Atmosphere

What is the Atmosphere?

- A blanket of gases surrounding the Earth.
- It is made up of different gases including Nitrogen (78%), Oxygen (21%) and others (1%).
- It is important because it provides the air we need to breathe, absorbs heat from the sun by day, retains heat at night and protects us from harmful rays of the sun.

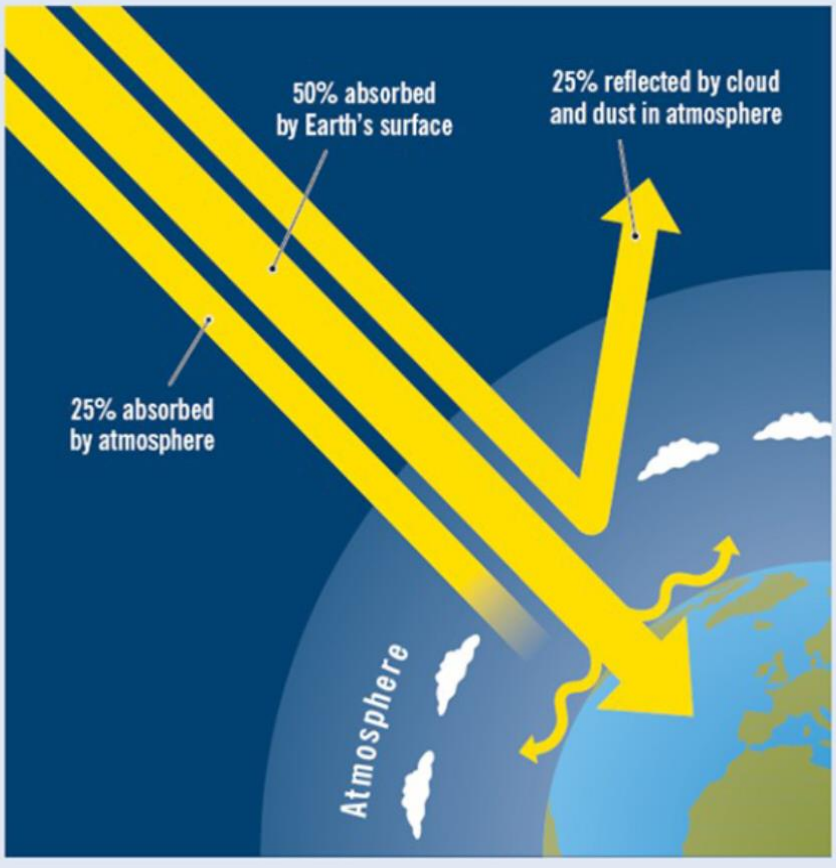
Troposphere

- The troposphere is the bottom layer of the atmosphere.
- 12km thick, 75% of the earth's gasses are found in this layer.

Heat machine

About 50% of the energy produced by the sun passes through the atmosphere and heats the Earth's surface.

About 25% of the energy is absorbed by the atmosphere.



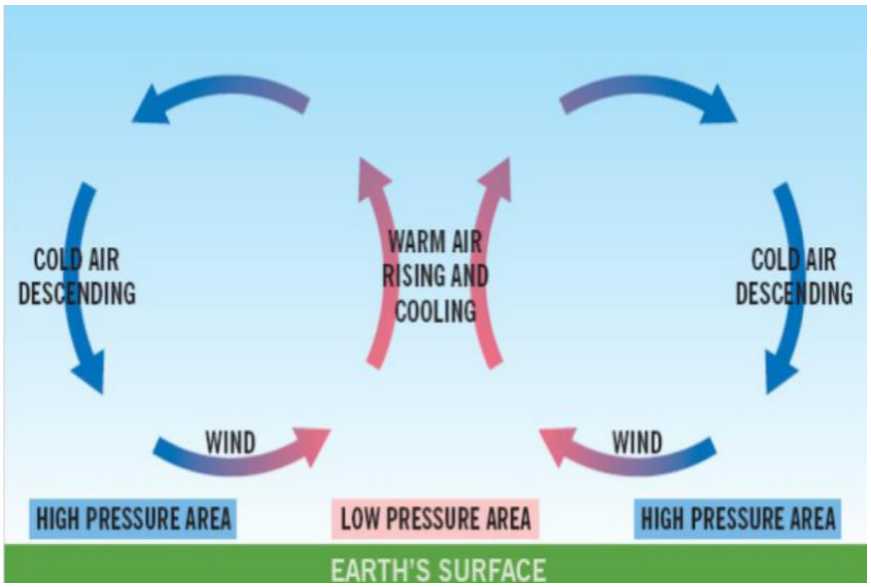
Some of the energy is reflected by clouds and dust in the atmosphere.

