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SAVE PLANET EARTH

KNOW CLIMATE CHANGE

Author
Tanya Luther Agarwal

Terrapin

Note from Mr. Majid Al Mansouri

It is He, who made you trustees of the earth,
And exalted some in rank over others.
In order to try you
By what He has given you
Indeed your Lord's retribution is swift
Yet He is forgiving and kind.

Verse from Holy Quran –Surat Al Ana'am

Ayah 165 (6:165)

Climate change today is threatening our planet and in fact our very survival on earth .All countries and governments are concerned as we humans have contributed to this malaise. To find solution to any problem, we must first fully comprehend it. Hence Environment Agency – Abu Dhabi (EAD) in association with The Energy Research Institute (TERI) is adapting and bringing this save planet series of books on Climate change to children in the UAE with a hope that students as future custodians of our environment learn about what ails our mother earth, how each one us impact the environment through our actions, so that they are in a position to make appropriate decisions on matters that affect the health of our planet.

Climate change is expected to have direct and indirect impacts on earth. Scientists predict that we would lose nearly one third of our biodiversity, Sea levels would rise flooding low lying areas, face severe fresh water shortages , desertification , health issues such increased incidences of infectious diseases, heat strokes, forest fires, hurricanes and extreme and strange weather patterns to name some .

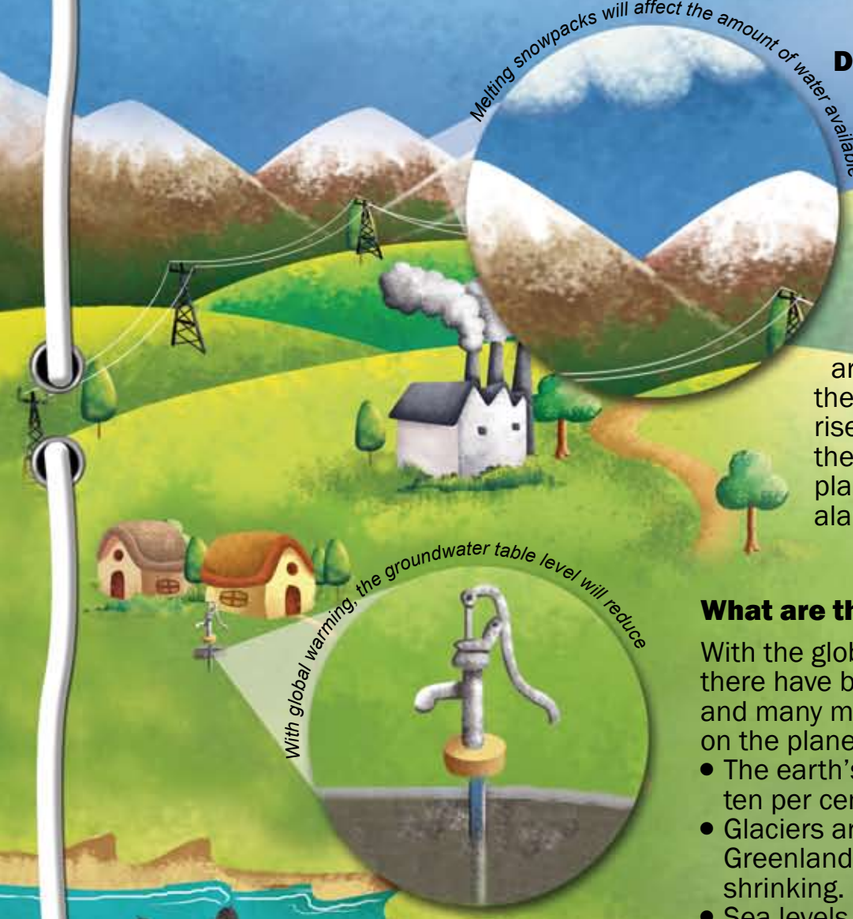
While governments are trying to fathom this new reality and looking at ways and means to tackle this global issue, it is becoming clearer to all, that only a concerted and collaborative action from each and everyone can actually help save this unique planet. United Arab Emirate too is aware of its responsibility and that is why despite being a country which is endowed with vast reserves of petroleum, a non renewable resource, and the one which contributes to climate change, it is working hard to establish the first carbon neutral city MASDAR in the coming few years and invest more on developing the renewable source of energy in the country. In addition, the country is also aiming to educate its future generation, through imbibing sound knowledge, imparting skill and helping to develop right attitude towards the environmental issues so as to prepare them to face any eventualities in the future.

We hope these books would be read by all students and would help them to understand the issue of climate change and the role that they can play in helping to save this unique planet.

CONTENTS

Is it just me or are things getting hot around here?

Global warming is the rise in the temperature of the earth's surface and the air over a period of time. The earth's surface and air have slowly been warming up over thousands of years. But in the past century, our planet has been warming up faster than ever before.



Does the earth have a fever?

Just as your body gets warm when you have a fever, the earth too seems to be running a fever. If your fever rises very quickly it becomes a cause for concern. Scientists around the world are just as worried because the globe's temperature has risen by 0.6 degree Celsius in the last hundred years. For a planet as big as ours, that is alarming!

What are the symptoms?

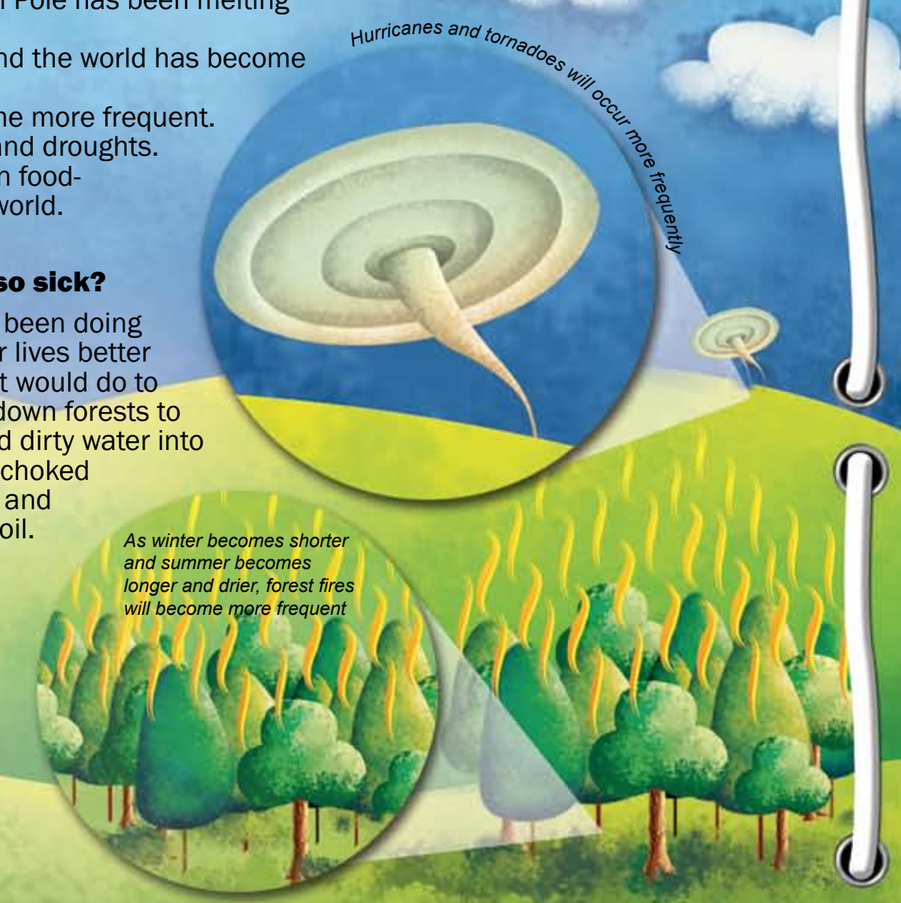
With the global warming fever, there have been many problems and many more noticeable changes on the planet.

- The earth's snow cover has melted by ten per cent.
- Glaciers around the world, such as Greenland's ice sheet, have been shrinking.
- Sea levels have risen.
- Ocean temperatures have risen.
- The sea ice at the North Pole has been melting very quickly.
- The winter season around the world has become shorter by two weeks.
- Heat waves have become more frequent.
- There are more floods and droughts.
- There is lesser rainfall in food-producing parts of the world.

How did the globe get so sick?

People on the earth have been doing many things to make their lives better without thinking what that would do to the earth. They have cut down forests to make their homes; poured dirty water into rivers, lakes and oceans; choked the air with dust and dirt; and buried their trash in the soil. All parts of the earth have been infected with 'germ-o-people'.

If doctors were to advise the earth on how to get better, they would probably say, "Stay away from people".



Eco watch

Our planet is warming very quickly. The last two decades of the twentieth century were the hottest in four hundred years and possibly the warmest in several thousand years. The last eleven years have been among the warmest since 1850!

The higher you go

If you hold your hand close to your mouth and blow on it you will feel something, a sensation. That feeling is caused by air, which is everywhere. Air makes up the atmosphere around our planet. It surrounds the earth like a blanket from the ground to about nine thousand six hundred kilometres high. The atmosphere hangs above the earth and does not vanish or blow away into space because the earth's gravity, or 'pull', keeps it in place.

What is atmospheric pressure?

The air around us is always pushing and pressing down on us. This is the atmospheric pressure. We cannot feel this air pressure like we can feel hot or cool air, but that does not mean it is not there. In fact, atmospheric pressure keeps changing from time to time and place to place. A barometer is an instrument that helps scientists measure atmospheric pressure.

Layers in the atmosphere

There are five layers in the atmosphere. The heaviest layer is closest to the earth's surface. As we move upwards from the ground level, the atmospheric pressure decreases and the temperature changes. Water vapour, carbon dioxide, methane, nitrous oxide, and chlorofluorocarbons are gases that are found in the atmosphere.

