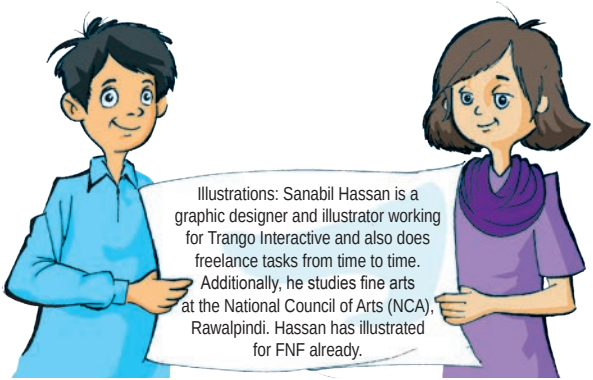
FRIEDRICH NAUMANN FOUNDATION For Freedom.
Pakistan

EASY KNOWLEDGE NO. 2

Climate Change



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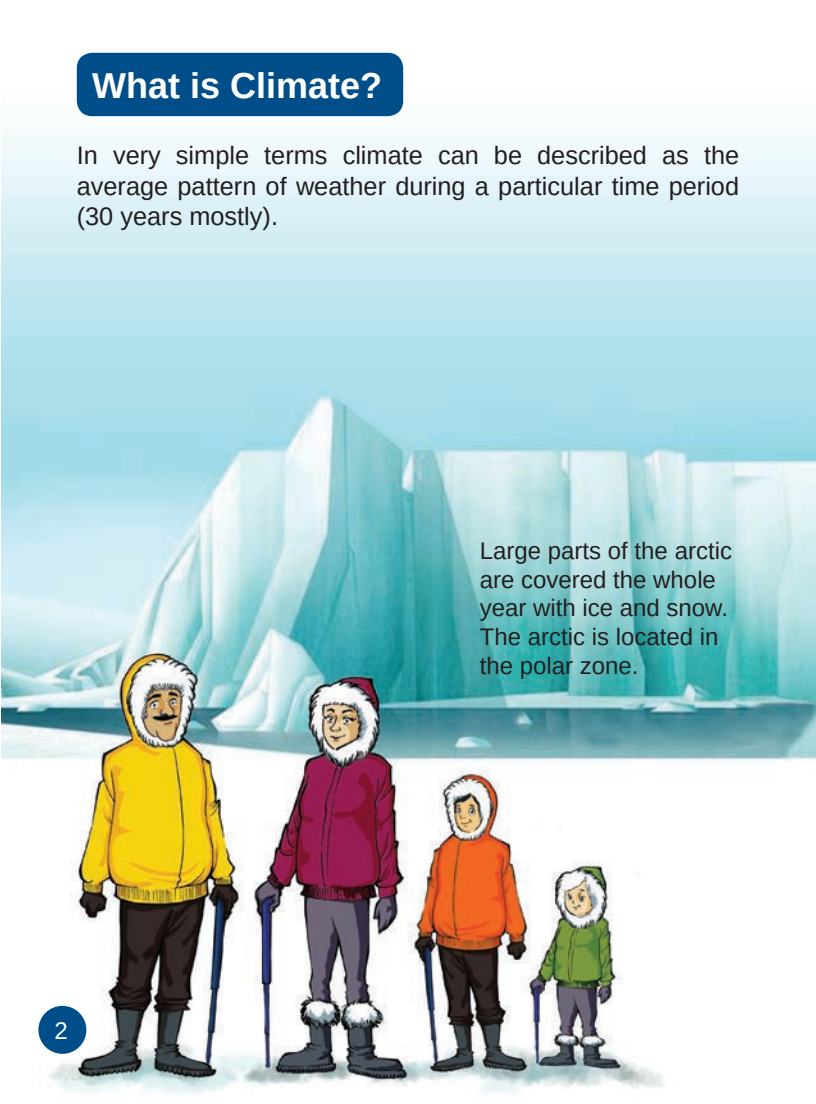
What is Climate?

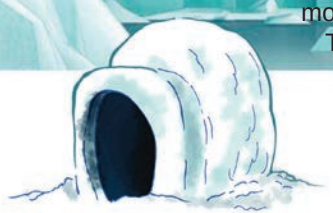
In very simple terms climate can be described as the average pattern of weather during a particular time period (30 years mostly).



