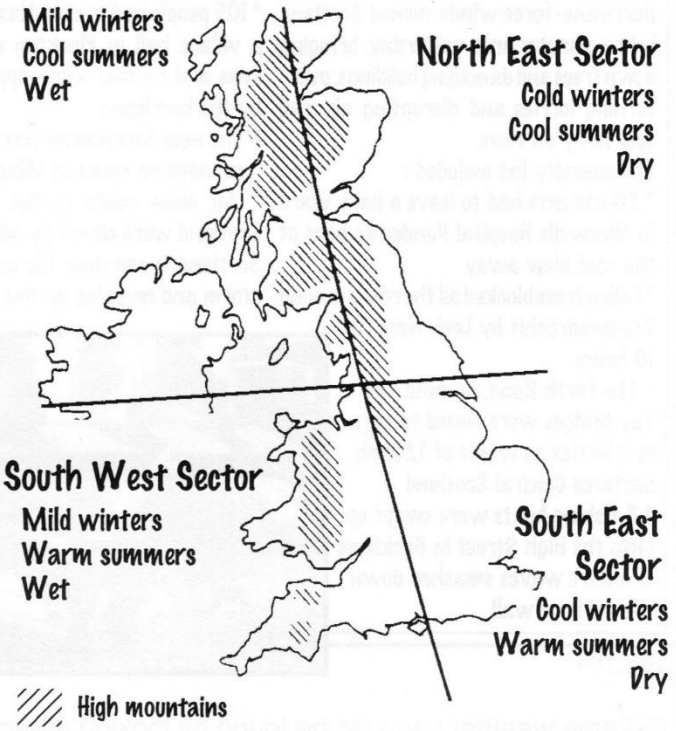
# CLIMATE

**Climate** is the average pattern of weather of a place, measured over 35 years. Depending on which part of Britain you live in, the average weather (or climate) will be different (fig.106).
If you live in the North East, winters, on average, will be cold and summers cool. It will likely be dry most of the year. If you live in the South West, winters are more likely to be mild with summers warm. It will also tend to be wet all year round.

There are many different types of climate in different areas around the world (fig.108). These have a big effect on the living things found there. World climates can be sorted or classified into many different types depending on how far they are from the Equator, whether they lie on the coast, inland and how high above sea-level they are. **Continental climates** are found inland. These are climates where there is a large difference between winter and summer. **Temperate** types of climate, such as that of Britain, are those found where there is little difference between winter and summer. **Monsoon** areas experience a change of wind direction which brings either a hot, wet or cool, dry season.

