



## Climate Zones

### Background Information:

Our planet has several climatic zones; their classification is based on the temperature and precipitation over the seasons. At CFE level 3 the climatic zones can be simplified into:

- Polar and Mountains - very cold and dry all year
- Cool Temperate - cold winters and mild summers
- Warm Temperate - mild winters, dry hot summers
- Arid or Desert - dry, hot all year
- Tropical - hot and wet all year

The climate of an area is affected by several factors: latitude, terrain, altitude and proximity to water. Pupils should be able to name certain weather phenomena that are common to different climate zones (e.g. Tornadoes, Hurricanes etc)

### Experiences and Outcomes:

I can investigate the relationship between climate and weather to be able to understand the causes of weather patterns within a selected climate zone

SOC 3-12a

I can explain some of the processes which contribute to climate change and discuss the possible impact of atmospheric change on the survival of living things.

SCN 3-05b

### Transferable Skills:

Communicating  
Data analysis  
Modelling difficult concepts  
Working in a team

Taking accurate measurements  
Reading scales  
Active listening

### Materials:

Coloured pencils  
Thermochromic paper  
Card (black and white)

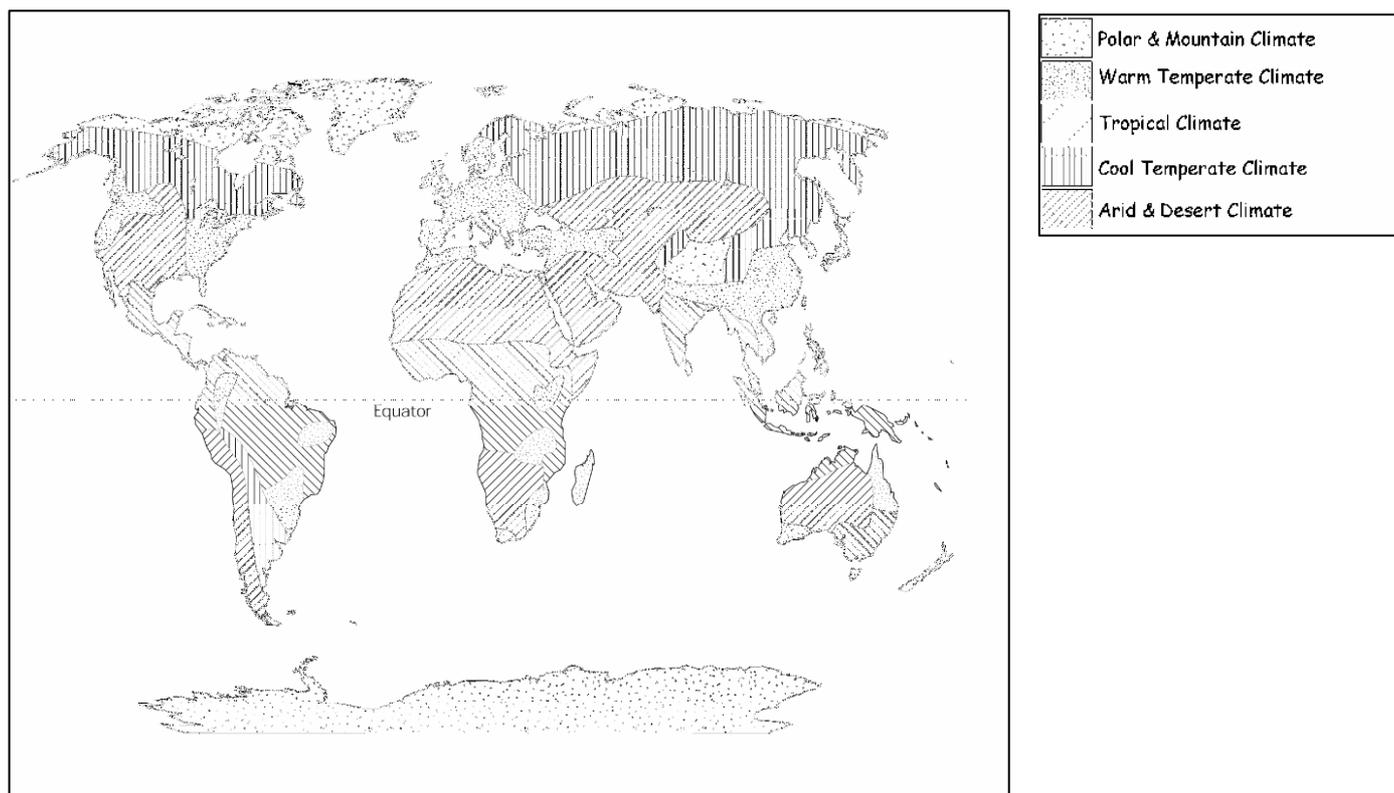
Plasticine (white, blue, green and black)  
A small ball  
A heat lamp

### Suggested activities:

Recap the difference between *weather* and *climate* refer to the activities suggested in Weather and Climate - Part 1 if necessary.

Discuss the idea of different regions of the world experiencing different climates. Make a mind map using ideas from pupils about climate zones and the factors that may affect the climate of a region.

Colour in the climate map and colour it in according to the key.



N.B. Pupils may find the subsequent tasks easier if a logical colouring code is used like the one shown. Where hotter regions are highlighted in warm colours and cooler regions in cool colours, for simplicity the polar & mountain climate zones can stay white.



With the map coloured pupils should look for patterns in the locations of the climate zone. Start by looking at the proximity to the equator and altitude with younger pupils.

Explain that climate is in part affected by the absorption of heat from the sun. Different objects absorb heat at different rates (water is slower to heat and cool, land is much faster).

