

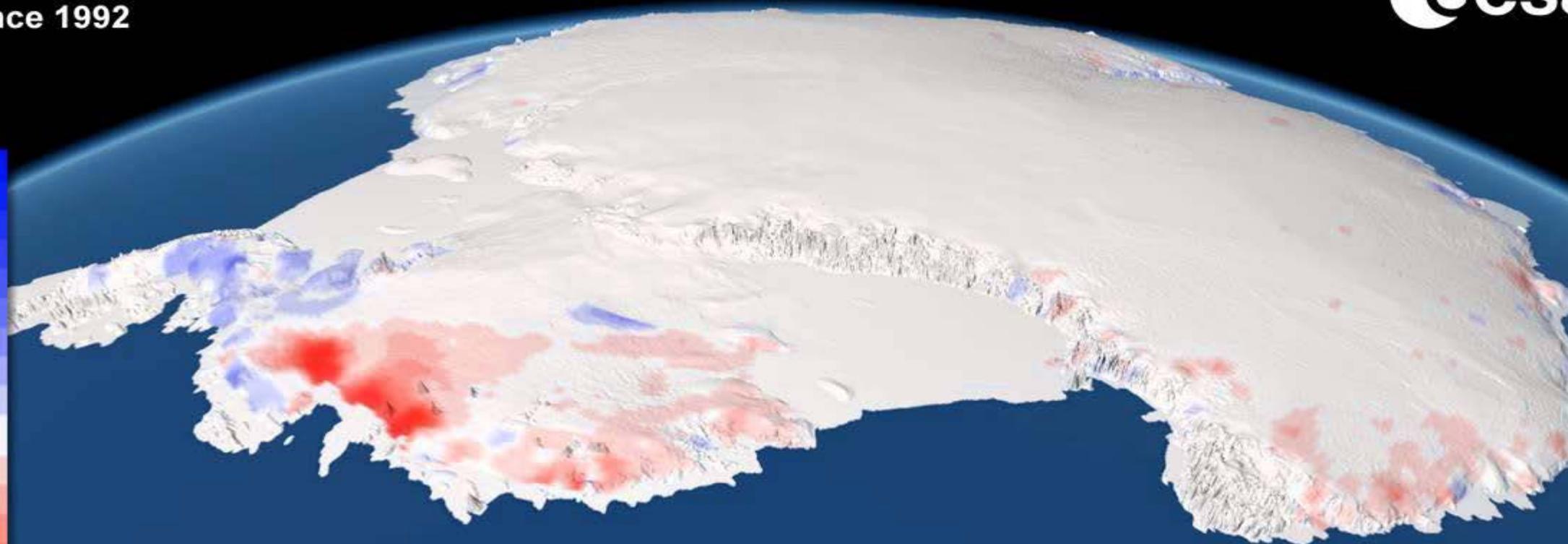
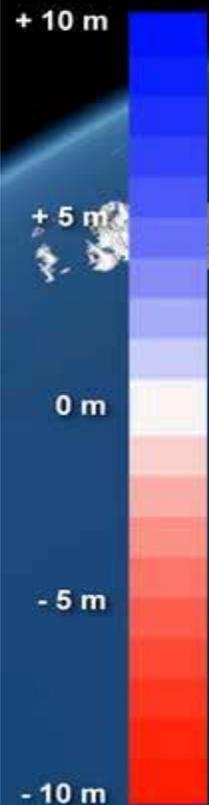
GREENLAND

- **Greenland is the world's largest island and an autonomous Danish dependent territory with limited self-government and its own parliament.**
- GDP of \$2.4bn (£1.5bn)
- Denmark contributes two thirds of Greenland's budget revenue, the rest coming mainly from fishing. Potential oil, gas and rare earth mineral reserves have attracted prospecting firms.
- Greenland enjoys perpetual daylight for two months each year but over 80% of the island is covered by an ice cap 4km thick in places. Global warming is feared to be causing the ice cover to melt increasingly fast but has also increased access to Greenland's mineral resources.
- The USA has long seen Greenland as strategically important and established a radar base at Thule at the start of the Cold War.
- The island's population is only 57,000. Inhabitants face severe social problems, notably unemployment, alcoholism and HIV/AIDS.

GREENLAND

- 82% is ice cap with a small strip of inhabitable land along shore line
- Melting ice sheets are changing the effect on the weight of the earth, since 2003 - **272 trillion** kms of ice a year has been lost and that affects the way the earth wobbles.

Change in Ice Sheet Thickness Since 1992



IMPACTS OF MELTING

The decline in ice cover on ice sheets can affect the economic and social well being of the population as well as the environment.