## Britain's Climate

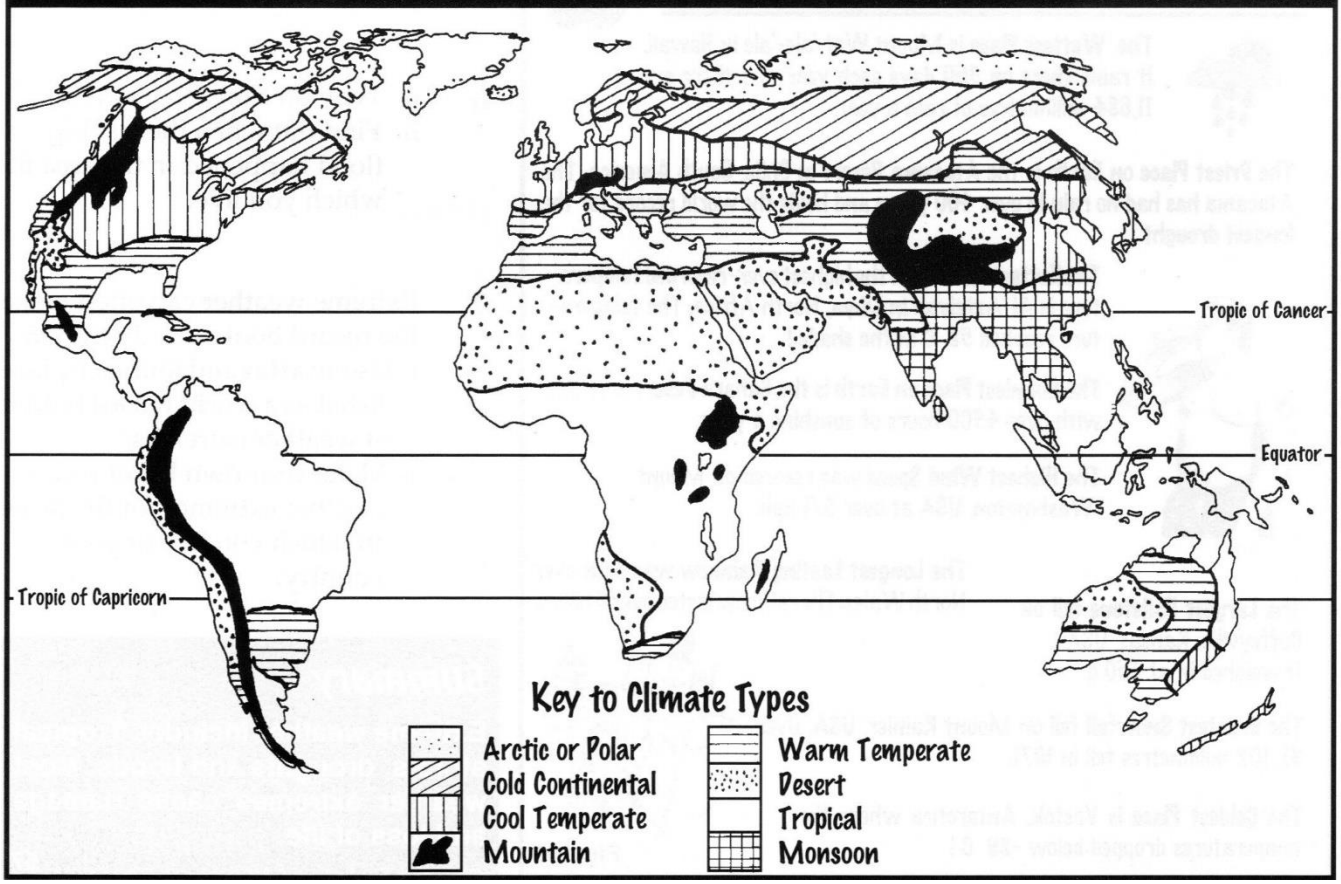
Fig.106




The average pattern of weather over Britain gives us a Cool Temperate type of climate.

## World Climate Types

Fig.107



# Climate and Living Things

Fig.108

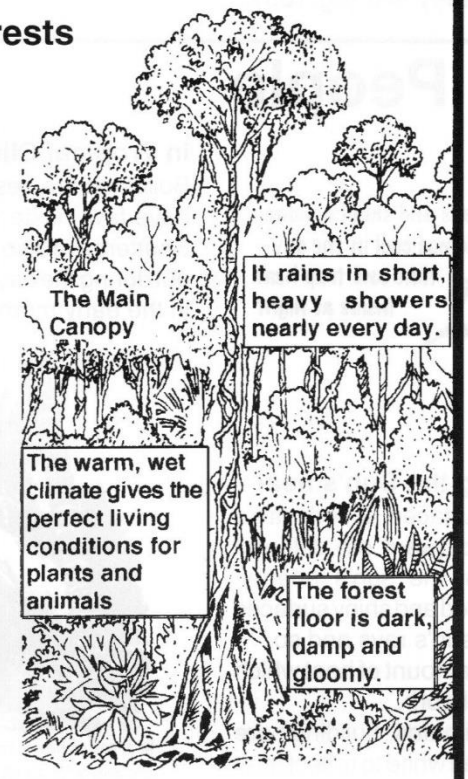
Plants and animals are found all over the world. They have adapted to the climate of each area. There are few species of living things where the climate is harshest such as at the Poles. More species of living things are found in warm, wet, tropical areas of the world.

## Life in Tropical Rainforests

Tropical Rainforests are found near the Equator where there is over 2,000mm of precipitation per year. It is always hot in the rainforest areas as they receive the most direct rays of the sun.

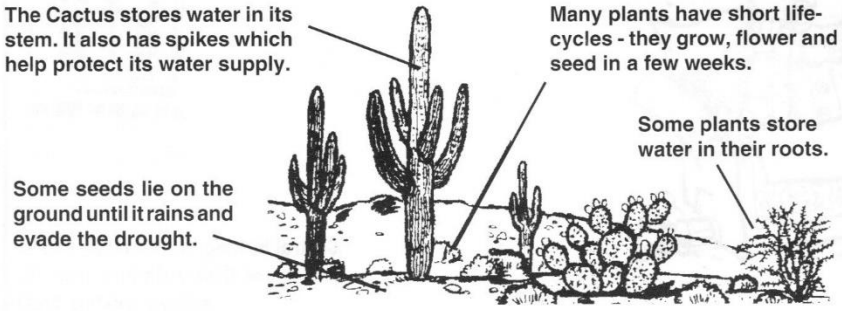
The Tropical Rainforests have no winter. Plants can grow from seed, flower and fruit at any time during the year. They are always green. The plants such as the giant trees and flowers provide food for millions of different creatures.

Over half of all the living things on Earth live in the Tropical Rainforests



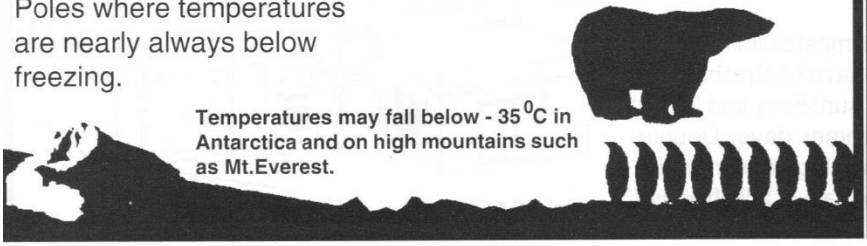

## Life in Deserts

Deserts are areas of the world which have less than 250mm of precipitation per year. In **Hot Deserts**, the day time temperatures are often very high, over 25$^0$C. But at night the cloudless skies allow the heat to escape and temperatures can fall below freezing. The lack of water also causes problems for living things which have had to develop ways of surviving the great heat and long drought.




## Life in the Deep Freeze

There are very few plants or animals that live near the Poles where temperatures are nearly always below freezing.




# Climate Tasks

**1** i. What is **climate** ?
ii. What is the **difference** between weather and climate ?
iii. How are world climates sorted or **classified** ?

**2** i. Make your own copy of fig.**106**.
ii. Can you suggest why the West of Britain is wet and the East is dry ? (Hint: look carefully at where the mountains are)

**3a** Look at fig.**108** - the World Map of Climates.
Copy out then match each of the following sentences below with the correct **climate type**.
(hint: look at the map **key**).