Large parts of the arctic are covered the whole year with ice and snow. The arctic is located in the polar zone.

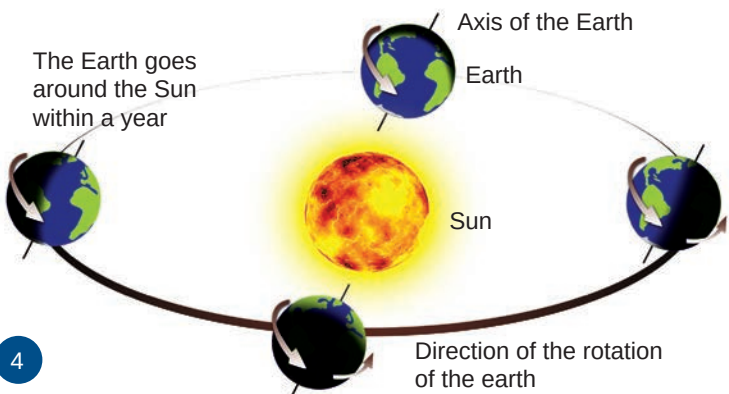
Weather and Climate

Weather can be described as changes in the atmosphere during a short period of time. Every day we experience the weather very closely. Sometimes we wake up to see a bright sunny morning perfect for a picnic at the park, on other days the clouds are dark and its raining cats and dogs and then there are days when its snowing and all you want to do is stay warm and inside. And then there are times when you can experience different weather within the same day. For example, it might be raining when you leave for school in the morning but by the time you get back home it might be nice and sunny. Weather therefore can change from day to day and may be described as being unsettled or without a set pattern. Climate on the other hand can be explained as the long-term changes in the atmosphere and essentially has a recognizable pattern. For example, the climate of Islamabad is hot and humid during the summers but cold and dry in winters. The climate of the Arctic regions such as Canada on the other hand remains mostly cold throughout the year. The climate of a certain place or area is determined by scientists through collection of meteorological data over a time period of at least 30 years. This means that they keep track of the weather that dominates a certain area during the year.



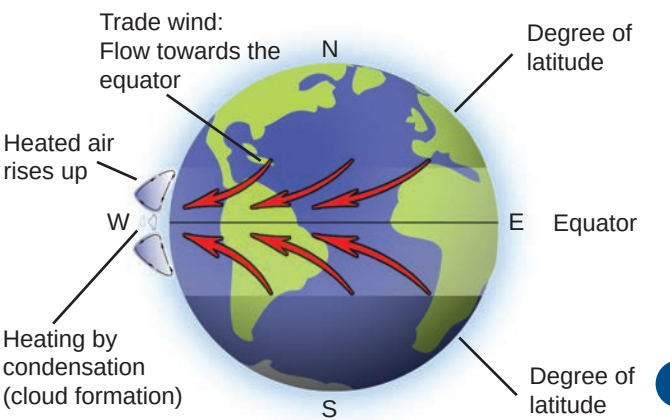
The Sun and the Climate

The role of the sun on this earth is not only to provide light but it also plays an essential role in determining the climate of the different regions due to the heat or warmth that it provides to the surface of the earth and the air. The climate in turn determines the seasons that a place experiences. For example, some places are more hot because they absorb a lot of rays from the sun while others are not as hot because they do not receive as much heat.This is primarily because the Earth orbits the Sun in a tilted position and the surface of the Earth is therefore not heated equally. That is why the countries in the Northern and Southern hemispheres have different climates. The seasons are also determined by the direction of the Earth and the amount of heat that each place absorbs from the sun during a particular time period. When the surface of a particular region is directly facing the Earth, that place experiences long and warm summer days, and when it moves away from the sun it faces short winter days.



