Harvesting ice, mining minerals

Rich resources

No sooner was Antarctica discovered than the exploitation began of its seals and whales, followed to this day, by fishing in the Southern Ocean.

During this time other resources such as ice, oil, gas and minerals became of commercial interest, especially during the 1970's. Today interest in these resources has waned since their protection by the Antarctic Treaty has made their extraction more difficult. Further protection of Antarctica's resources also arises through the sheer physical, technological and economic challenges of the continent. In future these protections may change in part because of what the continent may offer, namely:

- its oil reserves remain unknown but using its surrounding continents as a guide, the Ross and Weddell seas alone may hide four times the rich oil and gas reserves found in Alaska
- 70% of the world's freshwater is locked up within ice sheets and glaciers. Of this, 97% is found within the Greenland, Arctic and Antarctic ice sheets.

Nobody owns Antarctica

Antarctica is not controlled by any one country, although seven countries (Argentina, Australia, Chile, France, New Zealand, Norway,United Kingdom) make historic claims to the continent - but under the Antarctic Treaty these claims are acknowledged but not recognised. Also these countries cannot make new claims, enlarge claims nor act in a way that suggests they own an area.

In this way Antarctica is maintained as a continent of international cooperation which no one country owns, but also remains a continent where ownership is not settled.

Owning ice

Establishing the ownership of ice is difficult because

- its status is not clearly defined in international law and there are many different types of ice.
- although international laws commonly apply to land and sea, polar ice is neither of these - but instead is a substance that simply moves over them.
- the Antarctic Treaty (which applies to all areas south of 60 degrees) suggests ice shelves are land, even though they float on the sea.
- when ice shelves break up it is unclear whether the resulting icebergs are still land or whether the laws of the sea apply to them.
- if an iceberg drifts into the 200km economic zone around a country, should the iceberg then belong to that country?

Under international law all States are entitled to exercise special freedoms on the high seas. These freedoms include navigation, overflight, fishing, scientific research, the right to lay submarine cables and pipelines, as well as the right to construct artificial installations. However the 'high sea freedoms' do not not state anything about the right to harvest icebergs.

Harvesting icebergs

Harvesting icebergs for fresh water is not a new: in 1853 San Francisco was supplied with water from the Baird Glacier in Alaska. Also during the early 1970's Saudi Arabia investigated the feasibility of towing icebergs all the way from Antarctica to the Red Sea port of Jiddah and investigations were made to see if icebergs could supply fresh water to California, Colorado and Australia.

The northern edge of the giant iceberg, B-15A, in the Ross Sea, Antarctica.

These studies showed these s to be possible, especially using the more stable tabular icebergs found in Antarctica, but towing costs, melting and processing would make it barely economic.

Towing an iceberg also creates traffic problems, as under the laws of the sea towing vessels must not interfere with the movement of other vessels, the freedom to fish, and the freedom to lay cables and pipelines. Moreover since most of an iceberg is underwater it is highly likely that towing one will damage cables and pipelines.

Since ice is not classed as a mineral under the Antarctic Treaty there is nothing legally stopping the harvesting of icebergs nor using them as a source of bottled water. However, under the Antarctic Treaty activities must first be approved, a process which includes an environmental impact assessment. Where activities are likely to have a significant effect on the environment these plans must be discussed by the parties to the Antarctic Treaty.

In particular, activities in Antarctica must not

- disturb native birds and seals through the use of explosives, vessels or vehicles
- result in the significant modification of habitats
- affect specially protected areas
- create waste or pollution

Antarctic Minerals

Minerals are the solid chemical compounds found in rocks - compounds which commonly include oxygen, silica or carbonates. An ore is a mineral containing a significant amount of metal (e.g. iron ore). To extract a metal from its ore usually requires great heat in the presence of carbon (coal). Left alone metals will often return to being ores (e.g iron rusts, silver tarnishes, copper goes dull or green).

Although minerals containing iron, copper, molybdenum, nickel, chromium, cobalt, uranium and thorium are found throughout much of Antarctica their concentrations make them uneconomic to mine.