① Very cold and dry with strong winds. Summer temps may reach 10$^0$C.

② Less than 250mm per year; very hot and dry climate.

③ Change of winds brings either a hot, wet or a cool, dry season.

④ Hot wet climates. Temperatures over 28$^0$C.

⑤ Mild, wet winters and hot, dry summers. Winter temps. 5 - 10$^0$C and over 22$^0$C in summer.

⑥ Warm summers and cold winters with rain all year.

⑦ Very long, cold winters and short, cool summers. Temps in winter as low as - 25$^0$C and 15$^0$C in summer.

⑧ Temperature and precipitation depend on height above sea-level.

**3b** Which type of climate has **Britain** ?

**4** Look at fig.**108**.
i. Why are the Tropical Rainforests home to over half of all the **living things** on Planet Earth ?
ii. How do plants and animals survive in **deserts** ?
iii. Copy the **summary** below.

## Summary

**Climate is the average weather of a place, measured over 35 years. There are many different types of climate found around the world. Each climate affects the living things found there.**

1. What is **climate** ? _____

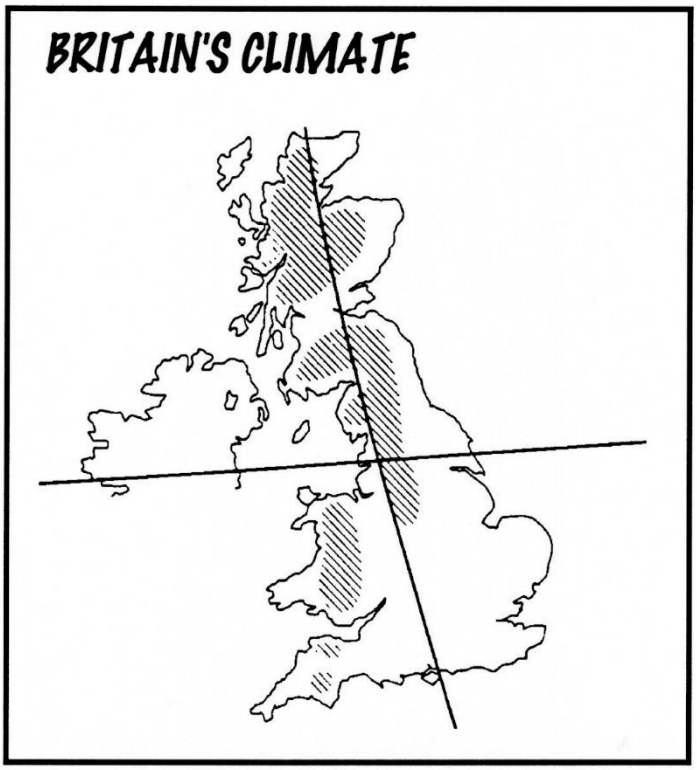
_____

2. What is the difference between **weather** and **climate** ? _____

_____

_____

3. Use figure **106** to help you fill in the missing information about Britain's Climate on the diagram alongside.




4. What type of climate does the area in Britain in which you live have ?

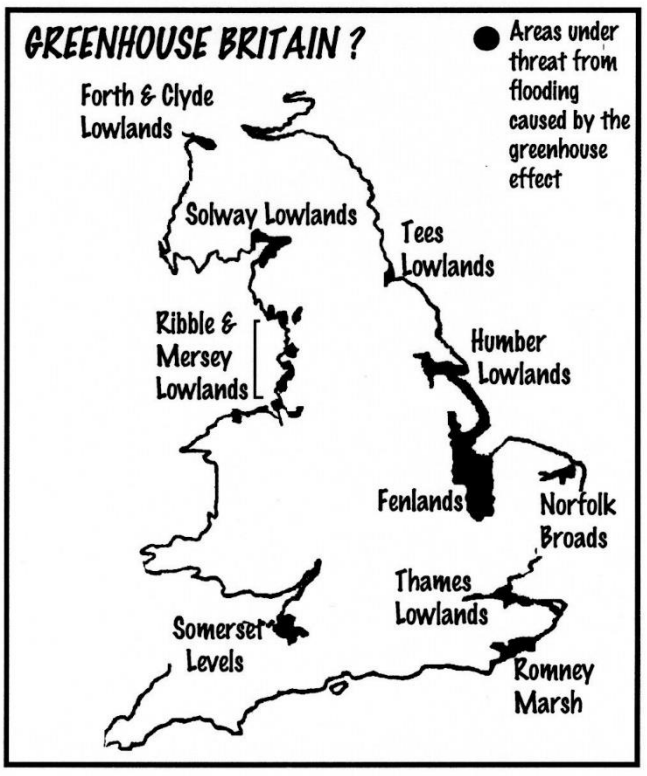
_____

_____

5. What is the name for Britain's climate type ?

_____

The last 10 years have seen several dramatic weather events - the 18 warmest years on record have occurred since 2001, Arctic sea ice has dramatically reduced since 1978, Tropical stoms have been getting more intense in recent years. Are these signs of a changing climate?




6. Write a report on **Changing Climate** in which you present evidence :-

   i. on dramatic weather events in recent years
   ii. about what is causing the problem
   iii. about what problems a changing climate may bring
   iv. on what we should do to help.

   Your report should be about **two** pages long and it should be illustrated (have diagrams, sketches, photos, etc). Give your report a title.

