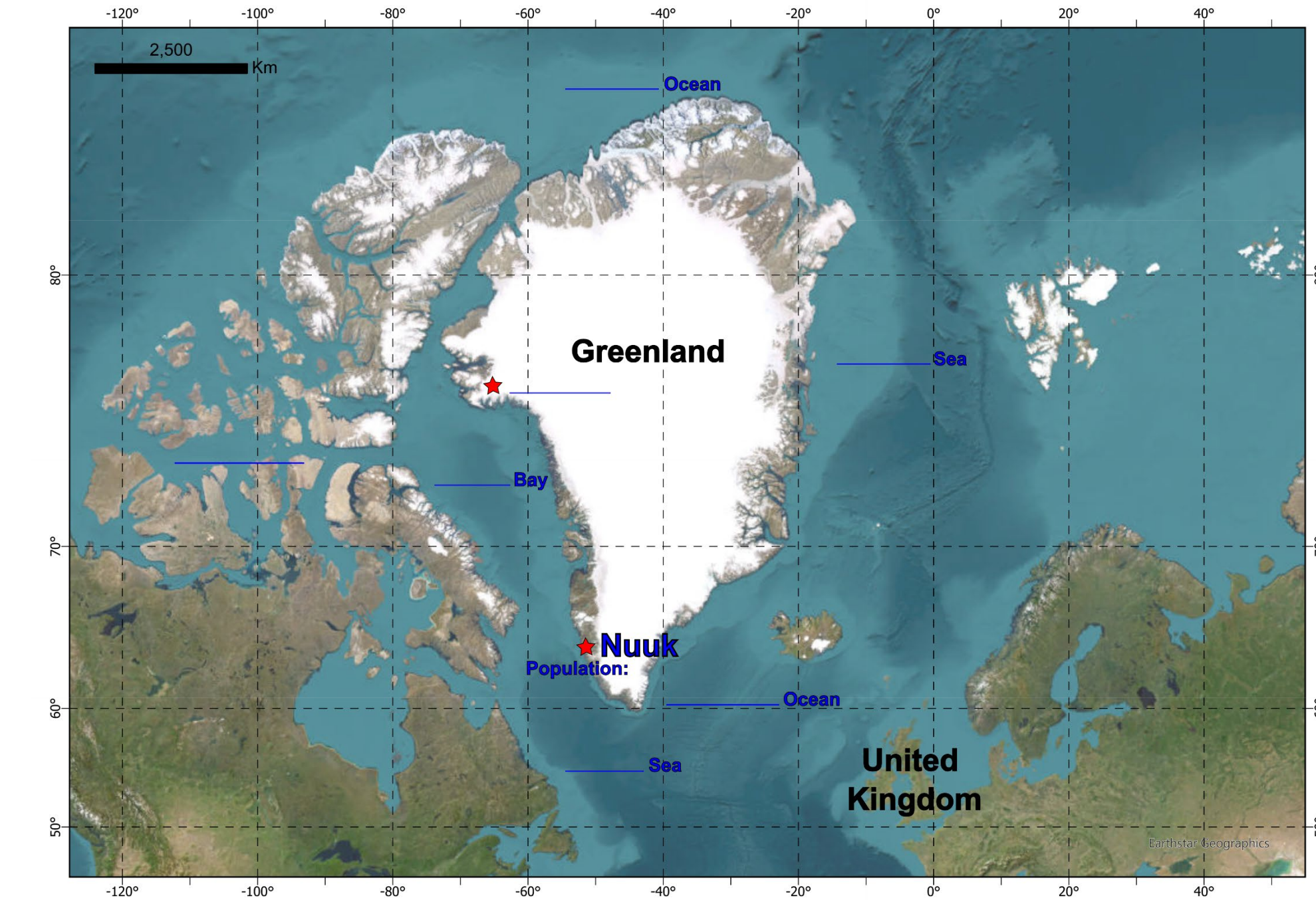
AntarcticGlaciers.org

Glaciers and Glaciation in Antarctica and beyond



Greenland Connection Scheme of Work

For Teachers:

The Greenland Connection Storymaps provide materials relevant to the UK A-Level curriculum, and can be used within the classroom or independently. They could be used as part of an extension activity and would be useful to stretch and challenge students, and provide greater depth to their learning.

The Greenland Connection StoryMaps are relevant to the 2026 AQA Geography A-Level Specification:

https://www.antarcticglaciers.org/glaciers-and-climate/changing-greenland-ice-sheet/the-greenland-connection-decolonising-uk-greenland-exploration/a-level-specifications/

This scheme of work provides two double-period A-Level Geography lessons (or homework) and comes with two student worksheets. The A Level specifications targeted by the StoryMaps as a whole is provided here.