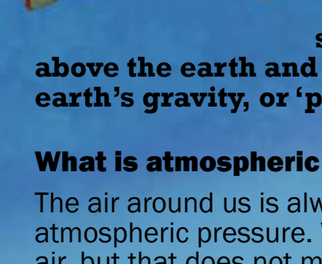
The **troposphere** is the layer closest to the earth. It extends from the surface of the earth to about fifteen kilometres high. This is the layer where almost all weather changes take place. Flying in an aircraft in the troposphere is likely to give passengers a bumpy ride because the air in this layer is always moving. We breathe the air in this layer.

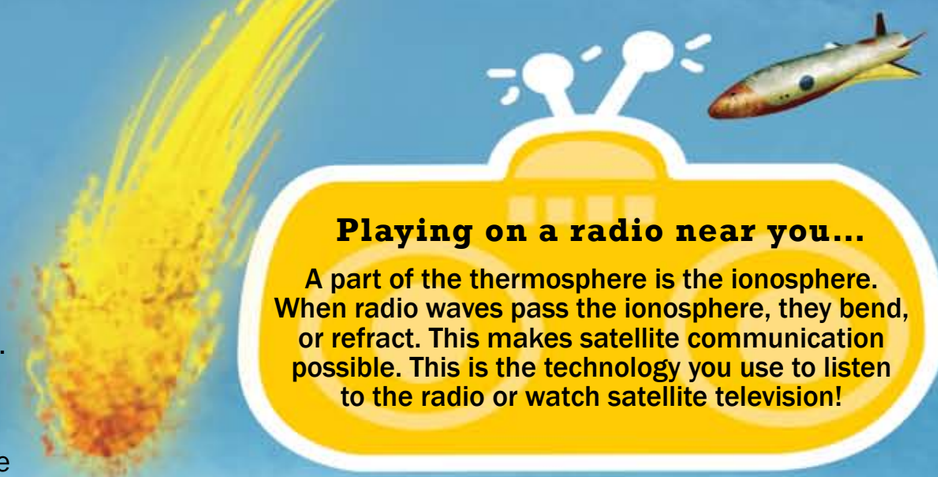
From the troposphere up to fifty kilometres is the **stratosphere**. Airplanes fly in this layer because it is very stable. The ozone layer is present here, and it absorbs the harmful ultraviolet rays of the sun that would otherwise be harmful to plants, animals, and humans.

Beyond the stratosphere, the air is very thin and cold. This area is known as the **mesosphere**, and is found between fifty and eighty-five kilometres above the earth's surface.

The thermosphere is the fourth layer in the atmosphere, between eighty-five and six hundred kilometres above the earth. Space shuttles orbit in this layer. Temperatures here can reach 1,727 degrees Celsius!

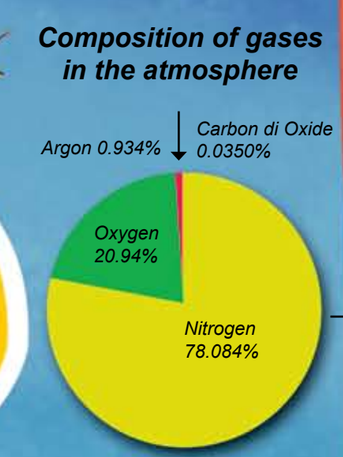
Beyond the thermosphere is the **exosphere**. This is the layer where the atmosphere and space meet. Satellite stations are located between six hundred kilometres and thousand kilometres above the earth.





Playing on a radio near you...

A part of the thermosphere is the ionosphere. When radio waves pass the ionosphere, they bend, or refract. This makes satellite communication possible. This is the technology you use to listen to the radio or watch satellite television!

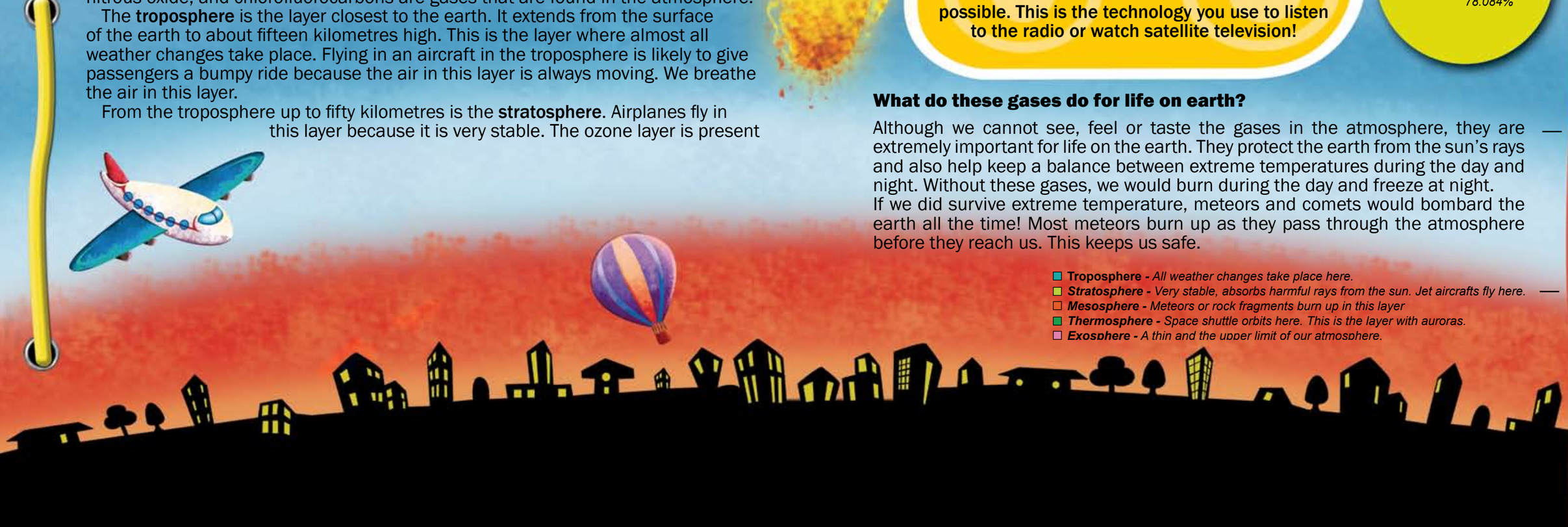


What do these gases do for life on earth?

Although we cannot see, feel or taste the gases in the atmosphere, they are extremely important for life on the earth. They protect the earth from the sun's rays and also help keep a balance between extreme temperatures during the day and night. Without these gases, we would burn during the day and freeze at night.

If we did survive extreme temperature, meteors and comets would bombard the earth all the time! Most meteors burn up as they pass through the atmosphere before they reach us. This keeps us safe.

- **Troposphere -** *All weather changes take place here.*
- ***Stratosphere -*** *Very stable, absorbs harmful rays from the sun. Jet aircrafts fly here.*
- ***Mesosphere -*** *Meteors or rock fragments burn up in this layer*
- ***Thermosphere -*** *Space shuttle orbits here. This is the layer with auroras.*
- ***Exosphere -*** *A thin and the upper limit of our atmosphere.*



You can't live without this greenhouse!

The atmosphere turns the earth into one massive greenhouse. A greenhouse is a glass shed used to grow plants, especially during winter. The glass panels let in the light and heat from the sun. The heat gets trapped inside and cannot escape from the greenhouse. The house heats up and gives out warmth to the plants. This natural process is called the 'greenhouse effect'.

The gases in the atmosphere work like glass panels. The sun's hot rays enter the atmosphere through the gases. They hit the land and water, heating them both during the day. Light and heat are reflected back from the planet's surface, and while some of it escapes into space, the rest of it becomes trapped because of the gases that act like a lid or a cover around the earth. This is a good thing and helps keep a cozy average global temperature of sixteen degrees Celsius. Without the greenhouse effect, the planet would be a freezing minus eighteen degrees Celsius. Brrrr!

What are the natural greenhouse gases?

One per cent of the atmosphere is made up of greenhouse gases. These are water vapour, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O).

So what's the fuss about?

It's really more than a fuss. The natural balance of greenhouse gases has been ruined in the last two hundred years. Things that people are doing on the planet have increased the amount of greenhouse gases in the atmosphere. This has contributed to global warming.

Man-made gases

CO_2 is produced naturally by humans and animals when they breathe, and is absorbed by trees and plants. Volcanoes also let out this gas. With increasing number of people on the earth, trees are being cut down for towns and cities. With fewer trees to take in CO_2 from more humans living on the planet, the amount of this gas has gone up. To make things worse, burning fossil fuels such as coal, oil, and gas adds more CO_2 to the atmosphere.

This won't just blow over!

Methane is among the deadliest greenhouse gases. It comes from cows, sheep, rice fields, and the oil industry. The gas is twenty-three times more efficient in trapping heat in the atmosphere than carbon dioxide (CO_2). It lasts twelve years in the atmosphere before it turns into CO_2 and water.

Methane gas is produced by cattle when they digest their food. It also comes from rice fields and landfill sites, where garbage is disposed. Both of these are created by people. CFCs are present in small quantities in the atmosphere. They are also used in spray cans, refrigerators, chemicals, and in the making of plastics. They are dangerous gases because even small amounts can trap large amounts of heat.

What does it all mean?