   Use textbooks, **internet** , the school library, newspapers, etc to help you write the report.

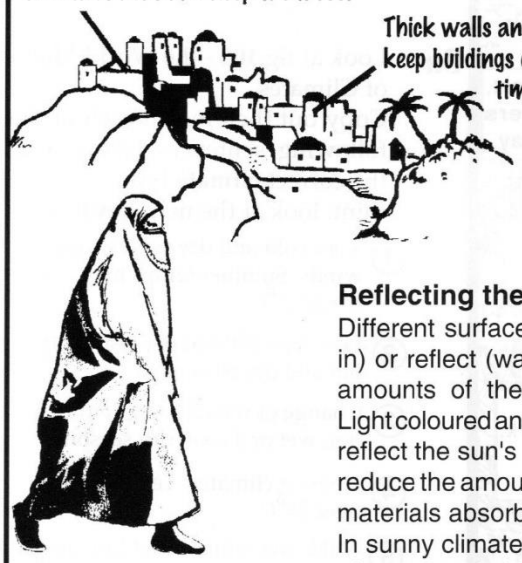
# PEOPLE AND CLIMATE

People live in all the different climates of the world, from the Equator to the Poles. In order to live a comfortable life, especially where the climate is harsh, people have designed their houses, clothes and lifestyles to cope with the climate of the area in which they live (fig.109).

## Buildings and People

Fig.109

In hot climates, buildings are white-washed to reflect heat and keep them cool



Thick walls and small windows keep buildings cool in the day-time and trap heat inside at night

In hot climates people wear long, light coloured clothing to protect them from the heat

### Reflecting the Sun's heat

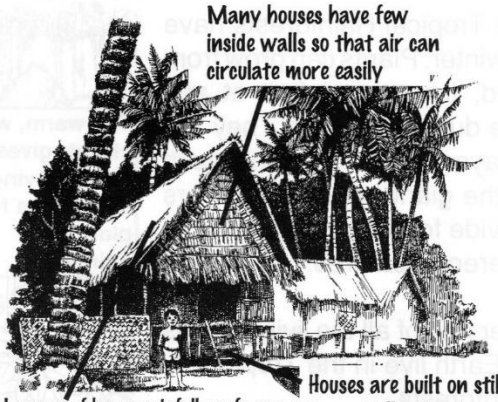
Different surfaces absorb (take in) or reflect (ward off) different amounts of the sun's energy. Light coloured and shiny surfaces reflect the sun's rays and so reduce the amount of heat which materials absorb.

In sunny climates, buildings are often painted white to reflect heat away. People wear light coloured clothing to reduce the amount of heat their bodies receive.

### In Tropical Climates

Buildings are designed for coolness. Most houses have few inside walls to allow the air to circulate. Shutters are also used on windows to keep the heat out during the day. The shutters can then be opened in the early morning or evening to let in cool air.

Many houses have few inside walls so that air can circulate more easily



In areas of heavy rainfall, roofs are built with a steep pitch to let water drain off easily

Houses are built on stilts to avoid flooding in areas of heavy rainfall

### In Cold Climates

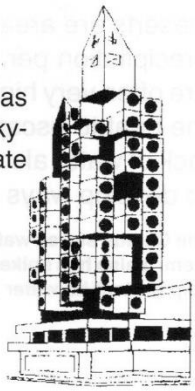
Wind can make the air temperature feel colder than it actually is. This is known as the **Wind Chill** factor.

If the air temperature is 0 $^0$C and a breeze is blowing, the wind chill can make it feel like - 3 $^0$C.

If the wind becomes a strong breeze, the wind chill can make it feel like - 10 $^0$C.

### Very Modern Buildings

Some large buildings such as Shopping Malls and giant Sky-scrapers have their own climate controlled by computers.



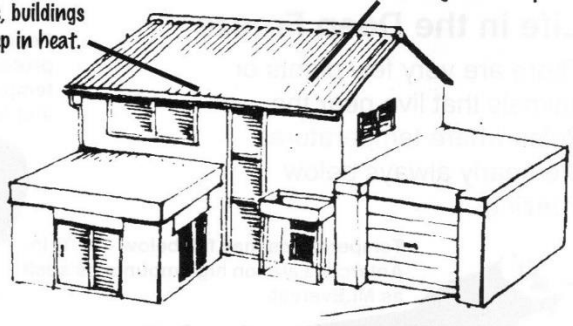
### In Temperate Climates

Most buildings are designed to make life as comfortable as possible.

In temperate climates such as in Britain, most buildings have thick walls to trap heat. Many buildings have central heating. Windows are designed to let in winter sunshine and let out extra heat which builds up during summer days. Double-glazed windows help to keep warmth in during winter months. Pitched roofs allow the rain and snow to drain or fall off easily.

Central heating (no chimney), double-glazing and thick walls help make the building weather proof

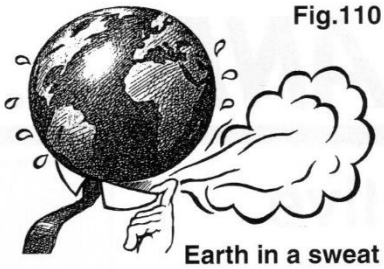
In temperate areas, buildings are designed to keep in heat.