<https://nsidc.org/cryosphere/quickfacts/icesheets.html>



Retreating ice fields have had an impact on native Greenlanders

Environmental Positive impacts

- Warmer weather may see more greening of Greenland as it was 1000 yrs ago when the climate allowed for farming.
- South western Greenland has indicated that the warmer temps have created a longer grass growing season to boost productivity for some 60 sheep farms who slaughter 23.500 sheep and lambs each year = less reliance on imports.
- Dairy cattle have recently been reintroduced
- Locally grown potatoes/broccoli/radish
- Commercial fishermen expect bumper cod catches after fish move north into Greenland's waters

Environmental Negative impacts

- As it melts old impurities such as soot and dust entombed for years start to darken the surface and when it refreezes the grains are larger so it creates a less reflective surface.
- As the surface gets darker and less reflective this will accelerate the melting and fuelling sea level rise(creating a dramatic feedback loop)
- So Greenland stores, rather than reflects solar energy.
- caribou and reindeer herding will be negatively affected
- Permafrost will melt and release previously locked up stores of methane gas
- Melting dumps fresh water in to ocean

Negative Impacts continued

- Longer melt seasons increases access for boats to harvest fish increases the concern that there will be over fishing = reduced fish numbers
- If sea levels rise due to melting then this will dislocate those who live on the coastal fringe and effect current economic and agricultural activity
- **Concerns re damage to environment as a result of the 2013 -** Greenland parliament votes to end the territory's 25-year ban on the mining of radioactive materials such as uranium.
- Climate change could remobilize abandoned USA hazardous waste thought to be buried forever beneath the Greenland Ice Sheet.

Economic impacts

Positive

- Mining companies now have greater access to gold, copper, iron and diamonds
- **2013** - Greenland parliament votes to end the territory's 25-year ban on the mining of radioactive materials such as uranium, leading to a boom in mineral resource exports.
- The melting ice has also made it easier to go after 48 billion barrels of oil reserves off the coast.
- Tourism in fishing and hiking can be extended
- Greenland's dependency on Denmark may be reduced.

Local commentary on the benefits to Greenland that mining will bring

- Henning Sonderup reels off a list of the improvements that mining could bring: "New school, bigger hospital, better airport, new harbour, new roads, everything," he says. "Greenland will be on the map again."
- The Tanbreez mine isn't the only one proposed near Narsaq. Another Australian company, Greenland Minerals and Energy (GME), is developing a rare-earth mine at Kvanefjeld, a mountain plateau about 6km (3.7 miles) from the town.
- Unlike the Tanbreez mine, Kvanefjeld will produce uranium, fluoride and thorium as well as rare-earth minerals.

Economic impacts

Negative

- Mining companies now have greater access to minerals which will cause greater environmental degradation.
- bringing in migrant workers to Greenland - London Mining \$US 2.35 billion iron ore project plans to bring in thousands of Chinese workers to build the mine within the next 5 years.
- The 48 billion barrels of oil reserves off the coast. May result in oil spills and affect native fish and other wildlife
- economy has been dependent on fishing as well subsidies from Denmark.
- Heavily dependent on imports of food.
- unemployment and poverty high.
- <http://www.bbc.com/news/magazine-25421967>

Social impacts

Positive

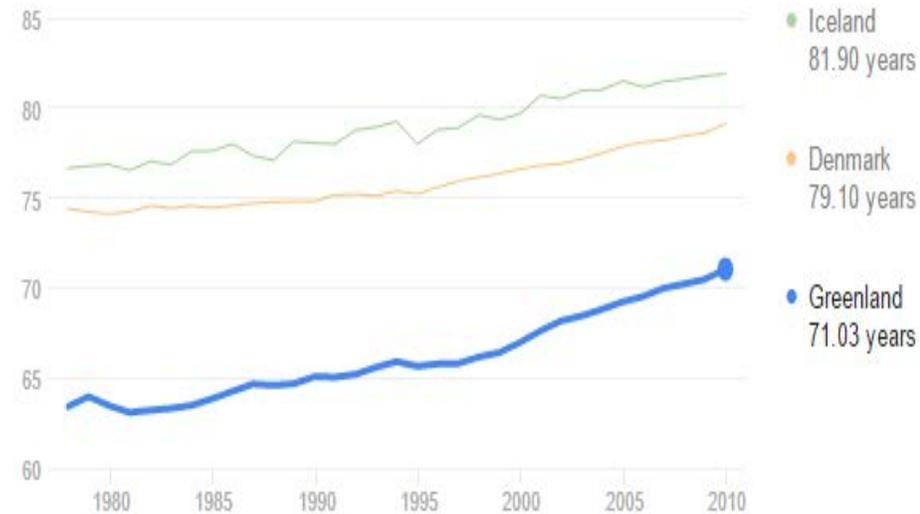
- Mining companies will provide employment
- Increase in tourism opportunities
- Construction industry expected to get a boost due to mining

