



What will happen if our seas keep rising?

This project asks students to think about the effects of rising seas on people and places. It gives students the opportunity to consider one extreme example – the Islands of Tuvalu, which started to become uninhabitable in the late 1990s because the sea began to encroach – and to compare this with possible scenarios in the UK, finally looking at what could happen if their local area flooded. It asks students to compare responses to natural hazards in the UK and in a developing country and to think about the effect of climate change on different people and places. In the UK, the average sea level is now 10 cm higher than it was in 1900, according to the UKCIP.

Background Information: Thermal expansion and sea level rise

If global temperatures increase, scientists have indicated that an increase in sea level is one of the likely secondary effects. Two factors will contribute to this accelerated rise in sea level. First, although the oceans have an enormous heat storage capacity and, if global atmospheric temperatures rise, the oceans will absorb heat and expand. A greater volume of ocean water due to thermal expansion will lead to a rise in sea level. Second, rising temperatures will cause the ice and snowfields to melt, thereby increasing the amount of water in the oceans. It should be noted that only the melting of land-based ice and snow will increase sea level. The melting of floating ice will not affect sea level. This can be demonstrated to your students by partially filling a glass container with ice and water and marking the water level on the glass. When the ice cubes melt, the water level will not have changed.

Throughout earth's history there have been periods of glaciation followed by warming trends in which the glaciers retreated towards higher latitudes and higher altitudes. At present, glaciers throughout the world are said to be retreating and the amount of snow and ice at the poles is shrinking. The present interglacial warm period began about 14,000 years ago. At that time sea levels were about 75 to 100 metres lower than they are today. The sea level rose rapidly (up to 1 metre per century) as massive amounts of snow and ice melted. Today the rate of sea level rise is much lower at 15-17 centimetres per century.

What are the potential effects of sea level rise?

The rate of sea level rise will increase as the rate of global warming increases. An accelerated rate of sea level rise would inundate coastal wetlands and lowlands, increase the rate of shoreline erosion, cause more coastal flooding, raise water tables, threaten coastal structures, and increase the salinity of rivers, bays and aquifers.

How will this affect the UK?

Climate change will cause the sea level to rise. This will mean that less of our shores and beaches will be exposed between the cliffs or sea walls and low water, a phenomenon known as 'shore line squeeze.' Unless the cliffs and sea defences collapse and retreat this shore line squeeze will leave a reduced habitat for shore species, less beach for our leisure activities, and less protection from storms.

How this project links to the curriculum

This project allows students to investigate and compare two different environments, one in a developing country and the other in the UK. Through the prism of a climate change, they will have the opportunity to look at the political, economic, social and environmental factors that contribute to flood devastation. Through looking at the migration issue caused by the flooding of Tuvalu, they will learn about the interdependence of places and environments and identify geographical questions, collect and analyse written and statistical evidence and develop their own opinions. Throughout the project, there will be opportunities to develop geographical skills through the use of resources including maps, satellite images and ICT. Students will be able to carry out their own investigation which relates to the area in which they live.

Teaching this project

There are two parts to the project.

The first challenge worksheet focuses on Tuvalu. It is designed to be worked through individually and offers students the chance to understand Tuvalu's problems through answering questions and writing reports. (The answers to the questions can be found below).

The second challenge worksheet focuses on the UK. The information included explains about rising seas in the UK and the effect a storm surge would have under such conditions.



Over to you

As a follow up to the UK based part of the project, schools based near the coast - or who have the opportunity to visit the coast - could compile a geographical investigation based on the effect sea level rise would have on your area. If the sea rose by five metres and there was a storm surge, what would happen to local people and businesses? What would happen to local wildlife sanctuaries and protected areas? What would happen to crops?

Appendix A: Answers to questions on Student Worksheet 1: Build up a picture of Tuvalu

- In which ocean is Tuvalu?
The Pacific
- Which other countries is it close to?
Fiji, Australia, New Zealand and Papua New Guinea
- What is its capital city called?
The capital is Funafuti
- What is the highest point on Tuvalu?
4.5m above sea level
- What latitude is it on?
Between 5 and 11 degrees south
- How big is Tuvalu?
26 km Square
- Who is Tuvalu's current prime minister?
Prime Minister Maatia Toafa
- How big is the population of Tuvalu?
11, 636
- How many coral atolls make up Tuvalu?
Nine
- What does the name Tuvalu mean?
'Eight standing together'
- What are the four main industries on the island?
Subsistence farming and fishing, exporting Copra and selling licenses to foreign tuna ships

Appendix 2:

Answers to questions on Student Worksheet 2: Immigration and Climate change

- What is happening to the Tuvalu Islands?
They are being covered by the sea
- What will happen to the people who live there?
They will have to leave the islands and emigrate to other countries
- Which country has offered to accept a quota of Tuvalun refugees?
New Zealand
- Which country has said it will not allow islanders from Tuvalu to move there?
Australia
- Which other country does Mr. Laupepa, quoted in the article, criticise?
The US
- Why?
For refusing to sign up to the Kyoto treaty

Student Challenge 1

Rising Seas: Disappearing Tuvalu



GEOGRAPHY KS3

CLIMATE LAB

“Every year around Funafuti island, the sea has risen 5.7mm for the past thirteen years. For a country with a high point of five meters, this will soon pass the dividing line between life and death. The tragedy is, not enough people are willing to accept that such a line exists. As the twenty first century matures, Tuvaluans will not be alone – but will we ignore other peoples as we have ignored them?”