South facing windows allow more sunshine in

# Changing Climates

Fig.110



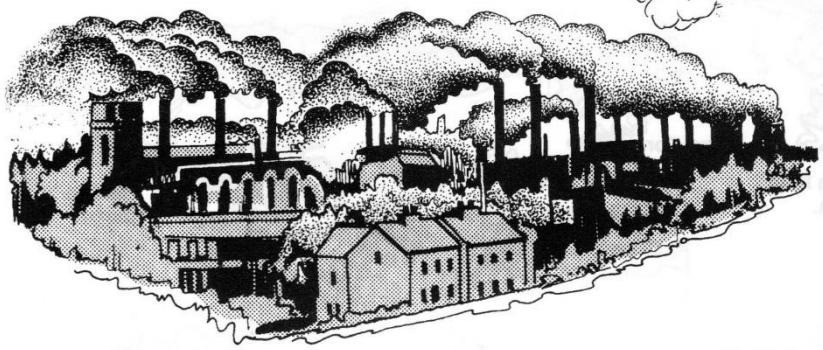
Earth in a sweat ?

Many scientists think that world climates are changing. They think that this is because the weather patterns are being affected by **Global Warming**.
At present, temperatures around the world are rising slowly. There are a number of reasons for this but scientists link it with a rise in the greenhouse gases. This is thought to be due to some of the human activities shown below.

**$CO_2$** is given off as forests are being cleared and burned to make way for farmland and building

The **Greenhouse Effect** is the term used to describe how the Earth is kept warm by heat trapped by gases in the lower atmosphere. Gases such as **Carbon Dioxide** ($CO_2$) and water vapour ($H_2O$) let the sun's rays through but hold back reflected light and heat.

Everything which burns **Fossil Fuels** (coal, gas and oil) - vehicles, power stations, houses and factories - give off **$CO_2$** as they produce power and give off waste gases.



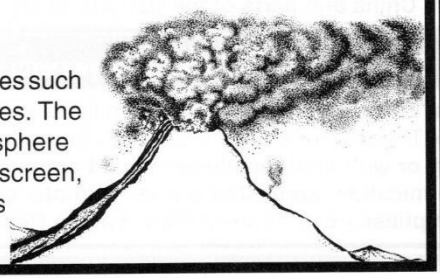
Other gases such as methane, nitrous oxide and **Chlorofluorocarbons** (**CFCs**) are also increasing and adding to the problem of trapping heat in the atmosphere. CFCs are given off by aerosol sprays and old fridges. They are thought to destroy the **Ozone** layer in the atmosphere which can cause skin cancers in sunbathers.

## The Effects of Global Warming

| | |
|---|---|
| **Climate Change** | Major changes all over the Earth - more rain in some areas with much less and drought in others. |
| **Major Flooding** | A hotter planet will lead to the ice caps melting and sea-levels rising causing major flooding all over the Earth. |
| **Death of Life** | Major changes in climate will lead to the death of many plants and animals. Floods may kill millions. |
| **Storms, Soil loss & Skin Cancers** | Global Warming will lead to more storms, fertile soils being washed away and epidemics of skin cancer. |

## Volcanic Eruptions

Scientists think that erupting volcanoes such as Mt.Etna (Italy)affect world climates. The fine dust thrown ino the high atmosphere when a volcano erupts can act as a screen, blocking out some of the sun's rays and causing heavy rainfall.



# People and Climate Tasks

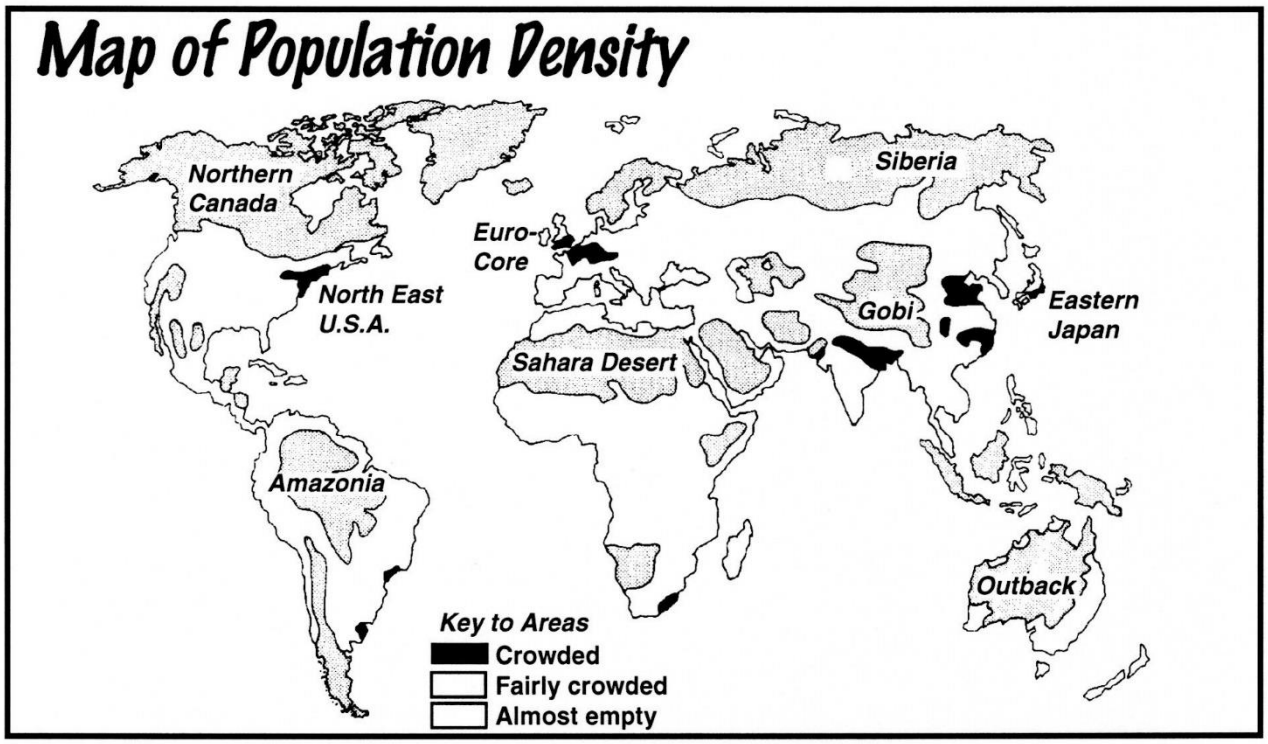
**1** Look back to previous pages before you answer the following -
i. What is **climate** ?
ii. Which are the **harsh** climates ?
iii. Why are they harsh ?

