



INTO SURVE



Q1: The poor polar bears and starving seals in this scene are feeling the effects of climate change. Can you explain what this means?

A: When we talk about climate, we mean the usual weather of a certain area, which might include features like temperature, precipitation, wind, cloudiness, sunshine, air pressure and humidity. When we discuss climate change, we are talking about the climate of the whole planet, and in particular, the effect of human industrial activity on the world's weather. During the 11,000 years before the Industrial Revolution (which began in the mid-1800s), the world's average temperature was around 14°C. Once humans began to burn fossil fuels like oil, coal and gas to power factories and machines, as well as undertaking mass

deforestation, the amount of greenhouse gases released into the atmosphere increased dramatically. These gases gathered to form a 'blanket' around the Earth, trapping heat from the Sun and causing the planet to heat up. This is known as the 'greenhouse effect'. Since the Industrial Revolution, that 14°C global average temperature has risen by around 1°C. While this might not sound like much, it is a faster rise than previous natural global changes. This dramatic shift and its causes are what we are concerned with when we discuss climate change.



Q2: There's a not-too-chill situation happening towards the rear-left of the scene! Do you know why a section of ice has broken from the glacier?

A: Like the poor polar bear being stuck on a sliver of ice, and the starving seals fighting over a diminished food supply, the crumbling glacier is another result of climate change. The greenhouse effect raises the temperature of the Earth's surface by increasing the levels of greenhouse gases - such as carbon dioxide, methane, and nitrous monoxide - in the Earth's atmosphere. It is important to know that the greenhouse effect is actually vital to life on Earth; if there wasn't a warming 'blanket' of gases around the planet, the climate would be too cold for life to thrive. The problem comes when this blanket becomes too thick, trapping infrared radiation and causing the Earth's surface to heat up. When it comes to areas like the Arctic, the increases in temperature cause the ice there to melt quicker, which explains the damage to the glacier! It also explains the impact on the polar bears, whose habitat is getting smaller and smaller, as well as the effect on the seals, whose food is getting more and more scarce due to changes in water temperature.

Q3: There are surveyors skiing, slip-sliding and snowmobiling all over the scene! But what are they doing all the way up in the Arctic?

A: The same thing that surveyors do all over the world! They're making maps, taking measurements and monitoring all the important geographic features of the area. For example, one survey team in this scene is using an underwater robot to measure the melting glacier below the surface of the water. The Hypack whale is using rQpod technology to scan the base of the glacier; this information can tell us how climate change is affecting the Arctic landscape. A similar project taking place in Antarctica is the International Thwaites Glacier Collaboration - a joint UK/US study where scientists from British Antarctic Survey (BAS) alongside professionals from other institutes are investigating the likelihood of the Thwaites glacier collapsing in the next few decades or centuries, and how this might impact global sea-level rise in the future. You can read about this project here: https://www.bas.ac.uk/project/international-thwaites-glacier-collaboration

Surveyors in this scene will also be busy making maps of unchartered landscapes, or updating existing ones with new data, while comparing the data sets to monitor any changes – including those that might be the result of climate change. They might also be gathering data that will be used in construction, like in the Polarled pipeline project, which is the first pipeline to extend Norwegian gas infrastructure across the Arctic Circle.



Q4: It looks like these surveyors have some pretty cosy camps! But these structures are actually called 'base stations', and they aren't just for catching Z's! What do you think is going on inside them



A: Just like the UK Arctic Research Station (Ny-Ålesund, Spitsbergen, Svalbard archipelago), these stations offer the opportunity for scientists and geo-surveyors to study various aspects of the geology of the Arctic region, such as:

• Ecological research (Including the study of native wildlife, such as the polar bear, reindeer and Arctic fox, as well as over 100 types of birds, such as guillemots, kittiwakes and little auks.)

• Glacial/periglacial geomorphology (With a focus on the effects of freezing and thawing on the Arctic landscape - especially as influenced by climate change.)

• Hydrology (Where the distribution and movement of water, on and below the Earth's surface, is the focus of study, along with the impact of human activity on water conditions and availability.)

• Atmospheric chemistry (Which is hugely important in contributing to climate change study, as it looks at the effects of things like acid rain, ozone depletion, photochemical smog, greenhouse gases and global warming, with a view to finding solutions to these issues.)

• Marine research (Which can include the study of physical marine geography, as well as marine ecology, including species like walrus, seals, white-nose dolphin, narwhal and orca.)

Q5: Can you spot the submarine taking a sneaky peak at the base of the glacier? Why do you think surveyors need to work under the sea?

A: The team in the submarine are carrying out a 'hydrographic' survey. This involves collecting data about underwater topography and water-line features in a given area. These might include things like the depth of the bed, the position of the shore line, the mean sea level and the level of the tide. Surveyors will often use sonar scanners to map underwater areas, which can help detect changes and irregularities in the bed, as well as measuring river and stream discharge. All these different elements are useful not only for monitoring the features of areas that are likely to be impacted by climate change, but the information they provide can also be put to use during construction work - for example, in the building of bridges, dams, harbours and utility networks.



Q6: We need to save the seals, protect the polar bears, and ensure Earth's future! Having seen some of the effects of climate change, what do you think we can do to reduce its impact?

A: Here are a few ways, large and small, that we could help counter the effects of climate change:

Use alternative energy

Alternative energy sources, such as solar, wind or tidal energy, can help us to reduce our use of fossil fuels - which, as we've seen, contribute to the greenhouse effect by introducing more harmful gases into Earth's atmosphere.

Plant trees

From supporting organisations like #TeamTrees to planting your own, planting trees encourages afforestation, which means there will be more trees to absorb the carbon dioxide in the atmosphere during photosynthesis. Have a look at www.theworldcounts.com to find out how serious the threat of deforestation is to our planet.

Recycle

The impact of recycling everyday materials and household objects and packaging is astounding. For example, did you know that it takes 95% less energy to recycle aluminium cans than it does to make new ones – and if UK consumers were to line up the number of cans they use each year, it would reach the moon and back? Did you also know that recycling just one tonne of aluminium saves up to 9 tonnes of CO2 emissions? Recycling is a great way to reduce the production of the harmful gases that we know contribute to climate change. Read more recycling facts here: https://www.recyclingbins.co.uk/recycling-facts/