## Suggested activities: (continued)

### Carbon Dioxide and Heat absorption

You will need: 2 balloons - these should be the same colour  
Carbon dioxide  
Heat lamp

Method: Fill one balloon with carbon dioxide and the other with normal air. They should be about the same size.

Shine the heat lamp on the balloons for a few minutes.

Feel the difference in temperature between the two balloons.

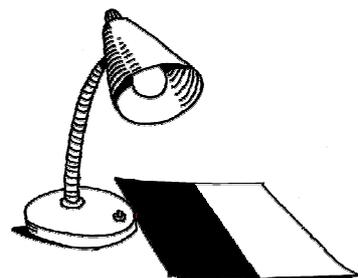
Results: The balloon filled with carbon dioxide will be much warmer. Carbon dioxide is a 'greenhouse gas', which is very good at absorbing heat. The Earth is like a heat lamp, radiating heat from the surface into the atmosphere. Ask the class to think about what would happen if there were more carbon dioxide in the atmosphere. Other greenhouse gases include methane and water vapour. Where do these gases come from?

You could expand on this activity by using different colour balloons, or by covering the balloons with materials/paints/foil etc.

The surface of a material affects the amount of radiation that can be absorbed e.g. from the sun. Introduce this concept by talking about dark objects heating up more than light objects on a hot day: black cars getting too hot in the summer, houses are painted white in hot countries etc

### Absorption of heat

You will need: Thermo-chromic Paper  
White and black card  
Heat lamp



Method: Cut two strips of card and glue them to the back of the Thermo-chromic paper. Shine the heat lamp on the back of the paper (the side with the black/white) for a few minutes.

Turn the paper over and examine the Thermo-chromic side

Results: The paper covered by the darker card areas should be much hotter than the side covered by the white card.

You could expand on this activity by using different materials/paints/foil etc.

In small groups carry out the following activities:

[Note: Mix some black with the green plasticine to make a dark green that gives really good results]

### Modelling the Earth

You will need: blue plasticine  
a small ball  
a heat lamp

Method: Make a model of the earth by covering a small ball with plasticine.

Put the heat lamp a fair distance away from the ball - maybe 1m.

Shine the heat lamp on the plasticine for a few minutes.

Feel the difference in temperature between the 'equator' and the 'poles'.

Results: The areas of the ball facing the lamp should feel much warmer than the areas pointing away - either the 'poles' or the 'night' side of the ball.

When the surface of the Earth isn't at right angles to the Sun, the Sun's energy is spread over a wider area and it doesn't heat up as much. This is the cause of much of the Earth's weather. As the Earth orbits around the Sun, the Sun moves from being at right angles to the Tropic of Cancer to be overhead at the Tropic of Capricorn. This gives us seasons.

### Modelling the Earth

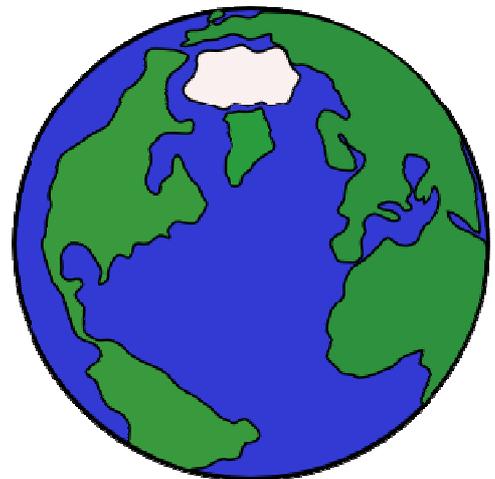
You will need: white, blue and dark green plasticine  
a small ball  
a sunny day

Method: Make a flat model of the earth by covering a piece of cardboard with white (Polar regions), blue (sea) and dark green (land) plasticine. Leave the map out in the Sun for 10 minutes.

Feel the difference in temperature between the white and dark green areas.

Results: The darker areas should feel much warmer than the white poles.

The colour of the area of land affects the ability to absorb light. Whiter regions (like the poles and mountains) reflect light and darker regions (like vast areas of tropical rainforest) absorb light and get warmer.



Rework the model of the Earth as if the ice caps have melted.

Discuss how the reduction of white reflective surface affects the average temperature of the Earth.

### Extension Ideas:

Investigate the use of reflective paint (<http://www.pulse-denshi.co.jp/english/general/gen001.html>) in small groups debate whether it would be worth painting the roof of everyone's house with this white paint to reflect some of the sun's rays.

Investigate how the weather in one climate zone has had an effect on the way life has evolved. E.g. snakes in cooler regions have dark patches to help absorb heat, meerkats who live in sunny climates have dark circles around their eyes to reduce glare from the sun, polar bears have fur which is incredibly good at keeping them warm etc.

Think about the UK seasons and how the life cycles of plants and animals are affected by them. How might the seasons be different in the Tropics?

## References/Resources:

Climate Zones: (Internet Geography)

<http://www.geography.learnontheinternet.co.uk/topics/climatezones.html>

Climates of the World: (Climate Zones)

<http://www.climate-zone.com/>

Global Climate Maps: (Food and Agriculture Organisation)

<http://www.fao.org/waicent/faoinfo/sustdev/EIdirect/climate/EIsp0054.htm>

Heat Reflection: (Geography for Kids)

<http://www.kidsgeo.com/geography-for-kids/0067-heat-reflection.php>

Extreme Weather: (Our Dynamic Earth)

<http://www.dynamicearth.co.uk/kids/scienceexplored/Weather/ExtremeWeather>

Climate Zones Map:



-  Polar & Mountain Climate
-  Warm Temperate Climate
-  Tropical Climate
-  Cool Temperate Climate
-  Arid & Desert Climate