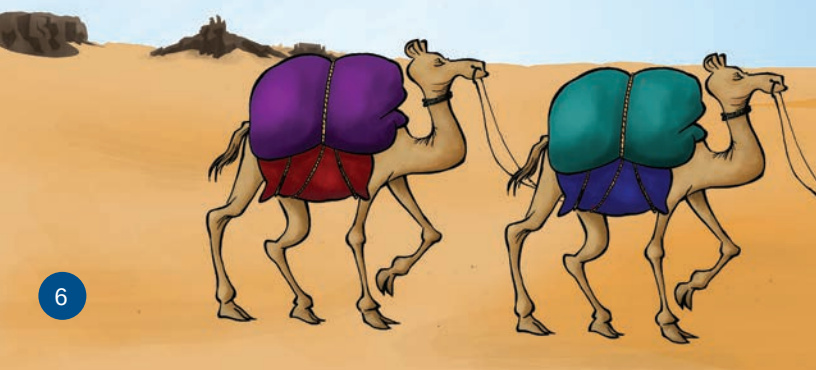
The Winds and the Climate

Like the sun, the winds also play an essential role in determining the climate of different regions. There are different types of winds and their origin often determines their effect on the climate. As an example we can look at the **trade winds**. The equator experiences very high temperatures. Due to this, hot air rises and starts blowing towards the colder regions. Once it reaches 30 degree latitude it starts sinking down in that place and the remaining winds flow back to the equator. These winds are called trade winds and they play an important role in determining the climate of different places. Other wind streams blow from the northern and southern latitude of 30 degree towards the north and south pole. They bring warm air along. Because of the Earth's rotation these winds come from the West. The territories through which these winds pass are called the **West Wind zone**.



The Ocean and the Climate

Ocean currents also play a significant role in determining the climate. Just like powerful rivers, warm and cold currents flow through the world's oceans. They are driven by the big wind systems and different contents of salinity within the water. Just like the areas close to the sea, places near oceans also experience mild climate. Examples of such areas include the countries in Central and Northern Europe such as England.



The Sea and the Climate

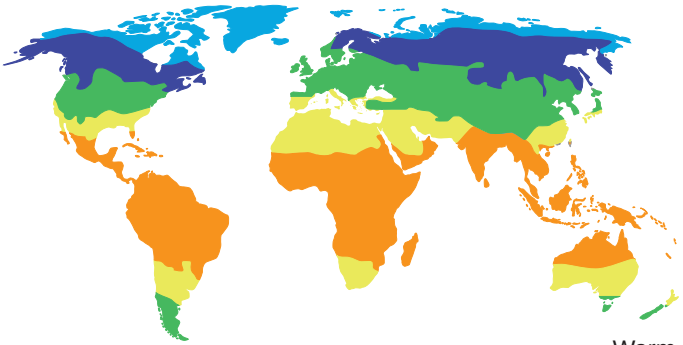
Water, by its very nature has the ability to retain heat very well. As a result winters are mild in areas that are close to the sea (for example Karachi) as compared to the rest of the country. During summers, the coastal areas are milder than the interior of a country (inland) because of the fresh wind and the evaporation of the sea water. The maritime climate is thus rather balanced.

On the other hand, inside the continents, there are hot summers, cold winters and large temperature differences between day and night. For example in the desert areas of Sindh the difference may go as far as 25-30 degrees Celsius.

It rarely rains in deserts

Climate Zones and their Types

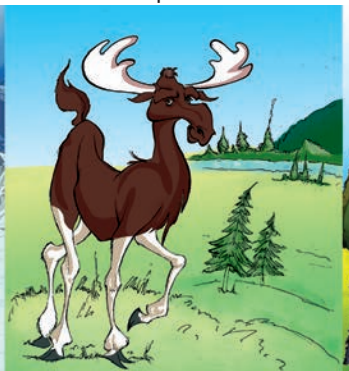
Climate zones are described as areas on the earth that have the same or uniform climate. The conditions of people and animals living and plants growing are dependent on the their climate zone. The climate of each climate zone affects the food supply, the living and many other areas of life.



Polar zone

Cold temperate zone

Warm temperate zone



Polar zone: This zone is located between the North and South Pole. There is permafrost here and the ground is always frozen.

Cold temperate zone: In this climate zone the winters are very long and snowy and the summers are *short and cool.*

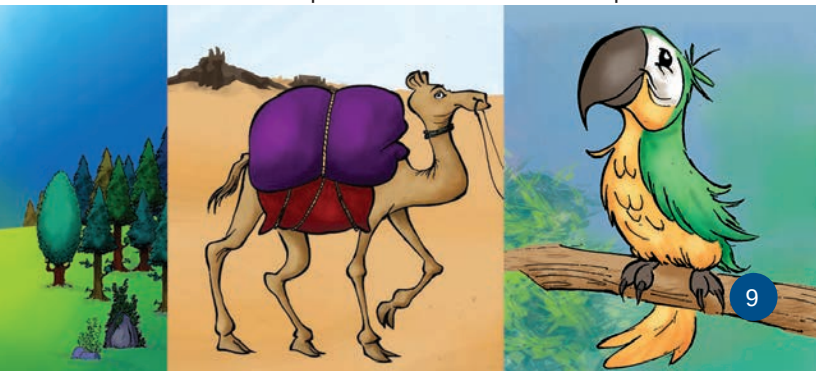
Warm temperate zone: This is the only climate zone that experiences all four distinct seasons. We live in this zone.