Some of the harmful rays are deflected back into space by the ozone layer.

The atmosphere is warmed also by heat reflected from the Earth's surface.

Atmosphere on the move

- The troposphere is always in motion. This moving air is called wind.
- Winds form because the sun heats different parts of Earth unequally.
- When air is heated, it expands and becomes lighter. It rises and creates an area of low atmospheric pressure.
- When air is cooled, it becomes heavier and descends. It presses down on Earth's surface and creates an area of high atmospheric pressure.
- Air moves from high pressure areas to low pressure areas

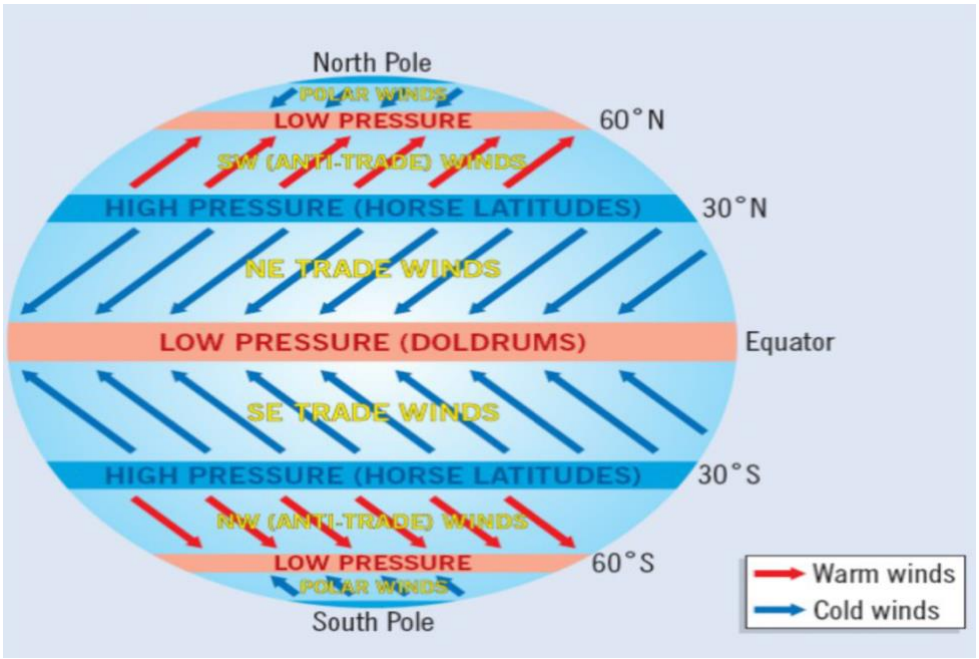


Types of Winds

Winds are named after the direction from which they blow.

- The wind that is most frequent in an area is called the prevailing wind.
- Winds that blow from the equator towards the poles are warm winds.
- Winds that blow from the poles towards the equator are cold winds.

Coriolis Effect



- The Coriolis Effect is the Earth spinning on its axis.
- This is as a result of the winds being deflected at an angle. They are deflected to the right in the Northern Hemisphere and to the left in the Southern Hemisphere.
- Doldrums are areas close to the Equator where wind speeds are very low.
- Trade winds were named as a result of their ability to quickly drive trading ships across the ocean.

Ocean Currents

☐ The heating of the oceans is very unequal due to different latitudes.
☐ Therefore, there are different ocean currents.

Fig 3.12 The currents of the North Atlantic flow in a clockwise direction. This is the result of the Coriolis Effect – the Earth spinning on its axis from west to east.

The Labrador Current is a cold current that flows from Greenland and passes along the coast of North America.

It brings cold air with it. Many ports in Canada and the USA are frozen over for a number of months in the winter. The Labrador Current also brings icebergs into the shipping lanes of the North Atlantic.

The North Atlantic Drift is a warm current that begins as the Gulf Stream. It flows in a north-easterly direction from the Gulf of Mexico and passes by the coast of Western Europe.