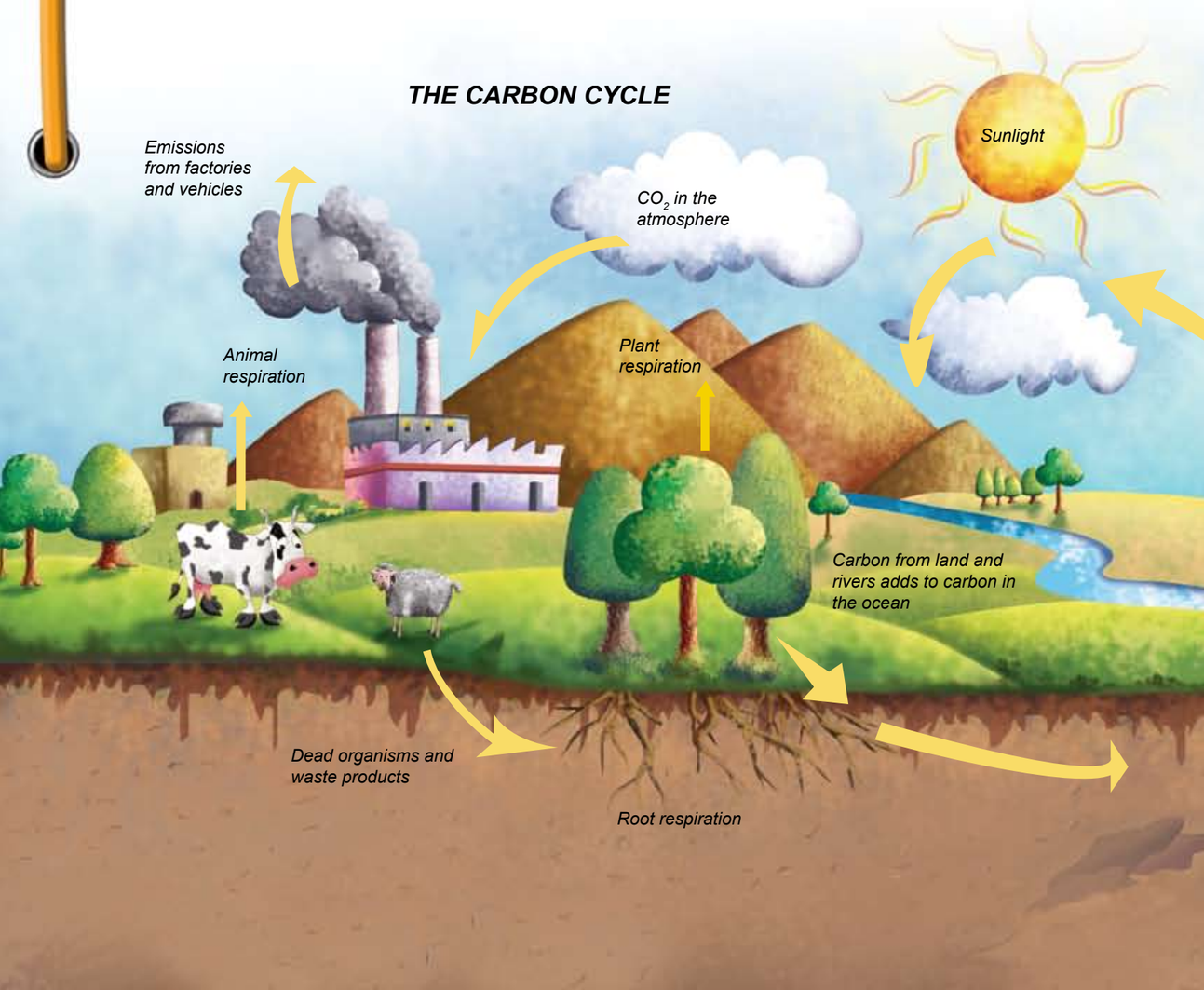
More gases in the atmosphere mean a thicker blanket around the globe that traps more heat, which simply means a rise in global temperature.

The carbon cycle

All living things are made of carbon. Non-living things like oceans and air also contain carbon. Carbon is also present in greenhouse gases. It is a part of the carbon dioxide (CO_2) gas in the atmosphere. Carbon is contained in fossil fuels like coal and oil under the ground. Rocks and shells of some animals have it too. Carbon is part of the soil, plants, and trees. The cycle actually changes the form of carbon from water to land to air to living things.

It's on the move in a cycle!

Carbon does not stay still. It is constantly on the move between land, water, and air. This is called the carbon cycle. Yet, not all carbon moves and may often get sealed in rocks in the oceans.



On land...

Plants and trees need carbon to grow. During photosynthesis, they use the CO_2 in the air to make food. This food is rich in carbon. Plants also give out CO_2 during respiration. When plants die, they become part of the soil and over time, turn into fossil fuels like oil and coal.

Humans and animals give out CO_2 when they breathe. This is added to the carbon in the atmosphere, some of it being used up by plants and trees.

In water...

Gases that have carbon move between the surfaces of oceans, seas and lakes, and the atmosphere. Like land plants, ocean plants too use photosynthesis to get CO_2 from the water and release it through respiration. Ocean animals eat these plants and when they die, the carbon in their bodies passes on to other animals, while some gets buried in the ocean floor. Some ocean creatures also use carbon from the water to make their shells. Over thousands of years, the bones and shells of these animals turn into rocks that contain – take a guess – carbon!

Floods, volcanic eruptions, typhoons, and hurricanes also move carbon from one place to another. No wonder then that carbon is everywhere!

The cycle can only carry so much!

When too many people sit on a cycle, it is either hard to move it or the weight of the riders makes for a wobbly ride. That is what people have managed to do to the balance of the carbon cycle. More CO_2 is being breathed out; burning fossil fuels has added thirty per cent more carbon to the air than there was a hundred and fifty years ago; trees have been cut down; and there are more vehicles on the road that emit CO_2. The amount of CO_2 on the earth today is more than what nature can manage, and scientists believe this is one of the causes of global warming.

Hard facts!

The world produces about two tonnes of concrete for each person on the earth every year. Cement, which is used to make concrete, is the world's most widely used building material. Each year, manufacturing cement gives out five to ten per cent of the world's total CO_2 emissions!

Something has changed

When global temperatures increase, the climate of the earth also changes. But what is climate? Is it the same as weather? When you look out of the window or step outdoors, you can see if the sun is shining or whether it is raining. It may be a windy day or a cloudy night; a sultry evening or a still afternoon. Is that weather, or is it climate?

Wondering whether it's weather!

Weather is what goes on in the atmosphere in a particular place at a certain time. In most places, the weather changes from hour to hour, day to day, and season to season. Newspapers and television channels give daily reports on what the weather was and what it will be the following day or even in the coming week. Everyone knows what weather to expect during summer or winter months in the place where they live. Ask people in Cape Town what the weather is like in June and you will be told that is it 'usually' cool and pleasant. They know that because that has been the weather there in June for many, many years. That is what climate is. It is the long-term and typical weather of a place.

Since weather changes all the time it is difficult to know the weather of a place weeks or months ahead. Climates of different parts of the world, however, are already known. For example, a Mediterranean climate has wet winters and dry summers; a Tundra climate has long, severe winters and short, mild summers. Even so, climates also change for short periods of time in a year. Those changes make our seasons. Climatologists study how climates come about and the effects on the environment. Meteorologists focus on and predict changes in the weather.

Chill box

If you thought 'cold' and 'desert' did not go together, know this. The Arctic is known to be a cold desert. The North Pole has long, dark winters and short, cool summers. The air here is very cold and dry. If you had to stick your hand in the freezer of your refrigerator for a few minutes you probably would not be able to do it even for that long. The temperature in your home freezer is minus twenty degrees Celsius. In some parts of the Arctic, temperatures drop to minus sixty-eight degrees Celsius! Brrr!!

Has the climate changed in the past?

Yes it has! There was a time when large areas of our planet were covered with huge, thick ice sheets and enormous glaciers. About forty million years ago began the first ice age, and there have been four such icy times since then. Glaciers have grown and shrunk, and at one time, reached where New York City is today.

What makes climate change?

In the last five billion years, the earth's climate has been changing constantly. Since humans were not around then, there must be other reasons for the changing climate.

The sun gives out energy and heat that we can all feel. However, small changes in the sun's energy, which we don't notice, have a huge impact on our climate. Scientists are still learning and trying to understand the extent of the effects.

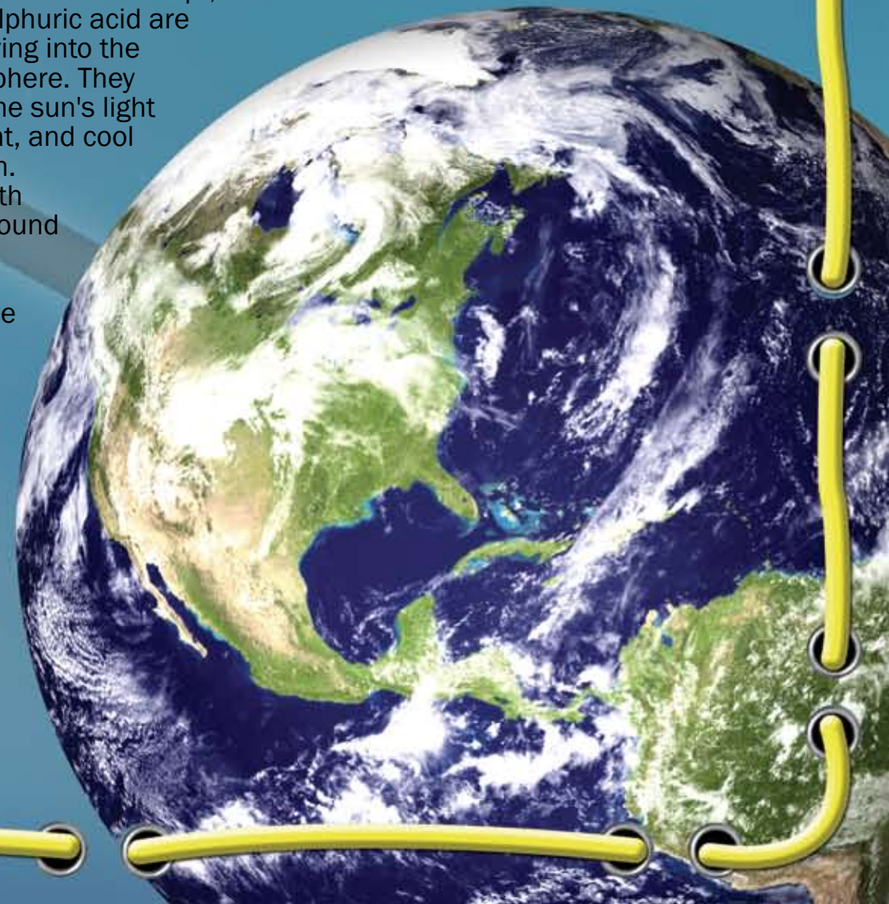
Clouds can either warm or cool the globe, depending on their distance from the ground, as well as their thickness. High-level thin clouds warm the earth, while low-level thick ones lessen the warming.