Subtropical zone: The summers in this zone are dry. There is no rainfall for months and there are large deserts and dry steppes. Very few plants grow in that area. In winters however it can rain for long periods.

Tropical zone: The tropics are located in the equatorial area and are therefore warm and humid throughout the year. The temperature remains the same all year round. The lush rainforests of the earth can be found in this zone.

Subtropical zone

Tropical zone



Climatic Differences within one Climate Zone

Countries around the world experience different climates due to their climate zones. More than often however, even within one climate zone there are many climatic differences. Many factors are responsible for this: the altitude of the place, its positioning towards the sun and variation of plants and trees etc.

For example places with a lot of trees and forests have an overall cooling effect on the environment. This is because forests slow down the wind and trees provide shade and evaporate water that helps to bring temperatures down.

Forests slow down the wind. Trees cast shadows and evaporate the water stored by them, especially during heat periods. Thus forests have a cooling effect on their surroundings.

Cities as Heat Islands

Another example is large cities that have their own climate. If you notice, a large and crowded city like Rawalpindi is a few degrees warmer than its sorrounding villages and smaller cities. This is primarily because urban canyons deflect the wind. In the summer it can be unbearably hot. The sun heats up the streets and rooftops, even at night they give off the stored heat. Additionally traffic, industries and air-conditioning heat the air. Cities are therefore often known as **heat islands**.

Buildings store heat

Climate Change

The climate of the earth has constantly changed since its formation. The causes of these climatic changes have been different - sometimes a change in solar radiation, at others ocean currents or in other instances volcanic eruptions. If we go back in history, we can find many examples of climate change. Climatologists are able to determine these changes through ice cores in places such as Antarctica. Just like rings of trees that enable people to gather information about trees, ice reveals information about the temperature and rainfall of a particular area.

Transversal section of a trunk

The Ice Age

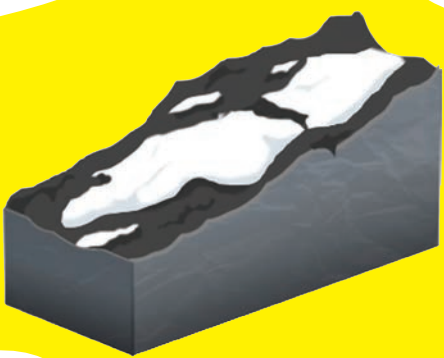
One of the best examples of climate change that we can see in history is the Ice Age. During the Ice Age there was a long-term reduction in the temperature of the earth that eventually resulted in the formation of glaciers and large polar sheets. Climatologists are of the view that the temperatures during this time period were so low that it was always snowing and there was no rain at all. Once the Ice Age was over and the temperatures started rising the ice started to melt. Most of the melted ice converted into lakes, rivers and valleys and what was left over is the glaciers we see today. The Gilgit-Baltistan of Pakistan were probably nothing like we see them today. If you were born thousands of years ago you may not have been able to access them as easily as you do today, in fact they probably resembled the North Pole! Large mammals lived there such as the mammoth or the cave bear, which protected themselves with a thick fur against the cold.

Mammoth

The History and Importance of Glaciers

Glaciers play an essential role in the the formation of landscape. Many of the mountain ranges, valleys etc. around the world and in Pakistan also have been formed as a result of melting glaciers.

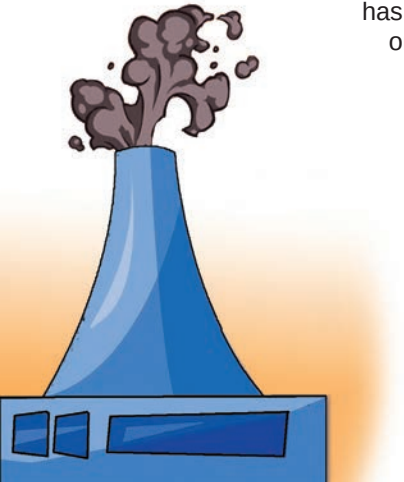
Some of the famous glaciers of Pakistan such as Baltoro, Biafo and Siachen are for example the reason for the mountain ranges, valleys and lakes that all join together to make up the beautiful Gilgit-Baltistan of Pakistan.