- Newspaper Article about Tuvalu

Tuvalu is a group of small islands in the Pacific ocean with a big problem.

They are disappearing.

The islands are made up of several small coral atolls. Because of their low lying nature, they are more at risk from the effects of climate change on sea level than countries which are higher. As the sea rises, Tuvalu is gradually being covered up by the sea, putting its population at risk of food shortages, flooding and displacement. Tuvalu's government blames the US for the rising sea waters, because it's one of the highest producers of carbon dioxide in the world. Many islanders have already fled in the hope of being accepted as immigrants by New Zealand, Fiji and Australia; many, however, have had their applications turned down and found themselves with nowhere to live.

Build up a picture of Tuvalu

Imagine you are a journalist who has been sent to Tuvalu to write about it's disappearance. Write a brief article describing the place, imagining you are writing for people who have never heard of it before.



To help you build up a picture of Tuvalu, it will help if you answer the following questions in your article (you can write the answers in note form first and then write up your article):

You can learn about Tuvalu by following these web links.

www.tuvaluaislands.com/about.html

<http://www.tuvaluaislands.com/maps/maps.html>

http://news.bbc.co.uk/2/hi/asia-pacific/country_profiles/1249549.stm

- In which ocean is Tuvalu?
- Which other countries is it close to?
- What is its capital city called?
- What is the highest point on Tuvalu?
- What latitude is it on?
- How big is Tuvalu?
- Who is Tuvalu's current prime minister?
- How big is the population of Tuvalu?
- How many coral atolls make up Tuvalu?
- What does the name Tuvalu mean?
- What are the four main industries on the island?
- How is climate change affecting Tuvalu?

Now write a second article explaining how climate change is affecting Tuvalu. It will help you if you answer the questions below in your article - these will help you build up a clear picture of what is happening. You can answer the questions by following the weblinks.

<http://www.tuvaluaislands.com/news/archives/2006/2006-05-26.htm>

'Sinking situation scary, says Prime Minister'

<http://www.tuvaluaislands.com/news/archives/2006/2006-03-04.htm>

High tides flood Funafuti

http://www.wwfpacific.org.fj/what_we_do/climate_change/impacts_on_pacific.cfm

How does climate change impact on lives in the Pacific?

Why is Tuvalu at risk from climate change?

What signs are there that this is already happening?

Give one example taken from something you have read on the internet about Tuvalu. Don't forget to put where and when it happened. For example, the Prime Minister says land where he fished as a child is now underwater.

What are the problems which will be caused by a rise in sea levels, for both the islands themselves and for the islanders?

Student Challenge 1

Rising Seas: Disappearing Tuvalu



GEOGRAPHY KS3

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Immigration and climate change

The population of Tuvalu is an example of what are now being called 'climate change refugees' – people who are forced to leave their homes because climate change has made them uninhabitable.

Write a speech explaining the plight of Tuvalu's people to the Australian Government . Explain why they need to be allowed to go and live in Australia. Read the article on the weblink below and answer the following questions.

<http://news.bbc.co.uk/2/hi/science/nature/1581457.stm>

- What is happening to the Tuvalu Islands?
- What will happen to the people who live there?
- Which country has offered to accept a quota of Tuvalun refugees?
- Which country has said it will not allow islanders from Tuvalu to move there?
- Which other country does Mr. Laupepa, quoted in the article, criticise?
- Why?



Student Challenge 2

Rising Seas: Tuvalu and the UK



GEOGRAPHY KS3

CLIMATE LAB

Could what is happening in Tuvalu ever happen in the UK?

As we know, the tiny country of Tuvalu in the Pacific is sinking. Climate change - and specifically the rising of our oceans - is being blamed.

But what are the similarities between Tuvalu and the UK? We, too are a group of islands. Could we ever face the same situation as Tuvalu?

Do we have a problem with sea level rise?

At the moment, the UK is not in danger of disappearing in the same way as Tuvalu. However, this does not mean we don't have our own problem with sea level rise. On the night of January 31st 1953, a storm surge in the north sea resulted in severe flooding on the coasts of England and the Netherlands, killing over 2000 people.



Because the UK is a comparatively rich country, sea defences - large structures designed to prevent water from rushing inland - were put in place to prevent such a tragedy occurring again.

But we now know that due to climate change, sea levels are rising, meaning there is a renewed risk of a major flood from a storm such as that which occurred in January 1953. Another problem is that the sea defences built after the flood are nearing the end of their lives. Because people felt protected by the defences, they have built heavily on the coastline where the flood occurred - so if such a storm occurs again, the consequences could be much worse.

What would happen to your local area if there was a storm surge such as the one in 1953?

Write a web report detailing the effect a similar storm surge today would have on local people and businesses.

Follow this link to the Friends Of The Earth website. It explains that because of accelerated global warming, sea levels could potentially rise by five metres.

http://www.foe.co.uk/resource/press_releases/potential_sea_level_rise_w_19092006.html

This is a worst case scenario. It is unlikely the sea will rise around the UK by five metres in our lifetime. But what would happen if it did?

If the sea level rose and there was a violent storm, imagine what would happen to your area.