



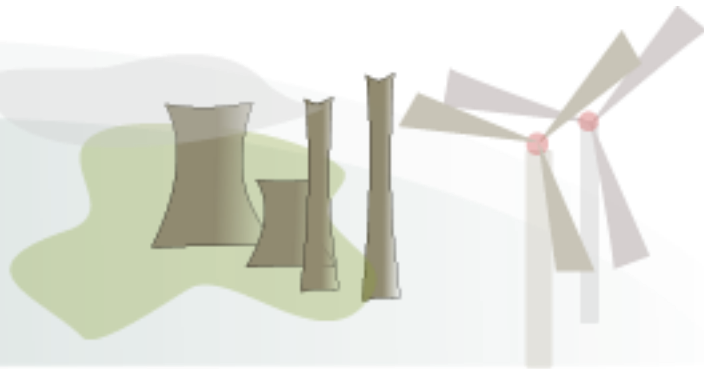
## Climate Change - Resources

Thank you for downloading this Climate Change resource from the *GeoBus* website.

This resource pack was developed in partnership with [Dr James Rae](#) of the School of Earth & Environmental Sciences, University of St Andrews. Special thanks are due to Rasa Juras and Dr Rosanna Greenop for their involvement.

The development of this resource would not have been possible without the generous support of the *GeoBus* sponsors, which we gratefully acknowledge.





### Overview

Activity Description	The influence of melting ice on sea-level will be explored and experimentally demonstrated.
Time	40-50minutes
Learning Outcomes	<ul style="list-style-type: none"><li>• Learn about how climate change will impact sea-level</li><li>• Understand the impact of melting land vs sea ice</li><li>• Explore how different topographies may affect ice-melt</li></ul>
Student Organisation	Groups (discussion)
Materials Needed	Sea Level Rise student worksheet one per group Sea Level Rise experiment resources (see below)
Other resources	This material was developed from an Andrill teaching resource at: <a href="http://cleanet.org/resources/42700.html">http://cleanet.org/resources/42700.html</a>

### Background information

The area covered by sea ice in the Arctic Ocean has been shrinking. For many decades, more sea ice has melted away during summers than has reformed during winters. Projections show that the ocean around the North Pole could be ice-free during summers as early as the year 2030!

Antarctica has ice sheets on land, floating ice shelves, and sea ice surrounding it.

The ice sheet on Greenland is also shrinking. Over the past 30 years, the total area of the Greenland ice sheet affected by summer melting has grown.

### Talking Points

How the melting of this sea ice— an area larger than the country of India — might affect the rest of the world?

How would the melting of land ice affect the rest of the world?

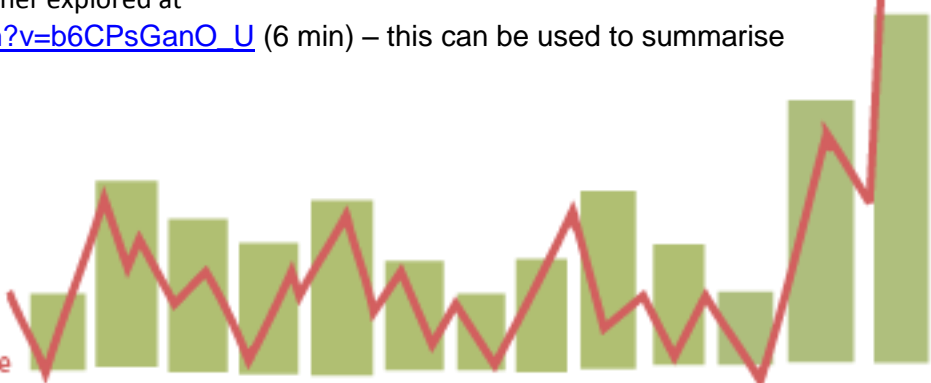
What effect might the melting of Greenland's ice sheet have on the rest of the world?