Ocean currents and winds carry heat towards the poles.

Changes in deep seas and oceans produce not just long-lasting climatic changes but also climatic effects such as the El Niño and the La Niña, which occur over and over again.

When volcanoes erupt, ash and sulphuric acid are sent flying into the atmosphere. They block the sun's light and heat, and cool the earth.

The earth revolves around the sun in a path, or orbit. Slow changes in the earth's orbit can alter the planet's climate over tens of thousands of years. Scientists think that this, along with ocean currents and winds, may have influenced the ice ages.



‘El’ who?

If seasons make weather, then El Niño makes global weather. El Niño is a natural cycle of the ocean–atmosphere system, as much as winter cold or summer thunderstorms or any other weather phenomenon.

The earth’s warmest waters are in the central western Pacific Ocean. When the sun’s heat warms the ocean, the water at the surface begins to evaporate quickly. Strong winds known as trade winds carry the warm air, as well as drag the warm ocean waters westward towards Indonesia and Australia. However, every few years, the trade winds are not strong enough and the result is that the warm water and warm air end up moving eastward along the coast of South America. This changes atmospheric circulation and weather patterns around the globe and is called El Niño.

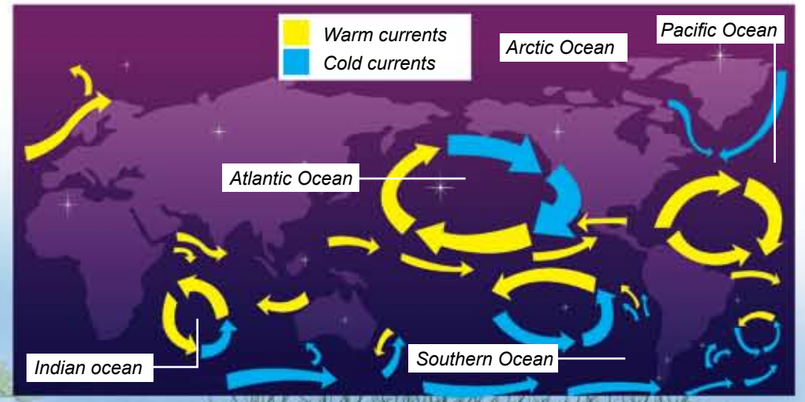
What makes El Niño?

No one knows for sure what causes an El Niño build-up. Some scientists think that strong trade winds near the equator push ocean water against Australia and Indonesia. The water piles up here and hits the coasts. Others think that the warm air that rises from the oceans makes the trade winds stronger. It is also possible that one El Niño causes another.

What does El Niño do?

El Niño climate conditions occur every few years, and they are not predictable. EL Niño has abnormal effects on temperature, wind, cloud formation, ocean currents—in short, on climate around the world. The most severe effects are found close to the equator. When an El Niño develops, it reverses weather patterns around the world.
The 1982-83 El Niño was the most terrible weather event of this century, causing disasters on nearly every continent. Africa, Australia, and Indonesia were affected by droughts, dust storms, and brush fires. Peru was drenched with eleven feet of rain in areas, where six inches was normal. Forest fires burned in Sumatra, Borneo, and Malaysia, and the haze forced drivers to use headlights at noon. The haze travelled thousands of kilometres to the islands of Maldives. In Mongolia, temperatures reached forty-two degrees Celsius; Kenya’s rainfall was hundred centimetres above normal; central Europe suffered record flooding, and tornadoes tore through Florida. The worldwide human death toll was two thousand and the damage was calculated at thirteen billion dollars!

Today scientists can predict El Niño up to a year in advance, using complex computer simulations and data from other satellites.



The ocean waters move in a constant cycle, affecting the weather patterns of a place.

Droughts in South East Asia

Forest fires blazed out of control in Indonesia and Australia

Rainy winters in the US

PACIFIC OCEAN

Droughts in Indonesia and Australia

Powerful hurricanes in the US and Mexico

Heavy rains in Ecuador and forest fires in Brazil

Are they related?

Where there is an El Niño there is a La Niña! La Niñas bring climate patterns that are opposite to, and follow, El Niños. Where there is flooding with El Niño, there will follow a drought with a La Niña. Some effects are good ones such as grass growing on barren land and planting of rice and beans in otherwise dry areas in parts of Peru.


Weather balloon

Detectives at work

Climate scientists work a lot like historians, geologists, and detectives, all rolled into one. To know about climate in the world today and tomorrow, they dig into the past, as well as keep track of the present. They search for and gather clues in the history of the earth to understand the changes in climate, temperatures, and life on the planet.

Old finds

When snow falls, it carries elements like dust, nitrate, and so on from the air, which freeze and get preserved. As more snow falls over the years, it traps air bubbles too. To know the climate of thousands of years ago, scientists drill holes in ice sheets and pull out 'ice cores', or ice samples, and study these.

The same is done from mountains and deserts. Bones and fossils can tell us a great deal about life forms and the conditions they lived in. Samples from the ocean floor reveal how ocean currents flowed in the past and the climate conditions they caused. Trees can grow to be hundreds or even thousands of years old. A tree's age can be known by counting its rings inside the bark. One ring grows for each year. Variations in the formation of tree rings also show how much rainfall, snowfall or temperature changed each year in its surroundings. With that information, experts can find out the changes in temperature and rainfall over these years.


Tree rings

New clues

From the air to the ground, science detectives have virtually covered every part of the planet and around it to track changes in temperatures every day.

Weather stations on land use barometers to measure atmospheric pressure on the earth. They also note wind speed, rainfall, and storm activity.

Weather balloons may not be fun for kids but scientists love them. The balloons are loaded with instruments and let off to fly high up into the atmosphere. The science detectives at the ground, then, receive weather-related information. Floating on oceans and seas, buoys record changes in the weather. Weather satellites orbit the earth and beam down information to earth stations.

What does all this mean?

It simply means that we are learning more and more about how climate has changed and continues to do so over time. We know from this information that while nature plays its part in climate change, humans too have contributed in warming global climates. Scientists and environmentalists all over the world want people to understand how human activity has speeded up global warming and to do something about it before it is too late.

Taking the hint

After studying fossils as old as five hundred and twenty million years, some scientists say that mass destruction of species happened during periods when the earth's climate changed. Temperatures increased during four of the five times the mass extinctions occurred!


Drowning mangroves


Melting glaciers

Fingerprints of Climate Change

The global climate has changed and is changing. Fingerprints of global warming are heat waves, rising seas, and melting glaciers. Scientists have been recording these changes and also studying what causes these dramatic trends in climate change.

It's not cool to be hot!

You will have to choose your summer destination carefully next year, especially if you hope to be in a cooler place than home.

The summer of 2007 broke temperature records across the world. Parts of Japan had the highest temperatures since 1933. Eastern and southern parts the United States had record highs in the month of August as well new daily high temperatures. Several countries in Europe sweltered that summer. In fact, according to the World Meteorological Organization, global land surface temperatures in January and April 2007 were possibly the warmest since 1880, at more than one degree Celsius higher than average for those months.

Since 1980, the earth has experienced nineteen of its twenty hottest years on record, with 2005 and 1998 tying for the hottest, and 2002 and 2003 coming in second and third.

Higher is not always better

In the twentieth century, sea levels around the world have risen by four to eight inches. That may not sound like much, but the fact that most of this water came from melting glaciers is a cause for worry. The expansion of ocean and sea waters due to the heat has also led to sea-level rise, which has led to the flooding of coastal areas.

The Sundarbans National Park in Bangladesh has been flooded by sea-level rise and affected seventy-five thousand square kilometres of mangroves. In Vietnam too the nature of mangroves is changing because of the salt coming in with the sea water.

Dripping and drying

Scientists have been keeping a close watch on the glaciers in the world. They can clearly see that most of the glaciers have shrunk faster in the last five to seven years than in the last one hundred and fifty years. Ten to twenty per cent of glacier ice in the European Alps has disappeared in less than twenty years. In 2002, a chunk of the Larsen B ice shelf in Antarctica collapsed and has been shrinking rapidly since then.

The polar ice cap is melting at nine per cent per decade. The Arctic ice thickness has reduced by forty per cent since the 1960s. In fifty years, the floating ice in the Arctic sea has melted by half.


Collapsing Larsen B ice shelf

Sinking fast!

Around the world, about fifteen to thirty metres of beach is lost when the sea rises by 0.3 metres.

Who made this mess?

Our planet is in a mess, and you don't need to look very far to see it or smell it.