**2** answer the following questions in sentences.
i. What do these **terms** mean ?
**reflect** **absorb**
**wind chill**
ii. For each of the climate types - **Desert, Tropical, Temperate** and **Cold** - give answers to the following questions -
a. Show how **buildings** are designed for the climate - use a sketch in your answer.
b. Explain the ways in which people have designed **clothes** to suit the climate.
c. Is your house well designed for our climate ? Give reasons for your answer.

**3** Look at figure **110**.
i. What is meant by **Global Warming** ?
ii. What are the main **reasons** for Global Warming ?
iii. Which **gases** keep the Earth warm by trapping heat in the atmosphere ?
iv. Which gas destroys **Ozone** ?
v. Draw an **advert** warning the public about each of the **Effects of Global Warming**
vi. What do you think should be done to help stop Global Warming ? Make a list.
vii. How can **volcanoes** change the climate ?


## Summary

**People adapt to their climate by designing houses, clothes and lifestyles to help them cope with the conditions.**
**Human activities are thought to be causing Global Warming which is affecting world climates.**




1. Finish off the above map of **Population Density** by shading in the *Almost Empty* areas on the map in light grey or blue. Remember to shade in the correct key box.

2. Fill in the following table by naming the climate type for each area listed. Use fig.**107** to help you identify the climate types.

| *Area* | *Climate* | *Area* | *Climate* |
|---|---|---|---|
| **Northern Canada** | | **Outback** | |
| **Sahara** | | **Amazonia** | |
| **Eastern Japan** | | **N.E. U.S.A.** | |
| **Gobi** | | **Siberia** | |

3. What is the link between **harsh** climates e.g. that of the Sahara or Siberia and population density ?

_____

_____

4. Write a **report** on the ways in which **people cope with climate** around the world. Your report should be illustrated (have diagrams, sketches, photos, etc) and be at least **two** pages long.

   Your report should consider lifestyles, housing, clothes, foodstuffs, etc. and look at how people **adapt** to their particular climate type.

   Give your report a title and remember to plan the layout carefully before you begin writing.

Scientists believe that world climates are changing. They think that this is because weather patterns are being affected by **Global Warming**. At present temperatures around the planet are rising slowly. There are a number of reasons for this but scientists link it with a rise in greenhouse gases.