Transversal section of a glacier. Glaciers are slowly flowing ice from freshwater.

What Causes Climate Change and Who is Responsible?

The Earth's climate is currently also changing. To understand why it is getting warmer on Earth, one must know something about the greenhouse effect. There is the natural greenhouse effect, which simply exists on the Earth and the other one for whom we are responsible for. To understand the impact of man on the greenhouse effect, one must first understand the natural greenhouse effect. The greenhouse effect works like a glasshouse. The atmosphere is a wrapper around the entire Earth, which consists of gases. The sun shines through these gases through and the sun's rays gets to the Earth. Here the sun's rays are converted into heat waves and thrown back from the Earth into the space. The so-called greenhouse gases in the atmosphere now ensure that not all of the heat that has come through the sun's rays on the Earth can escape into the space. A part of the heat remains on the Earth, which also heats the air around the Earth. Greenhouse gases act like a thick



Greenhouse gases coming out of the chimney

Bleak landscape

jacket, by ensuring that it is warm on Earth. If they did not exist, it would be bitterly cold on Earth. Thanks to the natural greenhouse effect, we have an average temperature of about 15 degrees. The more greenhouse gases are inside the atmosphere, the stronger the greenhouse effect gets and the warmer it becomes on the Earth. To the greenhouse gases that are already naturally in the atmosphere, now come the greenhouse gases that we produce by ourselves. For example we use fuels excessively (for cars, factories, generators) and cut trees. This results in an increase of greenhouse gases, which warm up the Earth more than it normally should. This is as if you would put on a much thicker jacket, which makes you sweat and you won't feel comfortable anymore. The greenhouse gases created by man are thus enhancing the natural greenhouse effect.

What is Climate and What Happens When the Climate Changes?

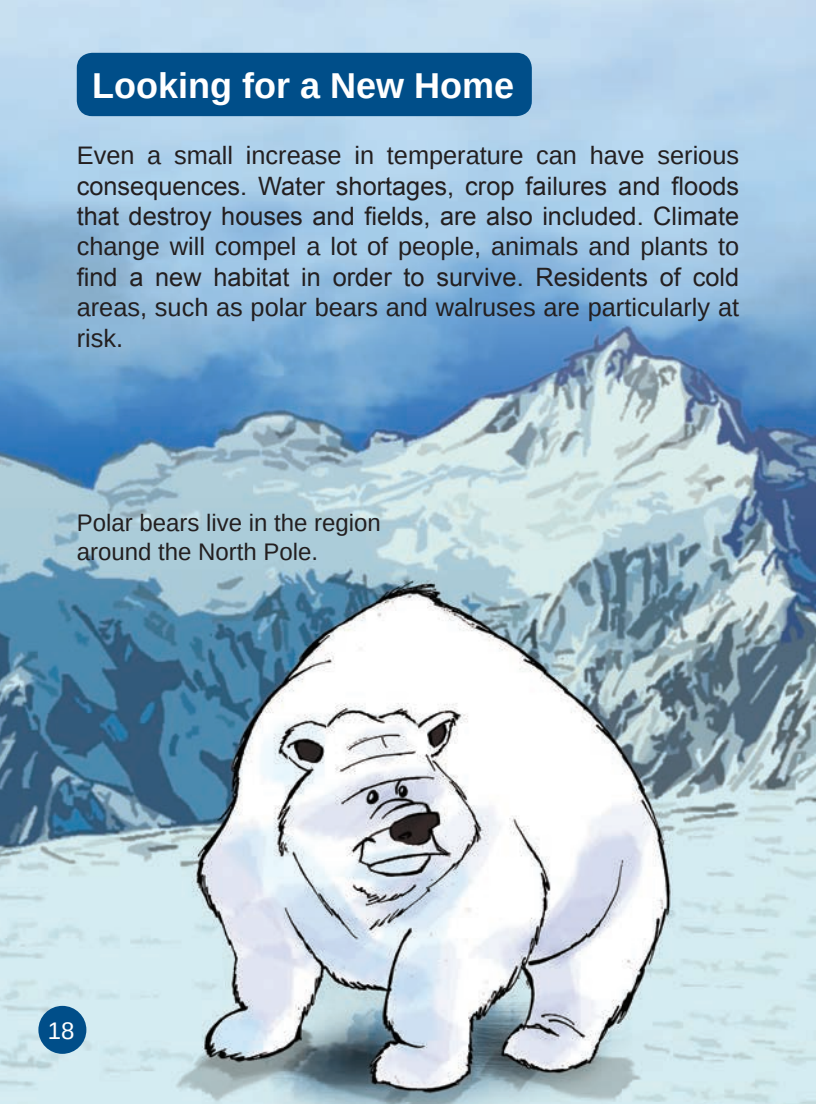
Climate may sometimes be described as annually recurring or prolonged weather conditions or simply, having the same weather for weeks. A good example for this would be the monsoon rains during the months of June, July and August in most areas of Pakistan.