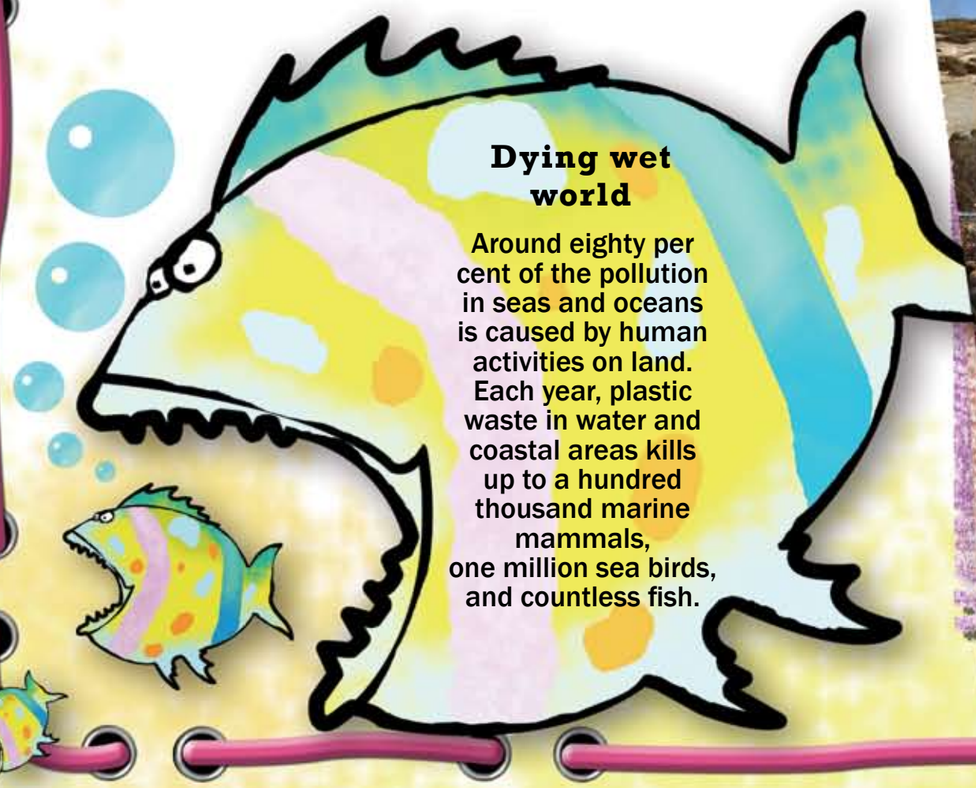
When air, water or land become dirty due to harmful chemicals or substances, they are said to be polluted. Pollution can also happen naturally as with volcanic eruptions or because of things that humans do, such as with spilling of oil or chemicals in oceans. Pollution of air, water, and land are the three major kinds of pollution on our planet.

Something in the air

Sometimes you see it, and sometimes you don't. Some air pollutants are invisible and others create a cloud or haze.

Beijing, Hong Kong, New York City, London, Toronto, Houston, Athens, and Mexico City are some of the places affected by 'smog'. This is a combination of smoke, fog, and sulphur dioxide gas that comes from industries and burning coal. Erupting volcanoes and forest fires can also create smog-like haze.

The 'big six' gases that pollute the air are carbon dioxide, carbon monoxide, sulphur oxide, nitrogen oxide, hydrocarbons, and particulates.



Dying wet world

Around eighty per cent of the pollution in seas and oceans is caused by human activities on land. Each year, plastic waste in water and coastal areas kills up to a hundred thousand marine mammals, one million sea birds, and countless fish.

Land pollution stinks!

Where do you think the trash that comes from your home goes? It is dumped in a landfill. Almost half of our trash is disposed of in landfills, while only two per cent of it is recycled.

Soil on land is polluted by pesticides, weed killers, and litter. Food garbage, wood, plastics, and construction materials find their way to landfills. So do vehicle parts and farm and mining wastes. Over time, the pollutants from land ooze around and spread, mixing with the groundwater, the soil, and even nearby rivers and lakes. The loss to humans is fifteen million acres of land every year.

Liquid mess

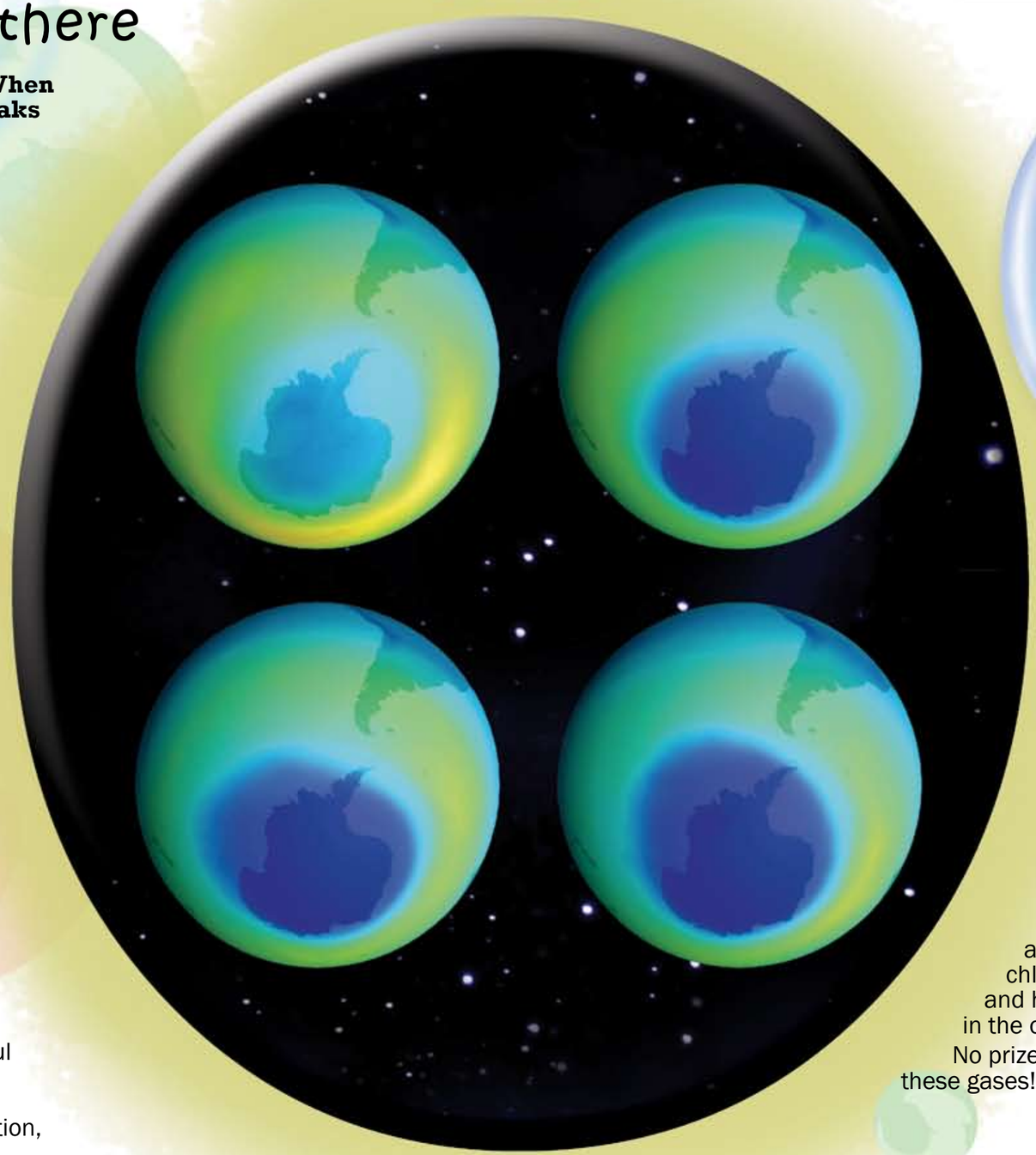
If you knew how polluted water is, you might find it hard to take that next sip.

Humans contaminate water in many ways. They dump raw sewage, chemicals, trash, pesticides, and poisonous waste into lakes, rivers, and oceans. Oil spills, in the high seas, cause the worst imaginable kind of pollution for the atmosphere and ocean creatures, coating their bodies with a thick layer of oil, making it difficult for them to breathe.

Polluted water also finds its way into the soil, crops, fish, fruits, animals, and finally, into our bodies.

There's a hole up there

We breathe in Oxygen and it is present everywhere, even in the stratosphere .When sunlight hits an Oxygen molecule it breaks it up into two parts to make an Ozone molecule. Ozone is a colourless gas in the atmosphere. It is made naturally with the action of sunlight. O_3 is found in two different layers of the atmosphere. It is identical in both layers but behaves very differently. The earth's ozone layer is about three millimetres thick, about the same as two coins stacked one on top of the other.



Nearly bad; good from far

Ninety per cent of all O_3 is the 'good ozone' that is present in the stratosphere, about seventeen to fifty kilometres above the earth. Here O_3 forms a protective shield and blocks nearly all the harmful ultraviolet (UV) rays of the sun. Some UV rays do reach the earth and that is why people are advised to wear UV-protective sunglasses and use sunblock lotions. UV radiation can cause sunburn, skin cancer, and eye damage.

In the troposphere, near ground level on the earth, O_3 behaves badly. It is formed when polluting gases from cars and power stations mix with sunlight and heat and lingers near the surface of the earth. The highest levels of O_3 are, therefore, found during summer. When O_3 is this close to the earth, it acts as a harmful pollutant. It dirties the air and creates 'smog'. This is bad ozone, which often gets carried by winds to hundreds of kilometres around. Pollution, especially air pollution, not only causes global warming, it also leads to Ozone (o3) depletion.

O_3 Cleaner

Ozone is the most efficient natural substance used for purification. It destroys bacteria, fungi,cysts when it comes in contact with water, air or any food item. This is why it has been used for water treatment for over hundred years!

The zone with the hole in it

In 1984, scientists discovered that the O_3 above Antarctica was thinner than expected. This led them to look at other places on the earth and they found that the North and South Poles, Europe, and South America, among other places, had a general loss of O_3. This came to be known as the 'ozone hole.'