**1.** What is the **Greenhouse Effect** ? Use a simple diagram in your answer.

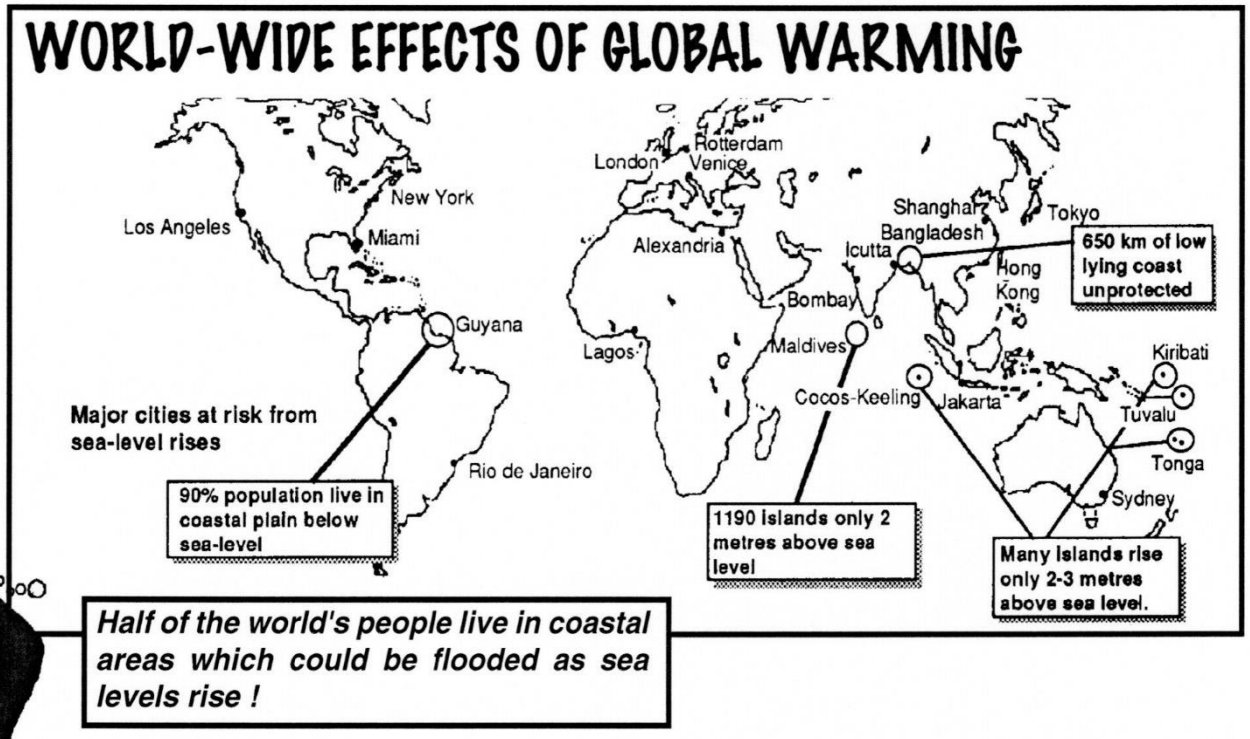
_____

_____

_____

_____

The map below shows some of areas of the world which may be flooded if the Greenhouse Effect continues into next century.




***Half of the world's people live in coastal areas which could be flooded as sea levels rise !***

**2.** Write a report about **Changing Climates** in which you :-

i. Explain what is meant by **Global Warming**.
ii. Give reasons for global warming around the planet
iii. State which gases keep the Earth warm by trapping heat in the atmosphere.
iv. Explain what the effect of global warming will likely be on the planet and its people.
v. Say what you think we should do to solve the problems of global warming
   a. by people on a local level such as in your area
   b. by industries, shops and services
   c. by the governments of the world's countries.

Your report should be about two pages long and have a suitable title.

# DESERTIFICATION

## THE ADVANCE OF THE DESERTS

Fig.1


6 million tonnes of land lost to desert each year.

100 countries, 1 in 5 of the world's population affected

Beginning in 7000bce, the rains in the southern Sahara Desert were frequent and abundant; they replenished ground water and helped vast lakes and swamps in low-lying areas from the Atlantic Ocean to the Nile Basin. Today scientists are studying the change in the sub-Saharan climate to see if it can provide possible clues about the real effects of global warming.

During the wet period more than 6,000years ago the driest area of today's Sahara was inhabited by aquatic animals (shelled protozoa, crustaceans, molluscs, fish). Near the lakes lived herbivores (elephants,giraffes, rhinoceroses, antelopes) as well as carnivores (lions, crocodiles,turtles, snakes). Some humans also inhabited the area which received 30cms ppt. annually. Today the same area receives a maximum of 0.77mm ppt. annually.

Scientists have discovered evidence that around 4,500bce the climate in the Sahara began to deteriorate. An arid climate became dominant between latitudes 23 and 22 degrees North (Fig.2) around 2,500bce. It stretched south to between 20 and 17 degrees North in 1,500bce. Today, the southern limit of the Sahara-Sahel desert region is 17 degrees North.

During 16 wet centuries, the region around 23 degrees North also enjoyed winter rains and received ppt all year round. The fauna of that period and the presence of human settlements indicate that the lakes and swamps produced substantial vegetation. The rest of the Sahara was grassland. Scientists have linked core samples taken from lake and swamp beds to the work of Milutin Milankovitch to show that ice ages and the following periods of warming followed a curve of solar activity linked to astronomical factors that affect the amount of solar energy that reaches the Earth.

To date, climatic variations on the Earth have been natural. Now, humankind is intervening, warming the Earth by increasing emissions of gases such as Carbon dioxide, methane, and nitrous oxide.

The effects of human-made warming will likely occur within a few decades increasing precipitation across much of the Sahara region but too late to prevent the major physical and social effects of advanced desertification.....

## Assignment

Study the information contained on sheets **14 -16** carefully. Answer on a separate sheet.

1. Explain what is meant by **desertification**.

2a. Using Fig.**1** describe the distribution of areas under threat from desertification.
2b. Explain this distribution.

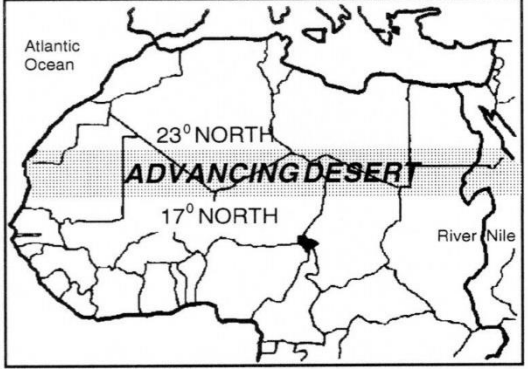
3a. What is the Sahel zone ?
3b. Design and label a diagram to illustrate the advance of desert conditions in areas such as the Sahel zone of Africa.

4. In which ways has the climate of the Saharan region changed ? (Use Fig.**2**)

5. To what extent do you agree with the statement...."it is human misuse of fragile areas such the Sahel zone that is the real cause of desertification..."