Social impacts

Negative

- Life expectancy is lower than average
- Poverty
- Unemployment

71.03 years (2010)



 Explore more

USE OF SPATIAL TECHNOLOGIES

- Allows more regular and higher resolution monitoring of changing ice volumes and rates of flow. This is vital to distinguish the melting from natural dynamics
- Data is being collected by a range of sources who monitor glaciated areas and recording their ice decline.
- NASA- satellite imagery
- GNSS- Global navigation satellite Systems
- Aerial photography
- Scientific probes
- GIS- to monitor trends
- WGMS- World Glacier Monitoring Service- a branch of UNEP
- GLIMS- Global land Ice measurements from space

Responses

to Greenland's ice sheet retreat

- Many of the responses to ice sheet retreat are interconnected with responses to reduce human contributions to global warming

Background to Global responses

- Previous agreement to limit greenhouse gas emissions was the Kyoto Protocol (KP) under which industrialized countries will reduce their collective emissions of greenhouse gases by 5.2% compared to the year 1990.
- This ran from 1997-2012, followed interim measures until 2015
- The KP was implemented due to concerns about the impacts of climate change
- Part of the [United Nations Framework Convention on Climate Change](#) (UNFCCC)

THE PARIS AGREEMENT

- [Paris Agreement](#) on 12 December, governing climate change reduction measures from 2020.
- The expected key result was an agreement to set a goal of limiting global warming to less than 2 degrees °C compared to pre-industrial levels.
- The agreement calls for zero net anthropogenic (man made) greenhouse gas emissions to be reached during the second half of the 21st century. In the adopted version of the Paris Agreement, the parties will also "pursue efforts to" limit the temperature increase to 1.5 °C.
- The agreement establishes a "global stock-take" which revisits the national goals to "update and enhance" them every five years beginning 2023.

HOWEVER.....

- Despite more than 175 nations signing the agreement in April this year.
- Each country that ratifies the agreement will be required to set a target for emission reduction, **but the amount will be voluntary.**
- There **is no way to force a country** to set a target by a specific date or **hold a country to account through** enforcement measures if a set target is not met

National Responses by Government



More Government responses

- 2013 public awareness campaign of link between fossil fuels and climate change via a series of cartoons publicised in different newspapers and magazines.



- this campaign targets individual citizens in its attempt to promote climate-friendly behaviour. The aim is to reduce greenhouse gas emissions and improve the efficiency of energy consumption where possible.

And yet more National responses

- Greenland has invested 1% of GDP annually in renewable energy throughout the last decade; today more than 50 % of population is supplied with energy from renewable sources (mainly hydroelectricity; some wind and solar).
- Greenlandic university has a climate centre set up by Denmark and Greenland – monitors impacts on the glaciers and ice sheets
- Encouraging mining and oil industry in an effort to increase fiscal independence from Denmark. However in doing so they may indeed
- Increase emissions

LOCAL RESPONSES

Municipalities work to advance climate-friendly initiatives and behaviour in local communities.

- Qeqqata municipality (in west Greenland) has developed a holistic sustainability vision in which energy efficiency is also promoted



Sermersooq municipality (in south and east) has formulated a Plan of Action for Climate and Energy. This will ensure that climate and energy perspectives are incorporated in future initiatives

Local adaptation of hunting and fishing activities

Uummannaq –
undertaking less hunting
on sea ice and more
open sea activities. Also
turning to tourism to
supplement income.



Locals banding together

- In an effort to overcome migration to the capital city when the fish processing plant shut down due to decrease in catch size with the changing climate, the 50 residents of Niaqornat pooled their savings to buy it and keep it operating.
- So is it all bad for the people of Greenland??
- **You be the judge!**

GREENLAND more reading

- <http://promice.org/home.html>
- <https://www.theguardian.com/environment/2016/apr/09/melting-ice-sheets-changing-the-way-the-earth-wobbles-on-its-axis-says-nasa>
- <http://www.polarresearch.net/index.php/polar/article/view/28858>
- <https://www.facebook.com/groups/159803670699972/>
- <https://news.agu.org/press-release/melting-ice-sheet-could-release-frozen-cold-war-era-waste/>
- <https://www.theguardian.com/environment/climate-consensus-97-per-cent/2015/jul/14/global-warming-is-causing-rain-to-melt-the-greenland-ice-sheet>
- <https://www.theguardian.com/environment/2016/mar/03/greenland-ice-sheet-melting-global-warming-feedback-loop>
- <https://www.theguardian.com/environment/2014/dec/15/greenland-ice-melt-underestimated-study-says>
- <https://www.theguardian.com/environment/2016/apr/13/greenland-sees-record-smashing-early-ice-sheet-melt-climate-change>
- <http://www.esa-icesheets-greenland-cci.org/>