Lesson 1: Glacial landscapes of Greenland

A Level Specification targeted:

2026 Geography AQA

- 3.1.4 Glacial systems and landscapes
- 3.1.4.2 The nature and distribution of cold environments
- 3.1.4.4 Glaciated landscape development
- 3.1.4.5 Human impacts on cold environments
- 3.1.5.1 The concept of hazard in a geographical context

StoryMaps:

The People of Greenland:
(https://storymaps.arcgis.com/collections/3a38d73267194b37b09f8031fe10f90b?item=1)

Greenland Science Today:
(https://storymaps.arcgis.com/collections/3a38d73267194b37b09f8031fe10f90b?item=6)

Where is Greenland?
(https://storymaps.arcgis.com/collections/cfae832dc3444613ae1f4e178769783f?item=1)

Learning objective: To understand the physical geography of Greenland, its ice sheet and glaciers.

Learning outcomes: An understanding of the importance of Greenland, its people and the impacts of climate change on its environment.

Lesson tasks:

Starter: Begin by demonstrating the appearance and function of the StoryMaps, including the interactive display items. Ensure that students are aware that they can be viewed across devices and at home (if set as a home learning task).

Main: Students to work through three StoryMaps, two from 'The Greenland Connection' StoryMap collection and one from 'Hidden Landscapes of Greenland' StoryMap Collection. Videos in 'Greenland Science Today' to be played with sound for full facts and figures of future scenarios.

Develop the Greenland worksheet 'base map' (Page 1), which can be annotated and illustrated to establish key locations on and around the island. Questions (below) will help the students populate the worksheet with specific answers, but others can be added around the map.

Attempt two exam-style questions on 1) the main impacts of climate change on Greenland and its people, and 2) interpretation of data on Arctic sea ice extent over the last 40 years, shown on a graph in one of the StoryMaps.

Plenary tasks: Discuss with the students the factors that allow the Greenland Ice Sheet to exist – the situation of a large land mass (the world's largest island) at high latitude with a cold climate.

Discuss the different impacts of climate change on Greenland and its people. Discuss how the different methods employed on scientific research expeditions might have been used to understand climate change impacts (ship-based expeditions to document ecosystem loss and movement, satellite data to study large scale processes like sea ice loss).

Questions (*and answers*) formed from StoryMap content:

Q1: Greenland is surrounded by seas and oceans. What are their names? Add these names to the Greenland worksheet basemap.

Oceans – Arctic, (North) Atlantic; seas – Greenland Sea, Baffin Bay, Labrador Sea. These are shown on the first interactive map of the 'Where is Greenland?' storymap (https://storymaps.arcgis.com/collections/cfae832dc3444613ae1f4e178769783f?item=1).

Q2: The most northerly point in the UK is at 60°51'N on the Shetland Islands, to the north of Scotland. What latitude is the most southerly point of Greenland?

60°N. On the worksheet basemap and on the final map of the 'Where is Greenland?' storymap (https://storymaps.arcgis.com/collections/cfae832dc3444613ae1f4e178769783f?item=1) the 60°N line can be seen crossing the southern tip of the island. Greenland stretches to >85°N, so you could almost travel directly to the north pole if the UK and Greenland were aligned.

Q3: A large amount of Greenland is covered by its ice sheet and by other glaciers. What is the area of ice on the island?

Greenland itself has a total area of 2.16 million km^2 (The Greenland Connection – The People of Greenland StoryMap), 79% of which is covered by ice. 79% of 2.16 million can be calculated by:

2,160,000 x 0.79 = 1,706,400 km^2

The UK covers a total area of 244,376 km^2, so Greenland is almost 7 times larger than the UK.

Q4: The glaciers and ice sheet of Greenland have experienced high rates of melt over the last few decades, with the melt water produced contributing directly to sea level rise. If all of the ice on Greenland melted, how much would is raise our sea level by?

7.4 metres, as highlighted in the 'Greenland Science Today' StoryMap (https://storymaps.arcgis.com/collections/3a38d73267194b37b09f8031fe10f90b?item=6).

Q5. Outline some of the main impacts of climate change on Greenland and its people.