As a result of climate change the earth and the seas are warming up. This in turn leads to ice melts in Greenland and on the mountain glaciers and rising sea levels. If temperatures continue to rise, the coasts of the earth are bound to be at an increasing risk of floods, droughts, heatwaves and storms.

Floods due to monsoon rains in Pakistan

Looking for a New Home

Even a small increase in temperature can have serious consequences. Water shortages, crop failures and floods that destroy houses and fields, are also included. Climate change will compel a lot of people, animals and plants to find a new habitat in order to survive. Residents of cold areas, such as polar bears and walruses are particularly at risk.



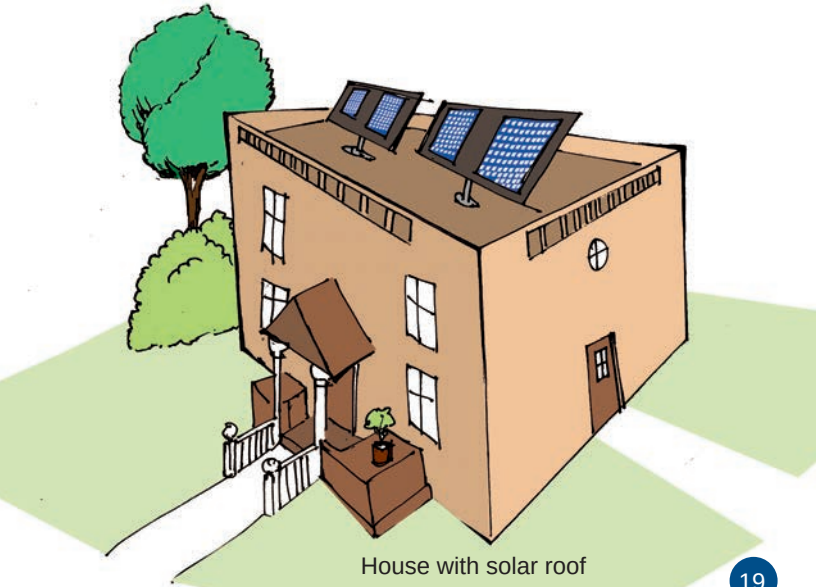
Polar bears live in the region around the North Pole.

How Can We Stop Climate Change?

It is impossible to stop climate change completely. Too much greenhouse gases are already in the earth's atmosphere, and they have been effective for a long time.

But if we act right away, the worst consequences of climate change can be prevented. The most important part is to save energy wherever possible.

The more climate-friendly electricity and heat are generated (solar, wind or hydropower) the better.



House with solar roof

Ways to Prevent Climate Change

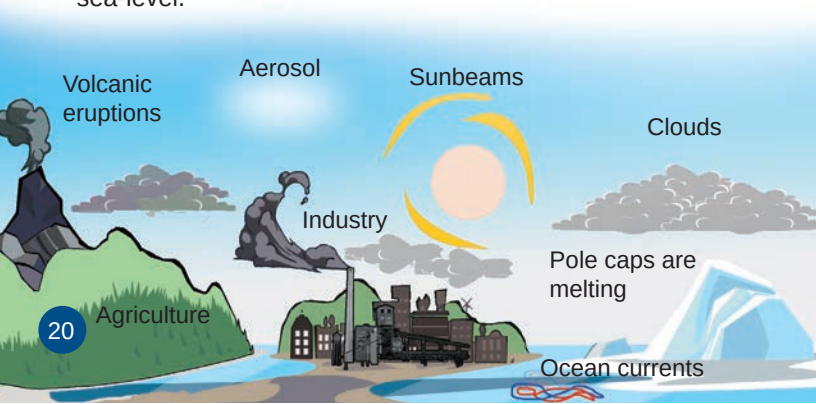
The industrialists and politicians are not the only ones responsible for preventing climate change. Each of us can play a role to protect the climate in everyday life.