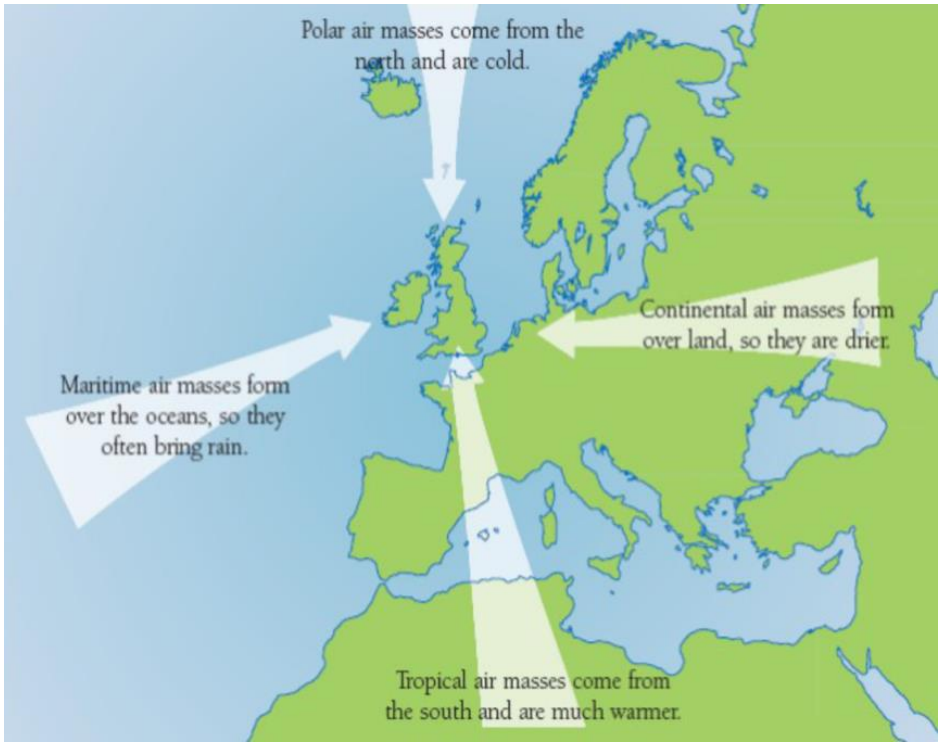
It raises winter temperatures and helps keep ports ice-free all year. The warm moist air associated with the North Atlantic Drift also ensures rainfall throughout the year.

The Canaries Current is a cold current that flows in a southerly direction along the coast of West Africa.

When winds blow over this current, they do not pick up much moisture. This means that very little precipitation reaches the Sahara, adding to the desert conditions.

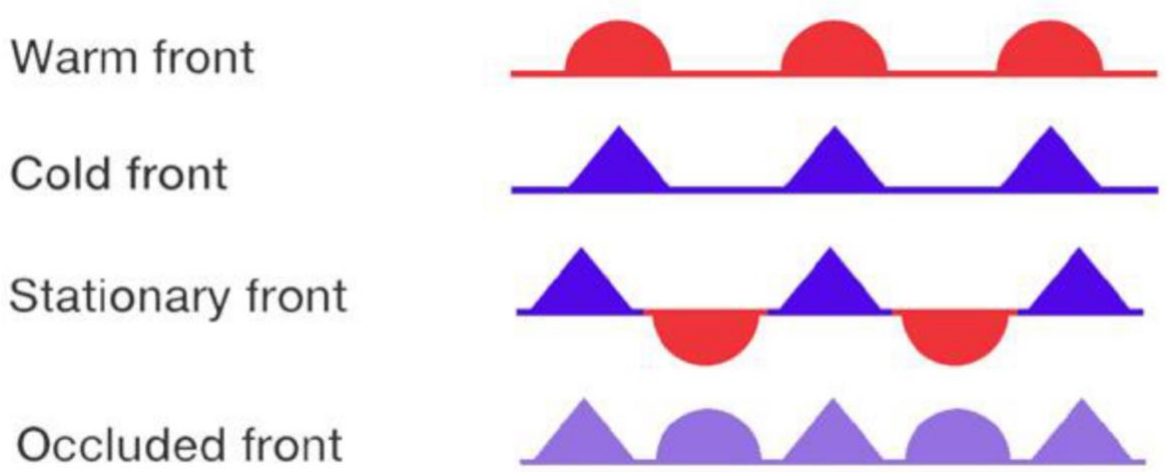
Air masses

Air masses are large bodies of air that have similar temperature, pressure and moisture throughout.
☐ There are 4 types of air masses on Earth and they are:
☐ Maritime air masses which tend to bring rain.
☐ Continental air masses which tend to be dry.
☐ Polar air masses which bring cold air.
☐ Tropical air masses which bring warm air.