Increasing temperatures are having impacts across Greenland, including (but not limited to):

-The loss of considerable amounts of ice from the main ice sheet, as well as from its peripheral glaciers. The main ice sheet has lost an average of 269 gigatons of ice per year since 2002 ('Greenland Science Today' StoryMap, 'Climate Change in Greenland today' video)

-The loss of sea ice, which has declined at a rate of ~12% per decade recently. This has caused changes in the extent and thickness of sea ice along the west coast, north coast and east coast of Greenland. Sea ice is relied on by local people, who use is to hunt seals, and other local wildlife.

-Permafrost thaw around the coast of Greenland, where the people of Greenland live. Many towns in Greenland are built on permafrost, which is becoming unstable. It's thaw also releases additional greenhouse gases.

-Mountainside instability, likely due to glacier melt and permafrost thaw. In the fjords around the coast of Greenland, glacier recession and permafrost thaw are causing steep mountainsides to become unstable. A huge example of a landslide adjacent to a receding glacier was documented in 2023, which luckily did not occur near any settlements.

-Ecosystem loss and movement, such as fish stock relocation. With ocean waters also warming and circulation patterns changing, formerly predictable fishing grounds are moving. This is causing challenges to local people, of which many depend on fishing for their income, where they are required to catch the same species of fish as they have previously. It also presents opportunities for people to catch different fish which may not have been available before.

Each of these topics are discussed in the 'Greenland Science Today' StoryMap (https://storymaps.arcgis.com/collections/3a38d73267194b37b09f8031fe10f90b?item=6).

Q6. Examine the 'Arctic Sea Ice' animated graph in the 'Greenland Science Today' Storymap. Describe how the extent of sea ice changes over short (annual) and long (decadal) timescales.

The Arctic Sea Ice extent graph illustrates the annual cycle of sea ice formation and depletion. Sea ice maxima occur around the beginning of March each year, at the end of the winter. Sea ice minima occur in mid-September, at the end of the summer in the northern hemisphere. At present, the maximum extent of arctic sea ice is about 13-14 million square kilometres, whilst its minimum annual extent is ~4 million square kilometres.

The graph also illustrates the long-term decline of arctic sea ice extent. The dashed and coloured lines on the plot illustrate the annual extent of sea ice from different points in time over the last 40 years. In the 1980s, the maximum extent of winter sea ice was between 15-16 million square kilometres, whereas it's minimum was between 7 and 8 million square kilometres. Between 2010 and 2020 (2010s mean), the maximum extent had decreased to ~14 million square kilometres, and the minimum to ~4 million square kilometres. These data show that less of the Arctic is developing sea ice cover (~1 million square kilometres) in the winter and that

much more of the arctic is covered by open water in the summer (~4 million square kilometres more).

The years 2007, 2012 and 2020 are highlighted in particular, with the summer minimum sea ice extent from all three being less than 4 million square kilometres. The diminishing sea ice cover is encouraging different countries to navigate arctic waters for shipping and causing geopolitical tensions as a result.

These estimates are taken from the 'Arctic Sea Ice' illustration in the 'Greenland Science Today' StoryMap (https://storymaps.arcgis.com/collections/3a38d73267194b37b09f8031fe10f90b?item=6).

Lesson 2: Greenland in the global landscape

A Level Specification Targeted

3.2.1 Global systems and global governance
3.2.1.1 Globalisation
3.2.1.2 Global systems
3.2.1.3 International trade and access to markets
3.2.4 Population and the environment
3.2.4.2 Environment and population

StoryMaps:

The People of Greenland:
https://storymaps.arcgis.com/collections/3a38d73267194b37b09f8031fe10f90b?item=1

The Scramble for the Arctic:
https://storymaps.arcgis.com/collections/3a38d73267194b37b09f8031fe10f90b?item=2

Learning objective: To understand the importance of Greenland in the global landscape

Learning outcomes: Understand the long history of the exploration of Greenland; understand the importance of Greenland in global security; understand the journey of Greenland towards self-governance.

Lesson tasks:

Starter – Reminder of the function of StoryMaps.

Main: Students to work through two StoryMaps from 'The Greenland Connection' StoryMap collection: 'The People of Greenland' and 'The Scramble for the Arctic'. Continue population of the Greenland basemap worksheet, adding detail about the population of Greenland and routes of early expeditions.

Attempt two exam-style questions relating to Greenland self-governance and the importance of Greenland to America over the last ~80 years.

Plenary: Discuss why Greenland has been important to global trade and security, both historically and in the modern world. Emphasise the long history of exploration of the western and northwestern coastline of Greenland as part of attempts to establish the 'northwest passage' trading route (through sea ice to reach Asia).

