

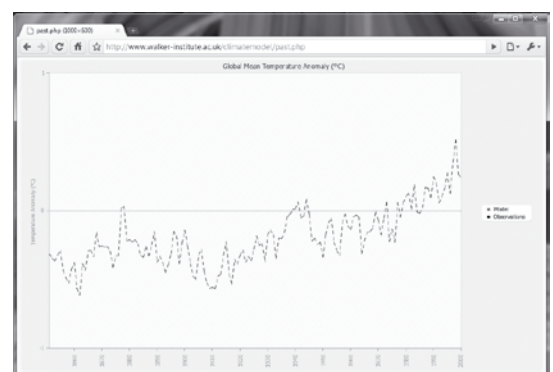
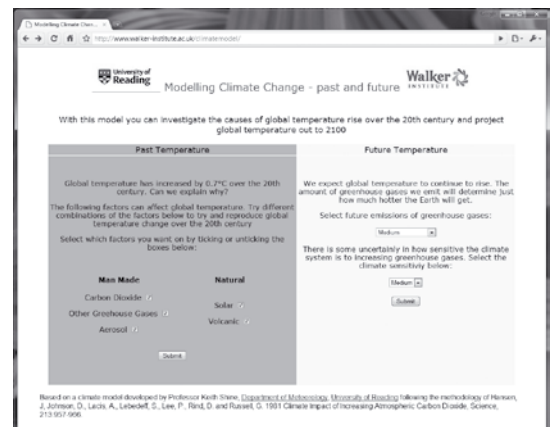
MODELLING CLIMATE CHANGE: GLOBAL TEMPERATURE CHANGE MODEL

We have seen global temperature rise by almost 1 °C over the 20th century. A number of things cause the climate to change, some natural and some due to human activities. These are known as *forcing factors*.

In this activity you will use a web-based model to investigate the effect of forcing factors on past climate and to predict future climate.

Task A Understanding the past

1. Open your web browser and go to:
www.walker-institute.ac.uk/climatemodel.
First look at the section 'Past temperature'.
The model allows you to look at the effect of *forcing factors* (i.e. factors that cause the climate to change) on past climate.
2. Uncheck all the man-made and natural forcing factor boxes. Click 'Submit'.
3. The graph produced shows a plot of 'annual global temperature anomalies'. These are the deviations from the long-term mean global temperature. Look at the observed data – how has temperature changed over the 20th century? Look at the 'model' plot – what does this look like?
4. Now repeat, checking each man-made and natural forcing factor in turn to investigate how they have affected temperature. How have volcanic eruptions affected temperature? How has increasing carbon dioxide affected temperature?
5. Combine different forcing factors to get the best match with the observed temperatures. Which combination of factors gives the best fit? What does this tell you about the causes of temperature change over the 20th century?



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Task B Predicting the future

6. Go back to the home page, and look at the section 'Future temperature'.
- To calculate what might happen to the temperature in the future we must make assumptions about the quantity of greenhouse gases being emitted into the atmosphere. The model lets you select different *scenarios* representing different levels of emissions.
7. Set the scenario to low and climate sensitivity to medium, and click 'Submit'. The model produces a graph showing the predicted temperature change. Read off the value of the temperature change in 2100 and record it in a table similar to the one shown here.
8. Repeat, setting the scenario to medium and then to high, keeping the climate sensitivity set to medium each time. Record the values in your table.
- Climate sensitivity* is a measure of how sensitive the climate system is to change. Scientists don't know the climate sensitivity precisely. It is another important source of uncertainty.
9. Try changing the value of climate sensitivity. What happens to temperature as you change the climate sensitivity from low to high? Record the temperature change in 2100 in your table.
10. How much will temperature change by 2100? What do your results tell you about uncertainty in future global temperature change?
11. All models have limits. Can you think of things that this model does not tell us about future climate?

Future emissions scenario	Climate sensitivity	Temperature change by 2100 (°C)
Low emissions	low	
	medium	
	high	
Medium emissions	low	
	medium	
	high	
High emissions	low	
	medium	
	high	