Fronts

☐ A front is a boundary area where two different air masses meet.



1. *Warm Front*

- A arm front occurs when a warm air mass approaches a cold air mass. The warm air is lighter so it rises up over the cold air.
- As the warm air rises, it cools and condenses to form dark, rain-bearing clouds leaving continuous rain in the process.
- Thunderstorms are normally associated with warm fronts in Summer.

2. *Cold Front*

- A cold front occurs when a cold air mass pushes in and replaces a warm air mass. Warm air mass is lighter so it is forced to rise rapidly into the atmosphere.
- As the warm air rises, it cools and condensation takes place. Masses of cloud develop. Heavy rain falls along the front.

3. *Stationary Front*

- A stationary front forms when a cold front or warm front stops moving. This happens when two masses of air are pushing against each other but neither is powerful enough to move the other.
- Winds blowing parallel to the front instead of perpendicular can help it stay in place.
- It normally is associated with heavy rain and temperatures in the low-mid teens whether it is a Winter or Summer month.

4. *Occluded Front*

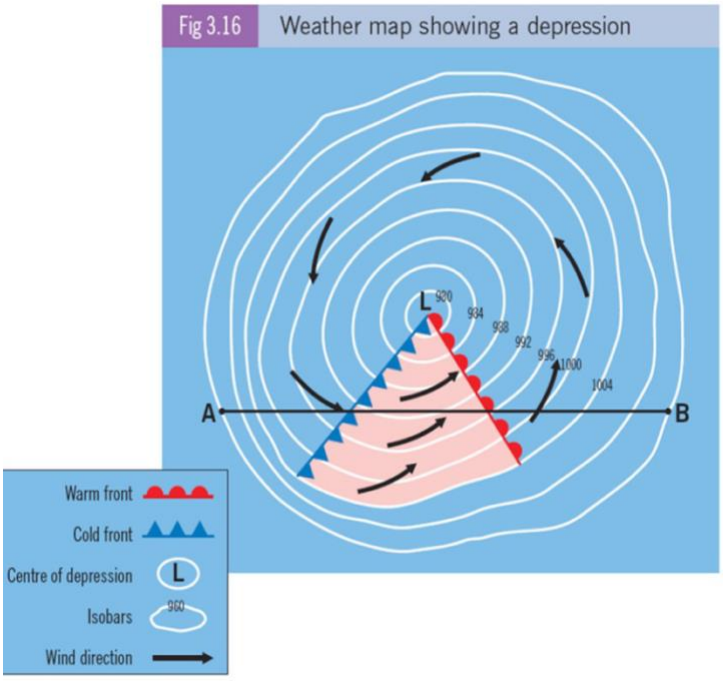
- At an occluded front, the cold air mass from the cold front meets the cool air that was ahead of the warm front. The warm air rises as these air masses come together.
- Occluded fronts usually form around areas of low atmospheric pressure