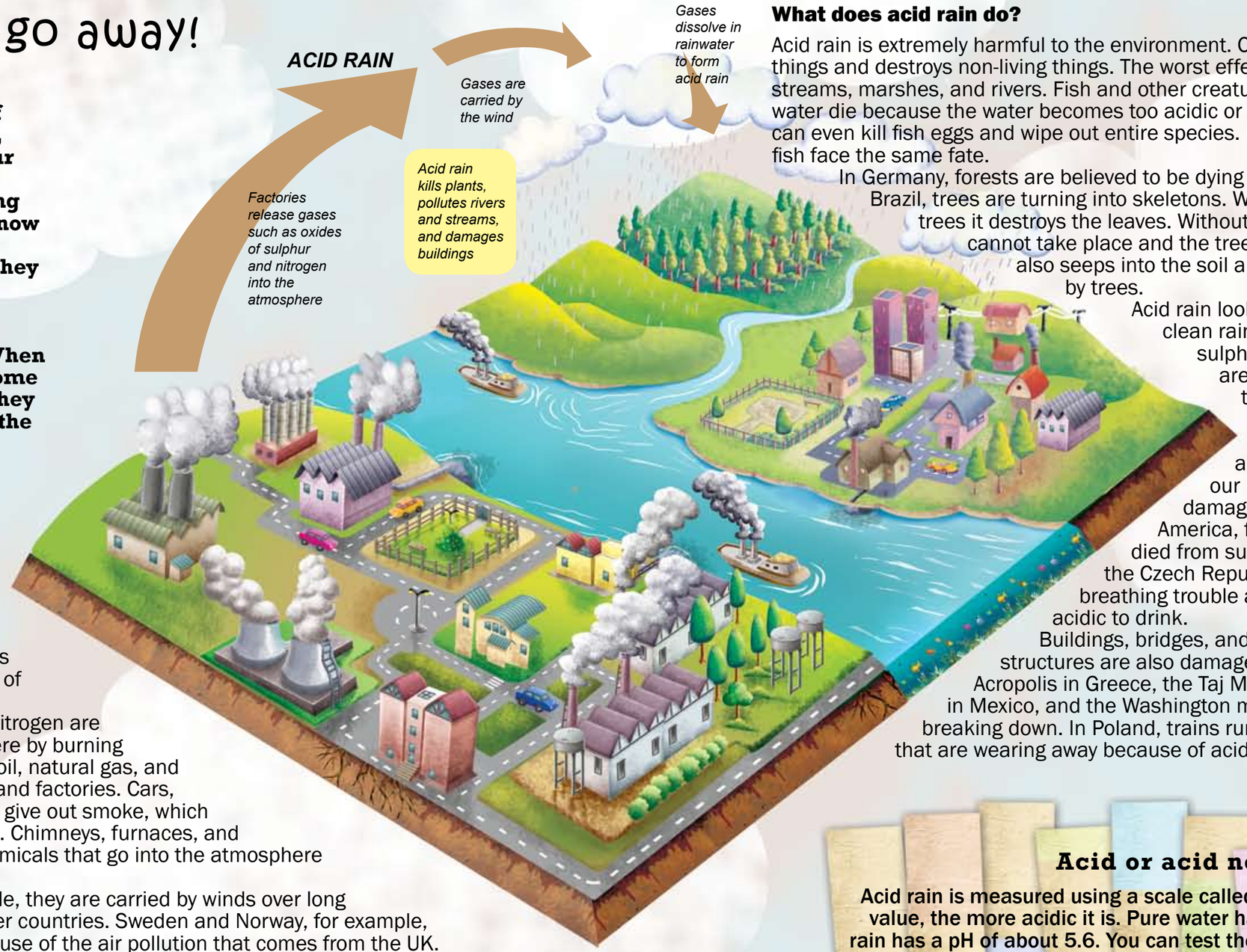
Scientists also learned what caused these 'holes'. Gases that came from refrigerators, air-conditioning systems, and fire extinguishers, also known as chlorofluorocarbons (CFCs), halocarbons, and halons, were responsible for making holes in the ozone layer.

No prizes for guessing who produced these gases!

Rain, rain go away!

Do you know that rain is the purest source of water in nature. Sadly, the increase in sulphur and nitrogen in the atmosphere is affecting rain too! When rain, snow or fog mix with these chemicals in the air, they fall to the ground as acid rain.

All water has some amount of acid in it. When the levels of acid become higher than normal, they cause air pollution of the worst kind!



Anything but natural

Sulphur and nitrogen are both found in nature. Sulphur is found in coal, oil, volcanoes, and sea spray. Nitrogen makes up seventy-eight per cent of the atmosphere.

However, sulphur and nitrogen are released in the atmosphere by burning fossil fuels such as coal, oil, natural gas, and gasoline in power plants and factories. Cars, trains, and other vehicles give out smoke, which contains these pollutants. Chimneys, furnaces, and engines let out these chemicals that go into the atmosphere and become acids.

Once the acids are made, they are carried by winds over long distances, sometimes over countries. Sweden and Norway, for example, get a lot of acid rain because of the air pollution that comes from the UK. Some air pollution falls back to the earth but a lot of it gets washed down with rain, snow, hail, mist or fog.

What does acid rain do?

Acid rain is extremely harmful to the environment. Over time, it kills living things and destroys non-living things. The worst effect of acid rain is in lakes, streams, marshes, and rivers. Fish and other creatures that live in and around water die because the water becomes too acidic or polluted. In fact, acid rain can even kill fish eggs and wipe out entire species. Birds that feed on polluted fish face the same fate.

In Germany, forests are believed to be dying because of acid rain. In Brazil, trees are turning into skeletons. When acid rain falls on trees it destroys the leaves. Without leaves, photosynthesis cannot take place and the trees eventually die. Acid rain also seeps into the soil and kills the nutrients used by trees.

Acid rain looks and tastes just like clean rain. When it falls as rain, the sulphur and nitrogen in the air are inhaled by people, and this can cause breathing problems. As acid rain falls on the food we eat and the water we drink, our health can be seriously damaged by diseases. In North America, fifty-one thousand people died from sulphur pollution in 1982. In the Czech Republic, children suffer from breathing trouble and the freshwater is too acidic to drink.

Buildings, bridges, and other man-made structures are also damaged by acid rain. The Acropolis in Greece, the Taj Mahal in India, the Pyramids in Mexico, and the Washington monument are peeling and breaking down. In Poland, trains run slowly on some tracks that are wearing away because of acid rain.

Acid or acid not!

Acid rain is measured using a scale called 'pH'. The lower the pH value, the more acidic it is. Pure water has a pH of 7.0. Normal rain has a pH of about 5.6. You can test the acidity of your drinking water or rain water by dipping one end of a pH paper, or litmus paper, in the water for about two seconds. Remove it and compare it with a pH colour chart to know how acidic the water is.

It's happening to them

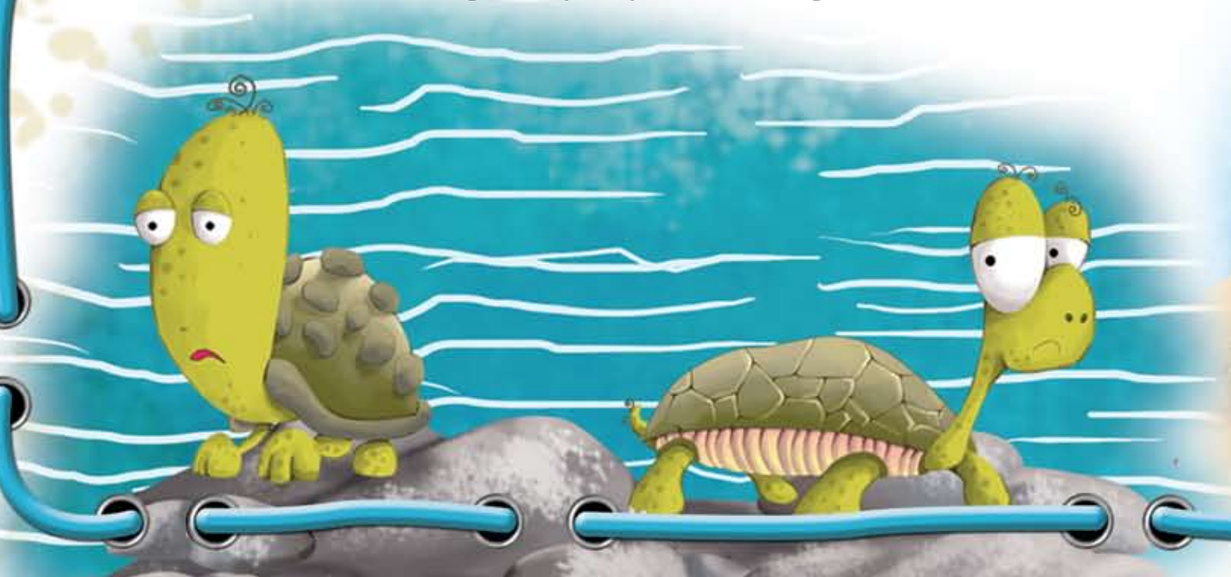
Birds, fish, land animals, plants, and ecosystems are all being affected by climate change. Even slight changes in temperature can cause endangered species to become extinct and threatened ones to become endangered.

Animals

It is hard enough living an animal's life. If global warming continues, animals that live in cold climates will be forced out of their habitats and will need to move uphill or towards the poles in search of food. This is already being seen in the Alps in Europe, in Queensland in Australia, and the forests of Costa Rica. Fish in the North Sea have begun moving northwards.

There is a long list of threatened animal species that could become extinct in the near future. The polar bear is facing shortage of food in the Arctic, and with its home under threat, this animal could be gone forever from the planet. Brazilian turtles are threatened by rising sea levels. This can affect their breeding and nesting and, in turn, their babies. The giant panda in China survives on the bamboo plant. As the bamboo habitats reduce due to climate change, pandas may be faced with starvation.

The warmer the climates the more likely are droughts and bush fires. If that happens in the rainforests of Indonesia, the orangutan will face extinction in the next few decades. Indian tigers, Australian frogs, and the African elephants are a few of the animals whose homes are being destroyed by climate change.



