting. Ships with more than 500 tourists cannot berth on Antarctica and no more than 100 tourists are allowed there at any one time (Figure 7.31). However, there have been some incidents involving cruise ships in the sea ice off the coast.



Figure 7.31 The Polar Code limits the number and size of ships visiting Antarctica.

Threat	Issues
Tourism	<p>Increasingly, “unspoilt” nature is being harnessed as an economic resource through the concept of ecotourism (a model of tourism where an unspoilt natural environment becomes the principal attraction for visitors). As a result, Antarctica is becoming increasingly busy, with up to 50,000 visitors a year.</p> <p>Modern transport has opened up previously inaccessible areas as part of a “shrinking world”. Now, in common with many other wilderness areas, Antarctica is at risk of litter, waste and spilled fuel from vessels.</p>

Tourism in Antarctica



Use the website to create a one page review of tourism to include:

- Activities.
- Tourist numbers (trends).
- Potential impacts. - summarise the nature of the threat of tourism and its potential impacts on the Antarctic environment.
- Management.

Answer the question:

How much should tourism be allowed to grow in Antarctica in the future?

What is your view on tourism in the Antarctic?

<http://discoveringantarctica.org.uk/tourism/destination-antarctica/visit-antarctica/>



Use pages 54-55 and Figure 2 on page 62 in the Oxford textbook to help you.

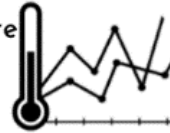
EXTRA – ‘Icebound’ video on Godalming Online and question sheet

Review:

Threats to Antarctica

Climate change and the environment

- Global warming is posing a risk to ice sheets and ice shelves on Antarctica, which are sensitive to an increased temperature. This poses a threat to the ecosystem on Antarctica (disruptions to the food chain, loss of biodiversity, loss of habitats).
- Sea-level rise (as a result of warmer oceans due to climate change) also poses a threat to biodiversity on (and around) Antarctica.
- Ocean acidification (as a result of dissolved CO₂ from the atmosphere creating carbonic acid in the sea) disrupts the ecosystem and affects marine life.



Tourism and scientific research

- Tourism is a growing industry for Antarctica, as people want to venture to places further afield than ever before. However, increased numbers of people going to the continent (and the transport methods involved in getting them there) results in erosion, an increase in carbon emissions, potential disruption to wildlife and potential littering.
- Scientific researchers pose similar threats to Antarctica as tourists. There is also the increased risk that their research may damage the environment (e.g. through ice core extraction).



Fishing and whaling

- Surrounding Antarctica, is the Southern Ocean. It is home to a diverse range of marine life, including whales, seals, fish and krill.
- These animals are at risk from stock depletion and disruptions to the food chain due to overfishing (especially krill) and commercial whaling.
- Commercial fishing and whaling also bring in other threats, such as land and sea pollution and high carbon emissions.



Mineral mining and exploration

- Antarctica is naturally rich in minerals such as gold, silver, iron, cobalt and oil. This puts the continent at risk from mineral exploration and subsequent extraction.
- Mineral extraction severely damages the natural environment. This includes land erosion (as well as degradation and depletion), disruptions to wildlife, loss of habitat and loss of biodiversity.



Quick Question: What are the main threats to Antarctica as a result of human activity?