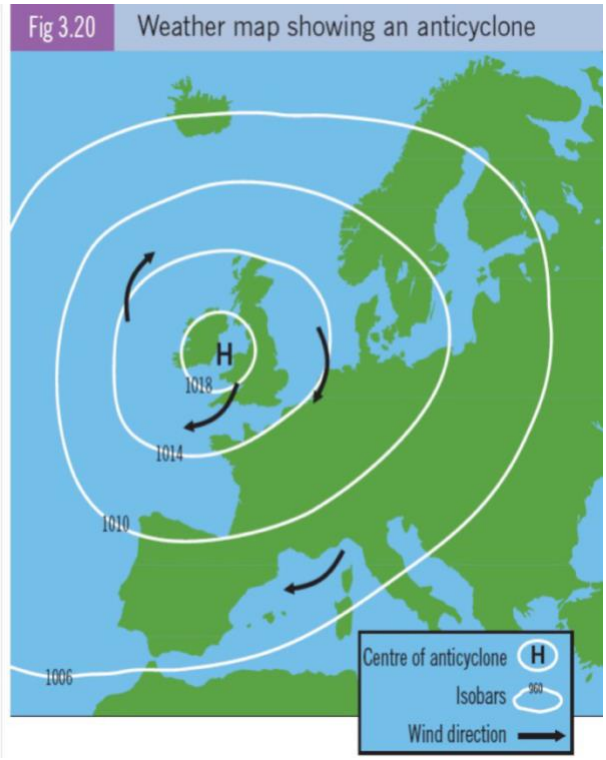
A Depressions

- A depression is an area of low pressure and is associated with unsettled weather.
- In the case of Atlantic depressions, warm, moist tropical air from the south meets colder, drier polar air from the north.
- Due to these differences, the air masses do not mix easily. The warm air is lighter and is forced to rise, creating an area of low pressure at ground level.
- At the same time, the air begins to move in an anticlockwise direction in the north hemisphere. The cold front begins to wrap itself around the back of the warm air. The warm air is now trapped in a **warm sector**.
- The cold front travels faster than the warm front and gradually begins to catch up with it. Eventually, it lifts the warm air completely off the ground. The ground air now consists entirely of cold air and the depression is over.
- Ireland's weather is dominated by Atlantic depressions that pass over the country for much of the year.
- They are also known as **cyclones**.

A anticyclone

- A anticyclone is an area of high pressure and is associated with settled weather.
- An anticyclone is an air mass with high pressure at the centre.
- In the Summer, they bring hot, sunny weather.
- In the Winter, they bring cold, sunny weather.

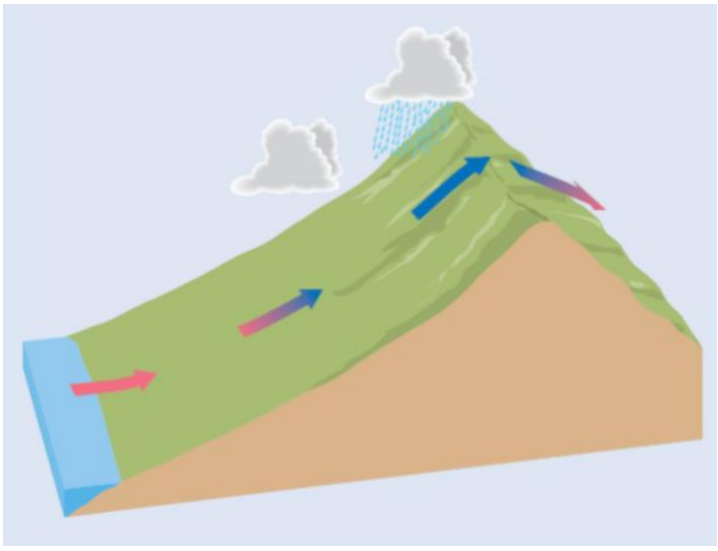


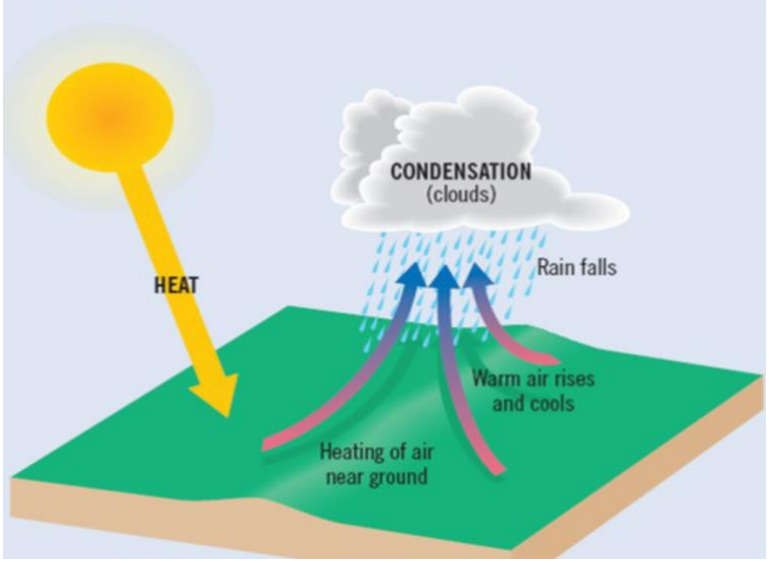


Precipitation Types

1. *Relief Rainfall*

- A warm wind evaporates water from the sea and blows it to the land. The air is forced to rise when it reaches high ground. As it rises, it cools.
- Condensation forms cloud because the cooled air can't hold as much moisture. The droplets then join and get heavier. Rain then falls on the windward slope.
- On the leeward slope, the air descends and gets warmer. The cloud evaporates so there is very little rain.