Explain why renewed interest in Greenland (by America) has resulted in so much media coverage recently. Whilst Trump insists Greenland should be American for global security, there is a long history of resource extraction from Greenland, casting doubt on Trumps main motivation for American 'investment' in Greenland.

Questions (*and answers*) formed from StoryMap content:

Q1. What is the current population of Greenland and how many of its people live in its capital? Mark the population of the capital city on the Greenland worksheet basemap.

56,740 people currently live in Greenland. Most of them live in the southwest of the country, on its coastline. Nuuk, the countries capital, is home to 20,085 people – 34% of the country's population. This information is found in the 'People of Greenland' StoryMap.

Q2. What is the 'Northwest Passage' and where is it? Add the route used by expeditions to find the 'Northwest Passage' to the Greenland basemap.

The 'Northwest Passage' was a term used to describe a shipping route through the North American Arctic, which was intended to facilitate trade between Europe and Asia. The route was up the west coast of Greenland and through the many islands of the Canadian High Arctic – a region known for extensive sea ice and bad weather. The map showing the route of the 1845 expedition in the 'Scramble for the Arctic' StoryMap illustrates the Northwest Passage location.

Q3. For how many years did early explorers try to find the 'Northwest Passage', and did anybody ever manage to find their way through it?

Explorers first started to try to navigate the seas up the western coast of Greenland and through the arctic during the 15th century (1400s). The linked YouTube video (https://www.youtube.com/watch?v=auFpowDCLB8&list=RDauFpowDCLB8&start_radio=1) in the 'Scrambles for the Arctic' StoryMap shows an expedition by Cabot beginning in 1497 which explored to the west of Greenland. Roald Amundsen led an expedition in 1903 which was the first to fine a route through the Northwest Passage, so it took just over 400 years for a route to be established.

Q4. Outline the recent steps taken towards Greenland becoming self-governing.

The Royal Greenland Trading Company, which had strong control over the society and trading utility of Greenland into the twentieth century, was dissolved in 1950. Greenland was then formally integrated into the Kingdom of Denmark as a country and was represented in Danish parliament by two representatives.

In 2009, the Self Government Act was passed by the Danish and Greenlandic Parliament, which gave Greenland greater powers over its police, coastguard, courts and its own natural resources. Denmark regains heavy influence over foreign affairs, defence and monetary policy.

Currently, most of Greenland's political parties are in favour of full independence, but they disagree on the path to it, along with the timescale.

Q5. Outline why Greenland is so important to America, both historically and today.

Greenland is found between America and Russia, who have a long, complex history. In the 1940s, when the threat from the Soviet Union (composed of what is now Russia and other neighbouring countries) was developing, Greenland was seen to be essential to the security of America. America built a new air base (called 'Thule' – renamed Pituffik in 2023) on Greenland to be able to detect and intercept any long-range aircraft travelling from the Soviet Union across the Arctic.

Pituffik was not the only American military development in Greenland, however. The American military also secretly developed 'Camp Century' in the far northwest of the country. Camp Century was an American military base constructed within the Greenland Ice Sheet. It was built in the 1950s and 1960s and was meant to house hundreds of American nuclear missiles under the ice, which were to be used in the event of an attack by the Soviet Union. The base was

ultimately closed in the mid-1960s because it proved too difficult to maintain, due to the movement of the ice sheet.

America still maintains a military presence in the northwest of Greenland though. Pituffik space station is located close to where Camp Century used to be. Its main purpose is to monitor satellite activity and keep an eye on the skies for signs of hostile missile activity.

Recently, Donald Trump has shown renewed interest in Greenland, again suggesting that America should expand its presence there in the name of national security. Whilst this could be true, it should also be considered that Trump is looking at Greenland as somewhere which presents opportunities for resource extraction. As the StoryMaps illustrate, there is a long history of such exploitation in Greenland, so an increased American presence here would essentially open a new chapter in the colonial history of Greenland.

Q6. What is 'Pituffik'? And can you place it on the Greenland basemap?

Pituffik is the American Space Force base in the northwest of Greenland, formerly known as Thule.

A-level curriculum (AQA) topics covered:

3.1.4 Glacial systems and landscapes
3.1.4.2 The nature and distribution of cold environments
3.1.4.4 Glaciated landscape development
3.1.4.5 Human impacts on cold environments
3.1.5.1 The concept of hazard in a geographical context
3.2.1 Global systems and global governance
3.2.1.1 Globalisation
3.2.1.2 Global systems
3.2.1.3 International trade and access to markets
3.2.4 Population and the environment
3.2.4.2 Environment and population

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