Birds

Leaving home in a hurry is never easy. Although birds can travel faster than other animals, there are some species that will not be able to make that move. If the planet warms more than two degrees Celsius, thirty-eight per cent of the birds in Europe and seventy-two per cent in north-eastern Australia could become extinct. Some bird populations that are decreasing are the tawny eagle in Asia and Africa, common guillemots around the coasts of Britain and Ireland, Arctic skuas and terns, and the Scottish crossbill. Warming of the earth is damaging the habitats of the Siberian cranes, tufted puffins, Galapagos penguins, red-tailed black cockatoo, and many other birds all over the world.

Climate change is considered to be a major threat to the common guillemots.

Conservationists are worried that unless action is taken to halt a rise in global temperatures, the Scottish Crossbill is under severe threat. This bird lives only in the Scots pine forests in Scotland.

There's a buzzzzzz...

They may be small but they have their timing right. With trees flowering sooner in spring, honeybees in Maryland, US, are starting their honey production earlier than usual.

Plants

Birds and animals can migrate to cooler places but for plants to sow their seeds in faraway places, without moving, would take a long, long time. Trees, shrubs, grasses, and plants are already feeling the heat. Trees are flowering earlier than usual and leaves are falling before time, almost as if plants and trees are confused about seasons. Coral reefs, alpine, mangroves, and rainforests may be lost forever to salt water rise and warmer air and ocean temperatures.

WARNING!

As the planet heats, twenty-five per cent of earth's species could vanish by 2050!

And it's happening to us

Climate change has a serious impact on the lives of humans beings too. Like plants and animals, human beings have to adapt to the changing climate, different weather patterns, and must battle graver diseases and natural disasters.

Diseases

A warmer earth would mean more frequent heat waves and milder winters. People in poor or developing countries would suffer higher heat-related deaths, especially among the young and the old. Mosquitoes breed in warm weather and that would mean more people becoming infected with malaria and dengue fever. The malaria mosquito would also be able to spread to other parts of the world. The West Nile virus, cholera, and lyme disease have been spreading across the US and Europe since 1999.

Food and water shortages

While on the one hand, sea levels would rise, on the other, there would be water shortages. Sea levels are already rising at twenty centimetres a century. Scientists think that global warming will cause sea levels to rise by as much as nine to eighty-eight centimetres by 2100. That would affect twenty-three million people in just five European countries, leave millions homeless worldwide, and threaten to wash away nations.
Floods, droughts, and storms would damage homes, human health, crops, and lead to diseases and food and water shortages.

Air pollution and UV radiation

Air and water pollution increase in higher temperatures. If our planet gets hotter by two degrees Celsius or more, people will suffer breathing problems. In the UK alone, higher levels of ultraviolet light could cause an extra five thousand deaths from skin cancer and may cause an increase of two thousand cases of eye disorders like cataract.

Another major problem would be an increase in ground-level ozone (the bad kind) and smog. If these levels go up they would cause death, affect the mental abilities of children, and lead to lung diseases.

Not a good count!

According to the World Health Organization, hundred and fifty thousand deaths and five million illnesses each year are caused by conditions directly related to climate change.

Will the culprit please stand up?

With all the mess and destruction around, you would think there's no hope for life on earth at all! Fortunately, all is not lost. People across the world realized they had to act fast to stop climate change. In 1992, representatives of 154 countries signed the United Nations Framework Convention on Climate Change (UNFCCC) at Rio de Janeiro, Brazil. This summit is famously known as the Earth Summit. It was thought that following the guidelines in the framework would control global warming. One of the most important achievements of the summit was an agreement on the climate change convention. This in turn led to the 'Kyoto protocol'. There was another agreement to "not carry out any activities on the lands of indigenous peoples that would cause environmental degradation or that would be culturally inappropriate". These rules would ensure that the world community at large, individuals as well as business communities, took real action to deal with the problem of global warming.

CO_2 and Kyoto

In 1997, representatives of more than one hundred and sixty countries met in Kyoto, Japan. They signed an agreement to cut down six greenhouse gases: carbon dioxide (CO_2), methane, nitrous oxide, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride. This came to be known as the Kyoto Protocol.

Countries were given different targets to reduce their CO_2 emissions, depending on how developed they were. Thirty-eight developed nations had to limit their CO_2 emissions and greenhouse gases to a certain number of units in a period from 2008 to 2012. If they managed to reduce their emission units more than what was required then they could sell the balance units to other countries that were emitting more than their share. Developing countries were not given any limits.

So far, 176 countries have accepted the Kyoto Protocol. Turkey and Croatia stayed away from the Protocol. The US did not accept it either but said it would work with other countries to control global warming.

In December 2007, the representatives of 187 countries met in Bali, Indonesia, to launch negotiations that would ensure that the new deal could enter into force by 2013, following the expiry of the first phase of the Kyoto Protocol.

Finally an agreement was drawn up under the Kyoto Protocol according to which industrialized countries will reduce their collective emissions of greenhouse gases by 5.2 per cent as compared to 1990. The goal is to lower the overall emissions of six greenhouse gases averaged over the period 2008– 2012.

Not so energetic!

In most countries, burning fossil fuels for activities related to the energy sector is the main source of carbon dioxide emissions. For instance, eighty per cent of the global greenhouse emissions are from the energy sector!

Tuesday, February 5, 2008

TOP NEWS

www.climatenews.in

The US, Japan, Russia, and the European Union together are believed to have given out seventy per cent of CO_2 emissions between 1850 and 2004. The US then became the global warming leader, giving out the most CO_2 emissions from burning fossil fuels such as coal and oil.

In 2007 the total U.S. greenhouse gas (GHG) emissions were 7,282 million metric tons. This is an increase of 1.4 per cent from the 2006 level. Since 1990, U.S. GHG emissions have grown at an average annual rate of 0.9 per cent.

After China and the US, the other top emitters of CO_2 are Russia, India, Japan, Germany, Brazil, Canada, UK, Australia, and Italy. But each American still produces more greenhouse gases than any other one person in the world.

Days after tomorrow

If you asked your doctor, "How healthy am I?", your doctor would not be able to answer the question by only looking at you. He/she would run some tests to check if your organs were functioning well, if your body was free of infections, and also ask you about past illnesses.
Similarly, scientists continuously check on the planet's health. They use computer models of the atmosphere and the oceans to predict how the earth is responding to higher levels of greenhouse gases. They also use information from the past, of rocks and soils, to test how accurate their models are. The GCMs (general circulation models) are the most advanced of these models and scientists are making some pretty scary predictions about the future of our planet.

The future of warmer temperatures looks like this...

Warmer temperatures will increase evaporation and increase the likelihood of droughts and wildfires from the Himalayas to the African bush, Siberia to southern France. Some other places will become drier and the Amazon rainforest may turn into a desert. Floods and droughts will become more frequent. Rainfall in Ethiopia, where droughts are already common, could reduce by ten per cent in the next fifty years.

Some scientists believe the planet is headed for a record-setting heatwave after 2009. From 2010 through 2014, each year would be fifty per cent hotter than 1998, the hottest year recorded so far. In the next one hundred years, the average global temperature is expected to increase by 1.4 degrees Celsius to 5.8 degrees Celsius. By the end of the twenty-first century, sea levels are likely to rise by nine millimetres and eighty-eight centimetres. This would threaten coastal areas from the North Sea to the swamps of West Africa. Islands in the South Pacific could disappear completely by 2100.

An increase of two to three degrees Celsius could melt most of the world's glaciers. The Himalayan and Alpine glaciers could be mostly gone by 2100. Those in East Africa and the Andes would disappear sooner. Climate change could bring more landslides, hurricanes, and smog. A possible increase in major storms, heatwaves, and flooding will be among the deadly effects, rather than the actual warming itself.

If things carry on as they are, with no one making efforts to reduce global warming, the results could be disastrous. Surprisingly, they could also benefit certain crops but only if the change in climate is small. The larger the change in climate, the bigger the negative effects for the planet.

The height of change!

The sherpas – many of whom are mountain guides – in Nepal have noticed that the glaciers around Mt Everest are melting quickly. Climbers used to take at least four days to get to the top from base camp. Today, with less ice and snow on the mountain, climbers can reach the summit in just eight hours!

What's your footprint size?

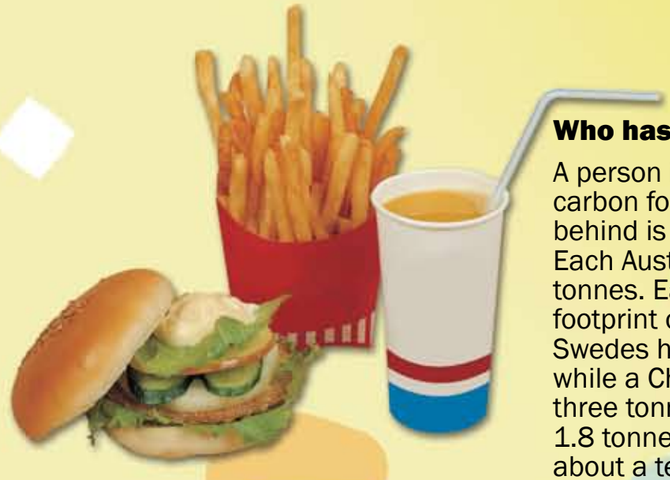
You probably have seen your wet footprint and shoe print but do you know that you also have another footprint that can be calculated? Every activity that you do, from brushing your teeth to switching on your television set, gives out a certain amount of carbon dioxide (CO_2). Environmentalists call this a carbon footprint.

People, schools, businesses, industries, homes, all have carbon footprints. Everybody's carbon footprint adds to global warming and climate change.

All human activities produce greenhouse gases. This is measured as CO_2 equivalent in pounds, kilograms, or tonnes.