1. Use energy saver instead of bulbs
2. Use the bus, train or bicycle instead of the car
3. Switch off the television or computer properly

Save fuel, use your muscles!

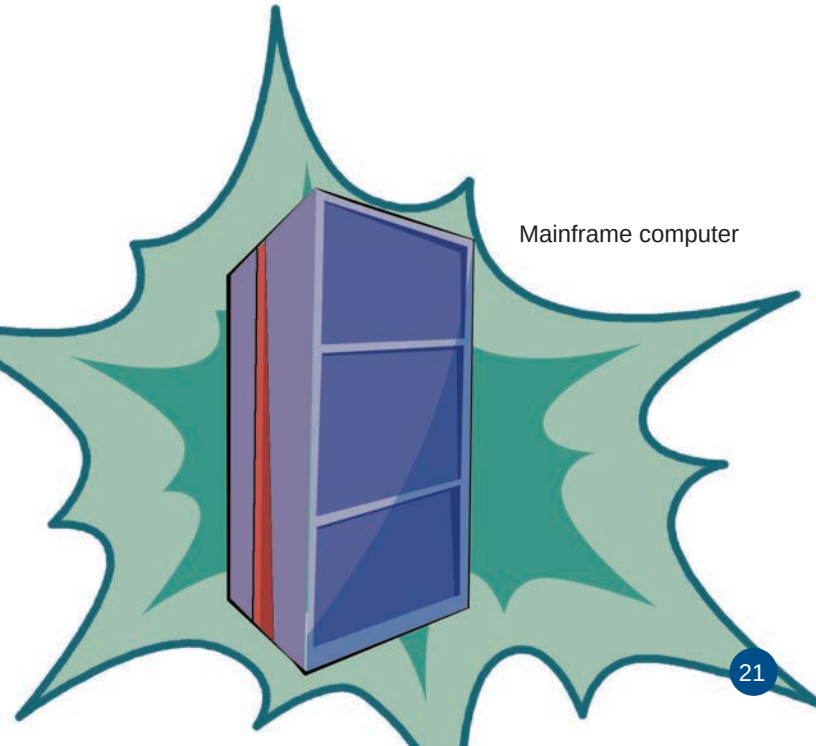
What are Climate Models?

To find out how the climate could develop, the researchers are working with models by picturing the processes within the nature. An example would be the connection between the temperature, the melting or increment of the ice and the sea-level.



Is the Climate Predictable?

Climate models are mostly reliable. But because of the fact that the diverse interactions can only be represented in simplified form, everything is unpredictable. Besides, researchers don't know exactly how the climate will change in certain areas. However, the most uncertain thing is the behavior of humans. Their behavior will determine how the climate will be in the future and this is difficult to predict.



Mainframe computer

Quiz Page

1. A climate diagram shows how hot or cold it was at a certain place in various months of the year (red line) and how much rainfall there was (blue area).

Which graph corresponds to which place?