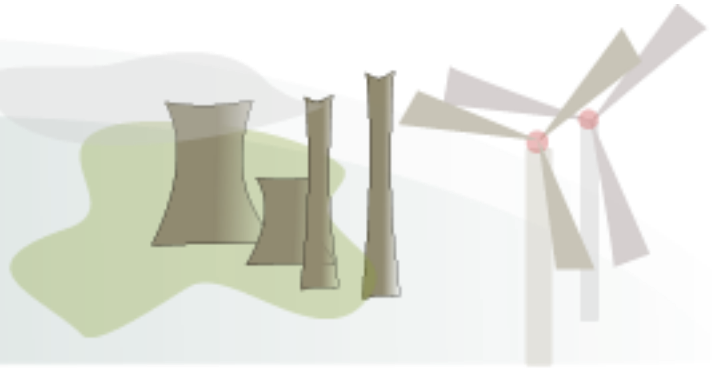
Show the sea level rise video (1 min) at

[http://climate.nasa.gov/climate\\_resource\\_center/earthminute](http://climate.nasa.gov/climate_resource_center/earthminute) to motivate discussion.

The impacts of melting ice are further explored at

[https://www.youtube.com/watch?v=b6CPsGanO\\_U](https://www.youtube.com/watch?v=b6CPsGanO_U) (6 min) – this can be used to summarise at the end





### Classroom Activity

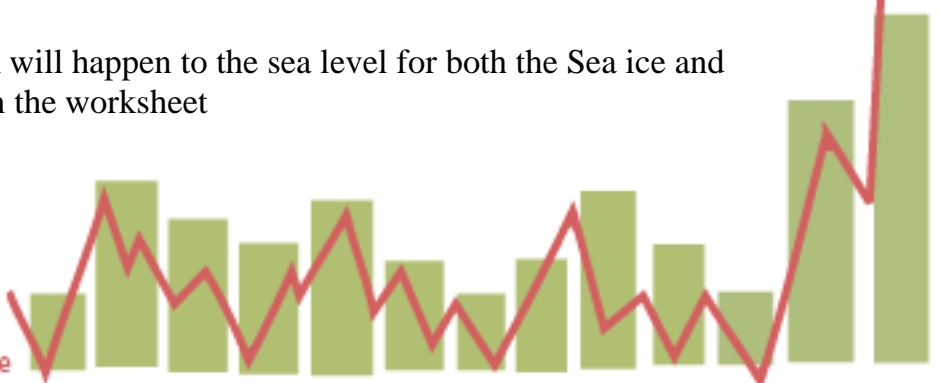
In this activity, you'll make two models that are identical except for one factor: one will have ice on "land" and the other will have ice in the "sea." You'll compare how melting ice affects each model.

#### What you need:

- Transparent plastic food container, about 8" x 6" x 2" (2)
- 2 cups of Gravel ( you can also use Plasticine)
- 2 different coloured white board markers
- Ice
- Warm Water
- Ruler

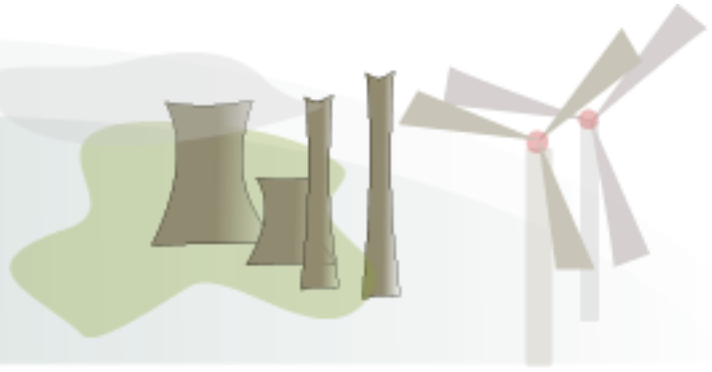
#### Method:

1. Put a label on the outside of each of the two rectangular containers. Write "Ice on Land" on one container and "Ice in Water" on the other.
2. Pour 1 cup of gravel into each container. Tilt and shake each container gently so the gravel is piled in one end to form the "land."
3. Gently pour 1 1/2 cups of water into each container. Make sure that the water doesn't cover the surface of the gravel.
4. In the Ice on Land container, place one of the pieces of ice on top of the gravel. No part of the ice should be in the water.
5. In the Ice in Water container, put the piece of ice in the water, so no part of it is supported by the gravel.
6. On the outside of each container, mark the water level, using an overhead-transparency marker.
7. Predict what you think will happen to the sea level for both the Sea ice and Land ice - note this on the worksheet



## Climate Change - Impacts

### Sea Level Rise



8. Measure from the table the height of the water container and the area covered in ice. Set the timer and every 3 minutes record the water height and ice coverage.
9. After 30 minutes using a different coloured marker make on the new water level.



#### 🔊 Talking Points

When ice that is floating in the ocean melts, sea level does not change. This applies to all floating ice, including sea ice and ice shelves: the floating ice is displacing its own volume already. This is also why melting ice cubes in drinks don't make the drinks spill when they melt.

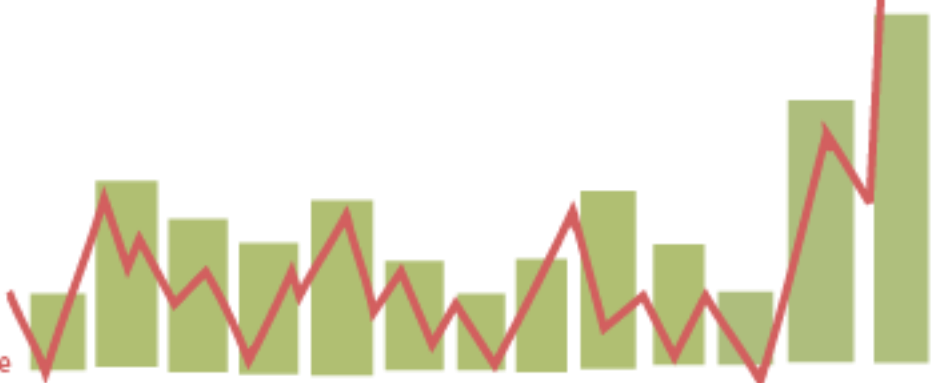
When ice that is on land melts and runs into the sea, additional water is being added to the ocean, so sea level rises.

What do the different parts of the model represent in the real world?  
In the model, what is the significance of the water level?

Imagine a flat beach area with roads, houses, and shops just beyond the sand. Now imagine how rising sea levels would affect your mental picture. Describe what might happen in your scene year after year as sea levels rise and water covers more of the land.

Explore recent changes in ice with the interactive images at:  
<http://climate.nasa.gov/interactives/global-ice-viewer/#/>. These could also be used as a homework exercise.

Use the following video to recap on the impacts of melting ice. It also introduces some other impacts of climate change that will be discussed more in future lessons  
[https://www.youtube.com/watch?v=b6CPsGanO\\_U](https://www.youtube.com/watch?v=b6CPsGanO_U)



## Climate Change - Impacts

### Sea Level Rise



#### Classroom Activity

By 2100 Sea level is predicted to have risen by 1m.