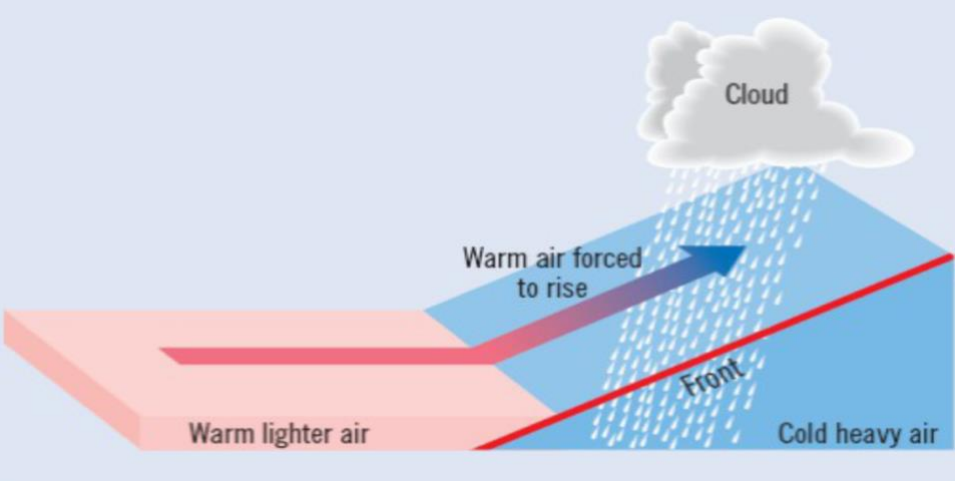


2.Convectional Rainfall

- The sun heats the ground all morning. The air near the ground gets warm and moisture is evaporated.
- By early afternoon, the heated air expands, it becomes lighter and rises. The rising air then cools and condensation takes place forming cumulus clouds.
- The cool air is unable to hold all moisture so the droplets join together and gets heavier then the rain falls.

2. *Cyclonic / Frontal Rainfall*

- A warm wind blows towards the cold air. When the warm air reaches the cold air, it rises because it is lighter. As it rises, it cools and condenses forming stratus clouds.
- Due to the cold air being unable to hold as much moisture, the droplets join and get heavier so rain falls.



Weather

Weather is the word used to describe the state of the atmosphere at any particular time and place.

- ☐ The study of weather is called **meteorology**.
- ☐ Meteorologists prepare weather forecasts.
- ☐ Met Éireann of Glasnevin is the headquarters of weather forecasting in Ireland.

Importance of Weather Forecasts

- ☐ The upcoming weather will influence what we wear and the activities that we undertake.
- ☐ It may affect our mood.
- ☐ Some occupations require very accurate weather forecasts such as farming, fishing, tourism, air traffic and sport.

Instrument	Weather element measured	Unit of measurement	Line on weather map
Thermometer	Temperature	Degrees Celsius °C	Isotherms
Hydrometer	Relative humidity	Percentage (%)	
Anemometer	Wind speed	Kilometres per hour (km/hr)	Isotachs
Wind vane	Sind direction		
Rain gauge	Precipitation	Millimetres	Isohyets
Campbell- stokes sunshine recorder	Sunshine	Hours (Hrs)	Isohels
Barometer/ barograph	Atmospheric pressure	Millibars (mb) or Hectopascals (hPa)	Isobars

Temperature

- Temperature tells us how hot or cold it is in an area.
- **Isotherms** are lines on a weather map that join places
- of equal temperature.
- Mean Temperature = Sum of temperatures ÷ number of months/days.
- Temperature range = Maximum temperature — Minimum temperature. The

Greenhouse Effect

- The greenhouse effect is when gases of the atmosphere trap much energy into it and they act like the glass on a greenhouse because they let heat in and prevent most of it getting out.
- Carbon dioxide, methane, chlorofluorocarbons (CFCs) and nitrous oxide are the most effective gases at trapping heat.
- Due to the atmosphere trapping gases like a greenhouse, global warming takes place.

Causes of Global Warming

1. Burning of fossil fuels
2. Deforestation
3. Methane
4. Burning of fuels
5. Chlorofluorocarbons (CFCs)

Impacts of Global Warming on the World

1. A rise in sea levels
2. Climate change

Impacts of Global Warming on Ireland

1. Heavier rainfall and downpours
2. Drier, warmer summers
3. More severe storms

Solutions to Global Warming

1. Clean energy
2. Reduce deforestation
3. Reduce, reuse and recycle
4. Use energy-efficient appliances