Place A: Canada

Place B: Dubai

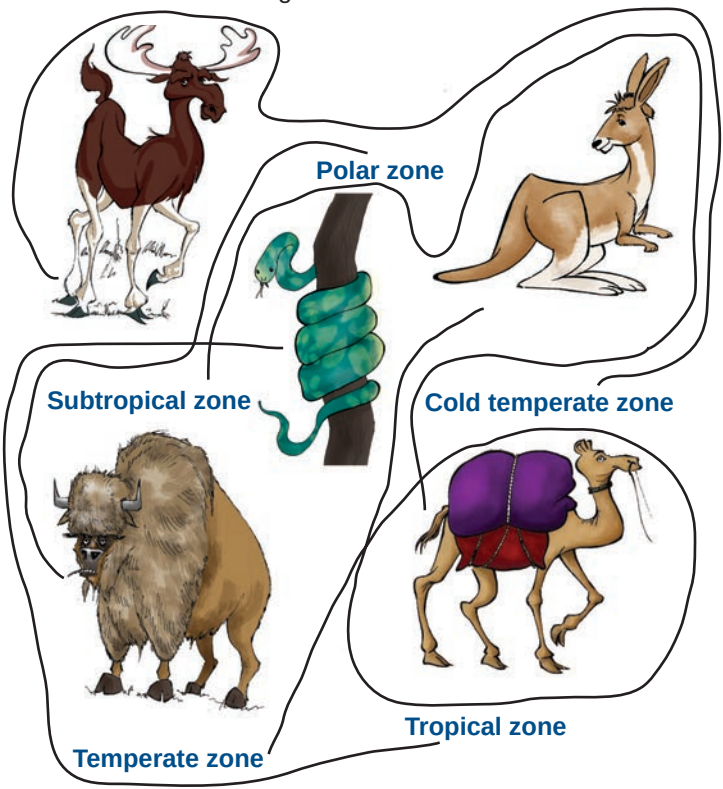
Place C: England

Diagram 1

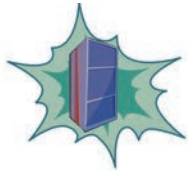
Diagram 2

Diagram 3

2. Which animal belongs to which climate zone?



Knowledge Glossary



Atmosphere

Air envelope surrounding the Earth.

Climate zones

Large areas with a uniform climate.

Condensation

Is the transformation from a gaseous state into a liquid, such as the conversion of water vapor in clouds.

Desert

A very dry area, where significantly less rain falls than it can evaporate through the heat.

Fossils

Are the remains of plants or animals of the Earth's history, for example, dinosaur footprints or skeletons.

Glaciers

Slowly flowing ice in the polar regions or in areas of high mountains. It arises where more snow falls than melts.

Greenhouse Gases

Gases in the air contributing to the warming of the Earth.

Ice Core

Narrow ice columns gained through drilling into polar regions. The ice reveals something about the temperature and rainfall of its respective time of origin.

Precipitation

From sky falling water in solid or liquid form, for example, rain snow or hail.

Trade Winds

Steady trade winds blowing in tropical seas north and south of the Equator.

Tundra

Treeless steppe with permafrost, the surface only thaws slightly close to the summer time. It is located below the Arctic zone and in Tierra del Fuego in South Africa.

Knowledge Quiz

1. The greenhouse effect is caused by

a) Greenhouse gases in the lower atmosphere absorbing radiation from the Earth's surface, and preventing much of it escaping into space
b) Too much heat in the atmosphere
c) Too much sunshine reaching Earth

2. Which of these natural events affect the climate?

a) Thawing permafrost
b) Rainfall
c) Snow

3. Which of the following activities contributes the most to carbon emissions globally?

a) Transport
b) Agriculture
c) Forestry
d) Electric power generation

4. What is called monsoon?

a) Winds in the tropics and subtropics, which bring heavy rainfall along
b) The tilt of the earth's axis
c) The largest desert in the United Arab Emirates

5. What is permafrost?

a) The extra ice layer created when rain falls on top of ice
b) The final ice layer to melt in the Arctic
c) High carbon soil that has been frozen for more than two years

6. Name the most widely discussed impact on climate change

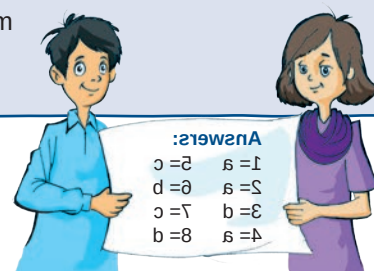
a) Soil erosion
b) Increase in average sea level
c) Deforestation

7. Sea level is expected to rise because of warmer climate due to the following:

a) Glaciers and ice-sheets melt
b) Oceans expand as they get warmer
c) Both of it

8. Climate change may have an impact on the following:

a) Human health
b) Natural ecosystem
c) Water resources
d) All of the above



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Pakistan

About FNF

The Friedrich Naumann Foundation for Freedom (FNF) is a global specialist for civic education. The German foundation is committed to liberal democracy, human and civic rights, peaceful conflict resolution, and a free market economy for more than 50 years. We are working for a peaceful and progressive Pakistan since 1986.

As part of the rising importance of climate change, FNF Pakistan is currently focusing on a climate change awareness campaign. The campaign is addressing different groups (youth, children, academics) to have a wide-ranging impact on the society.

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