You can see the impact of sea level rise on some specific regions using the interactive at [http://climate.nasa.gov/climate\\_resource\\_center/interactives](http://climate.nasa.gov/climate_resource_center/interactives)

Or

<http://geology.com/sea-level-rise/netherlands.shtml>

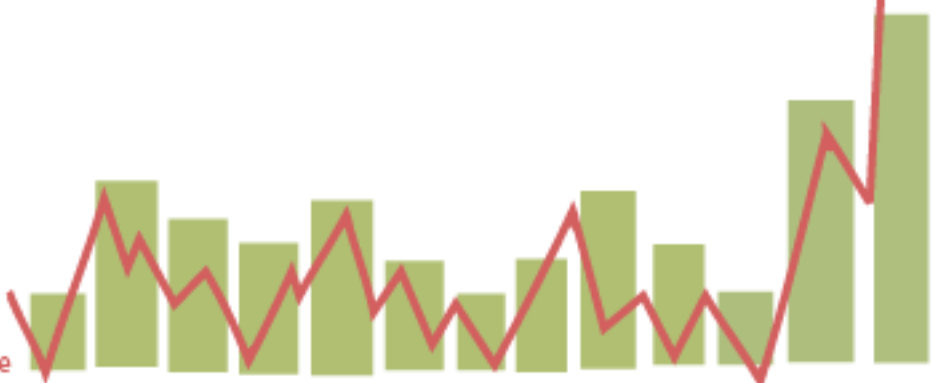
Design a poster highlighting areas either within the UK or across the world that are at risk due to sea level rise.



#### Classroom Extensions

Variations on the sea level rise experiment:

- You can vary the activity above by adding houses and roads to the land and mapping what happens to them
- Change the water temperature or add a heat lamp to examine the rate of ice melt as sea vs air temperatures rise
- Simulate the West Antarctic ice sheet by creating land ice in a depression that allows more interaction with water





## Land Ice vs Sea Ice

### Hypothesis

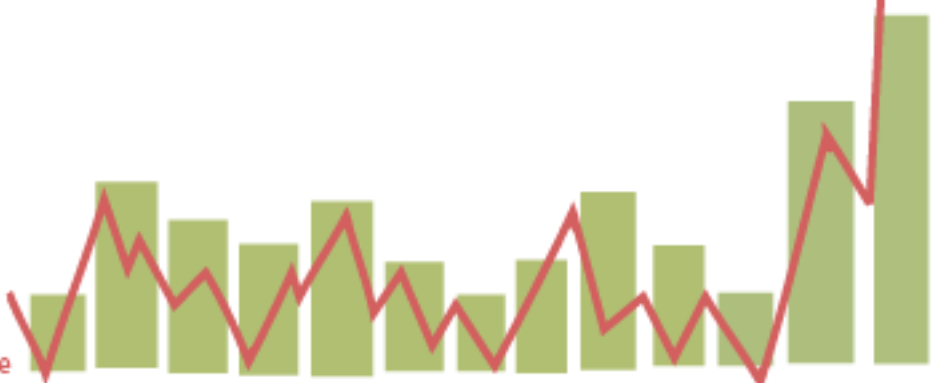
In the space below write a sentence describing what you think will happen to sea level in both containers

Land Ice \_\_\_\_\_  
\_\_\_\_\_

Sea Ice \_\_\_\_\_  
\_\_\_\_\_

### Results table

Time (minutes)	Land Ice		Sea Ice	
	Sea-level rise (mm)	Ice cover area (cm <sup>2</sup> )	Sea-level rise (mm)	Ice cover area (cm <sup>2</sup> )
0				
3				
6				
9				
12				
15				
18				
21				
24				
27				
30				