However, as in many deep oceans, on the sediments surrounding Antarctica lie potato sized nodules containing iron and manganese (ferromanganese) that are valuable and relatively easy to collect

Mining - good or bad ?

Of all human activities, mining has become one of the most controversial, despite our continuing need for metals and fossil fuels. In part this controversy has arisen from older mining practices which ruin or pollute natural habitats. The current high demand for minerals will continue because 'green' or 'renewable' technologies still require metals and concrete. For example, a wind turbine or solar panel still requires coal, aluminium, copper, steel, limestone and rock for its construction - all of which must be found, mined and extracted.

Changing values

The environmental dilemmas, debates and discussions, that have produced today's 'conservation movement', have also resulted in Antarctica being one of the most protected natural habitats on the planet.

Over the past 50 years public concerns over human activity have become so widespread that environmental protection is now an important part of the government policy's of Antarctic Treaty nations. They also see Antarctica as especially vulnerable and since 1970 almost annual alterations to international agreements have been made to ensure Antarctica is protected from exploitation and pollution - changes that can be seen in the following timeline.

1970	The issue of commercial mining in Antarctica is first raised by New Zealand.
1975	Parties to the Antarctic Treaty meet to discuss the exploitation of minerals in and around Antarctica.
1981	Treaty nations reaffirm the Antarctic Treaty and their commitment to the protection of the Antarctic Environment Negotiations for the Convention on the **Regulation of Antarctic Mineral Resource Activities (CRAMRA)** begin in order to control mining within the Antarctic Treaty area.
1988	Although CRAMRA was adopted, international opinion had hardened against any form of mining in Antarctica, resulting in France and Australia announcing they would not ratify the Convention - preventing it from entering into force.
1991	New and rapid negotiations produce the ***Protocol on Environmental Protection to the Antarctic Treaty***. Article 7 of this Protocol stipulates that "any activity relating to mineral resources, other than scientific research, shall be prohibited". This new Protocol did not mean CRAMRA had failed, as it had helped to establish strict and wide-ranging measures designed to protect the Antarctic environment. These included every stage of prospecting and exploration, prohibiting mineral activities within 'specially protected areas', along with far-reaching requirements for Antarctic operators and complex dispute resolution provisions.

Coal is reasonably plentiful in Eastern Antarctica, but its low quality, due to high ash and sulfur levels, make it of little commercial interest.

Practical activity: Mining for chocolate

Introduction

"If circumstances change and the harvesting of ice or extraction of minerals from Antarctica becomes realistic, new rules and agreements will need to be developed to protect the fragile Antarctic environment" - Karen Scott

A common simulation of mining is to extract the chocolate from chocolate chip biscuits. Here the chocolate represents a newly discovered Antarctic mineral, one which helps to produce electricity from sunlight.

What to do

1. Groups or individuals represent nations which have signed the Antarctic Treaty, others represent nations that have not. All however, are aiming to 'gain' the most chocolate, by what ever method they choose. (
2. Judging is by weighing the chocolate that has been 'mined', after a set time.
3. Make a list of ways you can cheat in this competition.
4. Using this list and working together, make a simple, clear 'international agreement' on chocolate mining - one which may alter the rules of the Antarctic Treaty (and any other international agreements) outlined on these pages.

How it works

Here students are forced to consider existing agreements but consider how these agreements may need to change, in order to better generate electricity - while still protecting Antarctica. It is likely every method of cheating (resource grabbing) listed has been attempted in the past.

Relevance

"Resource rights, environmental protection and benefit sharing cannot be separated, all must be fully addressed if a stable, durable and ultimately fair regime for the exploitation of Antarctic non-renewable resources is to be created." - Karen Scott

Legal aspects and considerations are adapted from material by *Karen Scott, University of Canterbury* by *Donald Reid, iMatters.co.nz* in association with *Gateway Antarctica, University of Canterbury.* Curriculla: Science L4 - 8, Social Studies L3 - 4, Geography L6 - 8. Images: Josh Landis (NSF), USAP, BrokenSphere. Wikicommons.