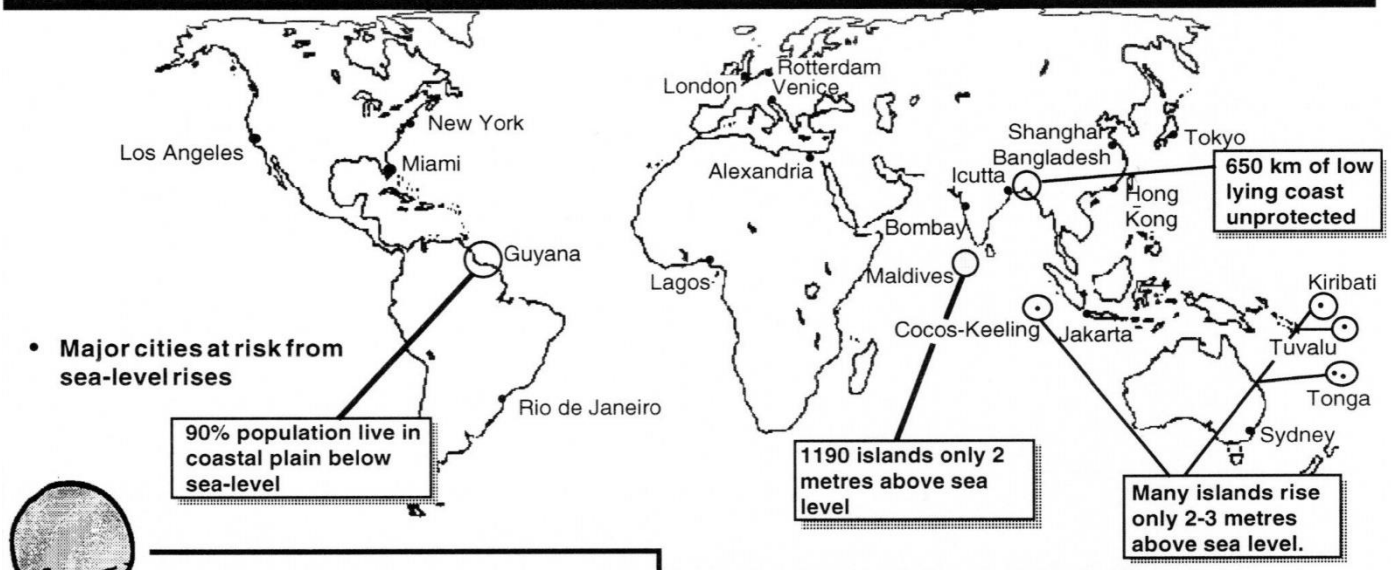
**Fig.2**

## WETTER SAHARA ?



# GREENHOUSE EARTH

## Fig.1 GLOBAL EFFECTS




**Half of humanity lives in coastal regions and is vulnerable to sea level rise**

The Greenhouse Effect will alter the face of the planet more widely than for hundreds of thousands of years. On average, by the mid-2000s, globa temperature is predicted to rise by an estimated 3-5 °C above the level prevailing in previous centuries. This is comparable with the -4 °C change which triggered the onset of the last ice age. While the tropics are likely to see little increase, the temperate zones could witness a rise of 5-7 $^0$C and the poles a vast change of 6-12$^0$ C.

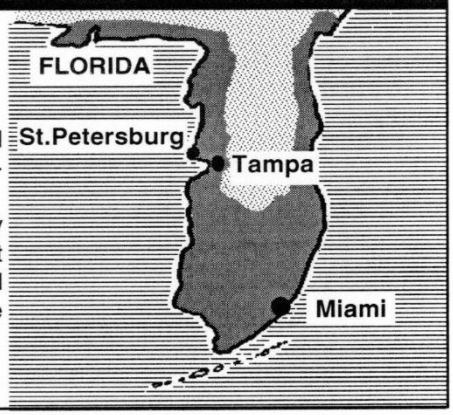
As the temperature zones move away from the Tropics, associated vegetation will follow. With co-operative and concerted effort we may be able to shift our food-growing regions to follow suit; or simply grow other crops in warmer regions. Wild plants may well die out as will their associated communities of animals.

At the same time, sea levels will rise by 0.5 to 1.5metres not due to the melting of the ice-caps and glaciers (this will occur later with far larger sea level rises) but because warmer temperatures will cause the upper layers of the oceans to expand. Coastal megacities (Fig.1) such as Calcutta, Lagos, Shanghai, will start to disappear as will London, Tokyo and Rotterdam. Entire island chains and some coastal nations will be completely submerged

Drought and flooding combined could well lead to 400 million people in developing countries becoming environmental refugees.

## Fig.2 FLOODED FLORIDA

Area permanently flooded (assuming a 3 metre sea-level rise).
This projection is not likely to happen until late next century but follows the old water-flow model for the peninsula.




**Florida** stands to lose 25% of its current land area to greenhouse effects (Fig.2). The US Environmental Protection Agency estimates that projects necessary to protect Florida's coastal areas from a 1 metre rise in sea level will cost $111 billion (at 1990 prices). They also state that there will still be a loss of land area equivalent to the entire state area of Massachusetts. No such solution is available in Bangladesh which lacks space, money and technology to protect its land area and population. Many other Southern nations will also be affected by greenhouse effects - Indonesia, China and Egypt to name but a few.

As the Tropical zone effectively expands polewards, many tropical diseases will migrate to previously temperate zones and into Europe. Many diseases will arrive when human immune systems may have been seriously weakened by increased UV-B radiation and AIDS.

The greenhouse effect will cause radical changes in the North too. Grain belts may require to be shifted northwards while tropical crops may be able to be grown in present day wheatlands.

## Assignment

Write an **essay** entitled

"*The Greenhouse Effect - its consequences and possible solutions.*"