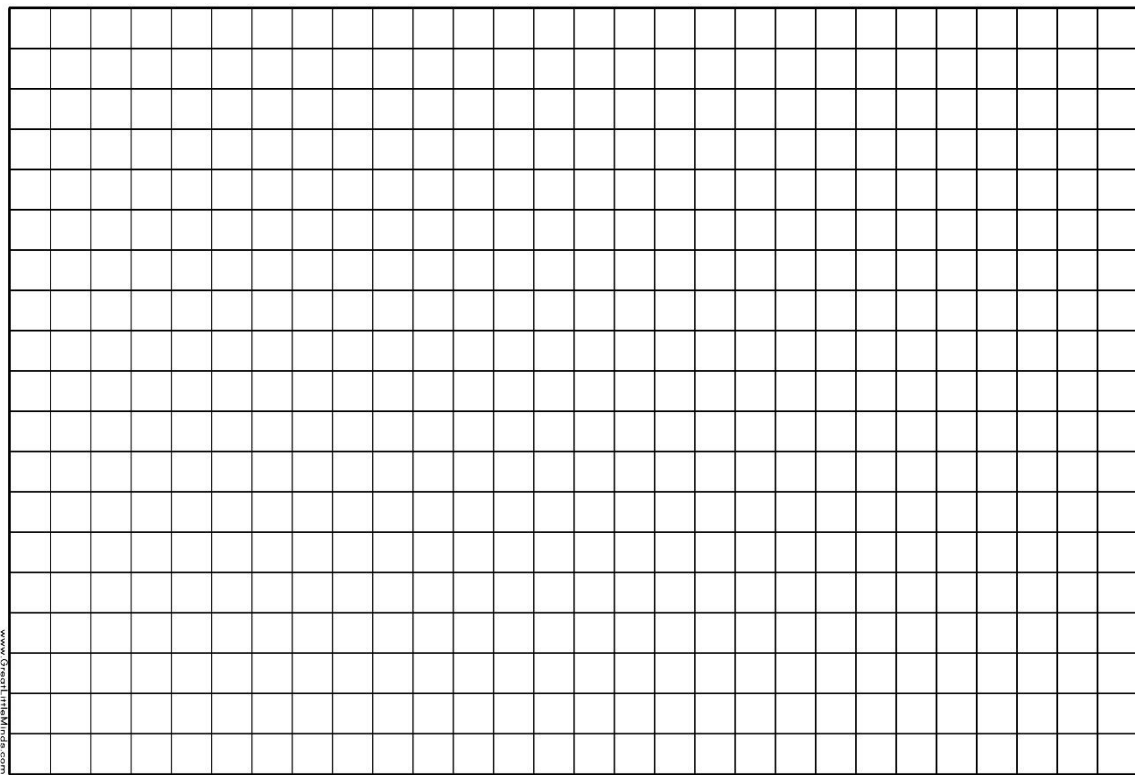
# Sea Level Rise Student Worksheet



## Result Graph

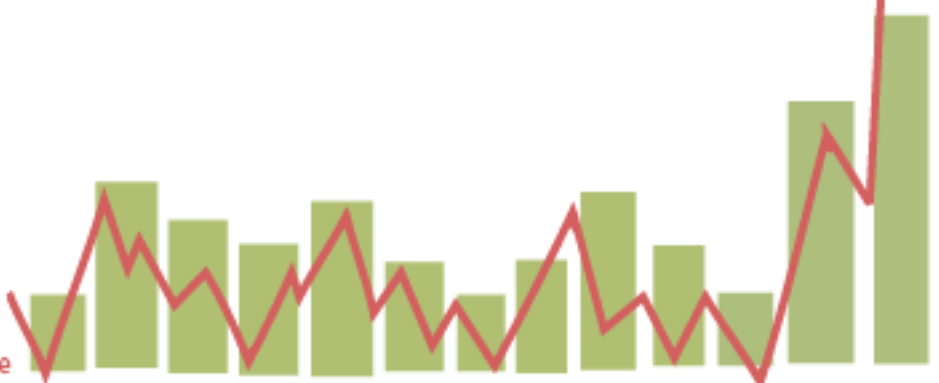
Plot your data recorded in your table on the graph. Choose an appropriate scale. Use 2 different colours to plot data for each container

Sea-level rise (mm)



- Land Ice
- Sea Ice

Time (mins)



# Sea Level Rise Student Worksheet



## Conclusion

Write a sentence describing your results. Remember to include;

- Does the sea-level increase or decrease over time?
- Was the rate of sea-level change constant or varied?

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