Bigger isn't better

Developed countries like the US and Russia give out more and more CO_2 each year. Developing countries in Asia and Africa, with their growing population, are catching up. As people's lifestyles improve, they begin to use gadgets, such as electrical appliances and cars, which use more energy. Electricity is one of the biggest cause of CO_2 emissions. Each time people switch on a light or turn on the television, they are adding to global warming.

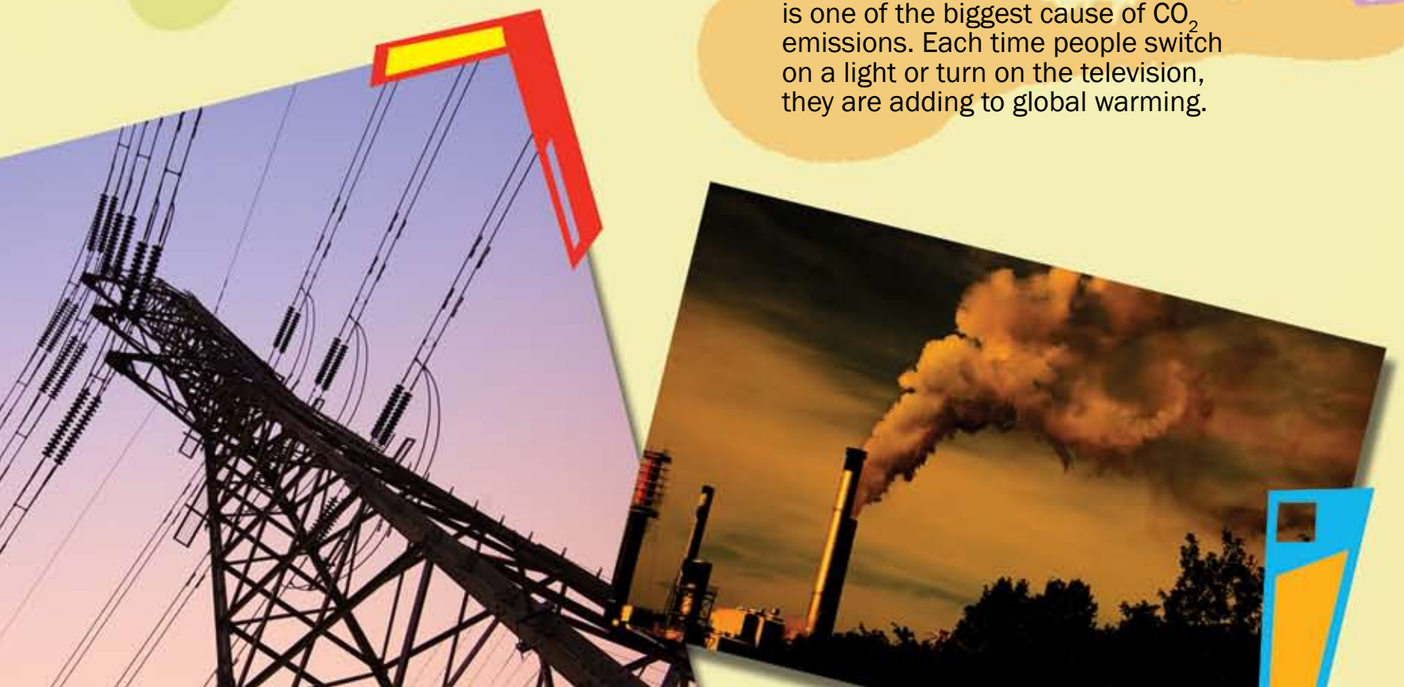


Who has the biggest footprint?

A person in Canada, on an average, has a carbon footprint of twenty-one tonnes. Close behind is an American, with twenty tonnes. Each Australian is responsible for eighteen tonnes. Each person in Britain leaves a footprint of nine tonnes. The Swiss and the Swedes have a footprint of six tonnes each, while a Chinese person's footprint is about three tonnes. An Indian's carbon emission is 1.8 tonnes and that of the average Ethiopian, about a tenth of a tonne. The smallest footprint in the world comes from the people of Chad—just one-hundredth of a tonne of CO_2!

With each step

Each of the following activities adds one kilogram of CO_2 to your carbon footprint: travelling a distance of ten to twelve kilometres by public transportation (train or bus); driving a distance of six kilometres in your car; flying a distance of 2.2 kilometres on a plane; operating your computer for thirty-two hours; buying two plastic bottles.



What's your size?

Your carbon footprint depends on many things: your age, where you live and, most importantly, how you live. The two biggest and most important human activities that make up a person's carbon footprint are transportation and home appliances or electrical gadgets a person uses. Even so, all your actions have some kind of effect on the amount of CO_2 you are sending out into the atmosphere. The food you eat, the clothes you wear, the paper you use—everything adds to your footprint. And each person's footprint makes the world warmer!

Usually, a carbon footprint is calculated for the time period of a year.

Do the earth a favour

If you have read enough to be worried about your carbon footprint and would like to be a size smaller, then here are some tips.

Saving energy

If people changed their lights bulbs in their homes to compact fluorescent lamps (CFLs), they would reduce their household emissions by about three hundred kilograms per year. Switching off lights/fans before leaving a room would save a huge amount of energy. Microwaves, televisions, DVD players, and other electrical gadgets that are left on standby not only use energy but also give out tonnes of emissions. By being more energy efficient at home, people can reduce their emissions, as well as lower their energy bills by more than thirty per cent.

Making energy-efficient homes with the right kind of building materials is another intelligent way to reduce greenhouse gases. Almost half of the energy used in homes goes into heating and cooling. Lowering the temperature in winter and raising it in summer by just two degrees Celsius could save the planet from thousands of tonnes of carbon dioxide (CO_2).

Low-carbon diet

Takeaway food can seem more delicious and convenient than home-cooked meals, but the foil packing that comes with it gives out more carbon than you can see. Strawberries from Spain in the UK, apples from California in India, and kiwis from Australia in the US are transported by burning fuel. Eating fresh and seasonal produce grown in nearby fields leads to a smaller footprint than when food is transported from far away places.

Cutting emissions

Using public transport to get to a place, car-pooling, walking or cycling are simple ways to keep the planet clean. Fewer vehicles on the road would mean less CO_2 emissions. If people carried a strong reusable shopping bag and turned down plastic bags, less trash would fill the landfills.

Doing the right Rs

People can prevent five hundred kilograms of CO_2 emissions if they cut down their garbage by ten per cent.

Almost half of a person's carbon footprint is made up of things used and thrown. Cans, bottles, paper, plastics, and metal are things that can be recycled and made into new materials or products. Reusing boxes, bottles, clothes, books, cloth napkins, and other usable things by repairing, selling or donating them also reduces waste. It is better to reuse than recycle because the item does not need to be treated before it can be used again.

Fitting solar panels for heating homes and water reduces fossil fuel burning. Using a composter to recycle garden and kitchen waste such as leaves, tea bags, and grass cuttings benefits the environment in many ways. It also reduces the need to use chemicals and fertilizers, as well as the load on landfills.

The three chasing arrows

This logo – the Mobius Loop – was designed on Earth Day in 1970. Today, it is recognized all over the world as a recycling symbol. If the logo is printed on a dark background it means that the item has been made from recycled material. If it is on a light background it means the item can be recycled.

FIVE STEPS TO SAVE ENERGY

- Turn off the lights when not in use
- Use public transport whenever possible
- Set your computer on a sleep mode after 15 minutes of non use.
- Replace light bulbs with CFL's
- Never exceed the speed limit and maintain a steady speed when driving.

Did you know?

An aquifer is an underground bed, or layer, of the earth that stores freshwater. When groundwater gets polluted it is very difficult to clean as it doesn't just 'flush out' on its own. Water that enters an aquifer remains there for an average of one thousand four hundred years!

Replacing ten hundred-watt light bulbs with CFLs reduces the same amount of carbon dioxide that an SUV emits over a year over the course of the bulbs' lifetime!

The good news is that nine out of ten people around the world are aware of global warming. The bad news is that only over half of them (fifty-seven per cent) consider it a 'very serious problem.' The Czechs are the most aware about global warming.

Some of the most polluted places in the world, 2007

- ***Sumgayit, Azerbaijan,*** forty factories release 70,000 -120,000 tons of detergents and pesticides into the air every year
- ***Linfen, China,*** where people actually choke on coal dust in the evenings. Severe air and water pollution from coal,steel and tar industries
- ***Tianying, China,*** largest lead production bases in China,with ver high lead concentrations in the air and the soil. Ten times more than the national health standards
- ***Sukinda, India,*** twelve chromite ore mines dump untreated water into the river, causing severe water contamination
- ***La Oroya, Peru,*** where a metal processing plant gives out toxic emissions of lead
- ***Dzerzinsk, Russia,*** a major chemical weapons manufacturing sites that were used until the end of the Cold War
- ***Norilsk, Russia,*** which is home to the world's largest heavy metals smelting factory
- ***Chernobyl, Ukraine,*** where the nuclear site disaster took place twenty years ago. The 19 mile exclusion zone around the site is uninhabitable

Make your own greenhouse

You don't have to be a scientist with a sophisticated laboratory to figure out how our planet is getting warmer. Try this simple experiment at home to know and understand more about the greenhouse effect.

Materials

- Plastic bottle
- Nail
- Two thermometers

Objective

The objective is to make your own small greenhouse and in a simple way to test its effect on temperature.

Procedure

1. Make a hole near the top of the plastic bottle with the nail and insert one thermometer.
2. Place the second thermometer next to the bottle.
3. Make sure that the same amount of sunlight reaches both the thermometers.
4. Record the temperature values of both thermometers after ten minutes or so.
5. Take the temperature records again after another ten minutes. Repeat that procedure a few times.

You will find

Both thermometers will record different temperatures. The one in the bottle will show a higher temperature because of the trapped heat in the bottle. This is your greenhouse effect in a bottle!

Glossary

Aquifer— an underground bed, or layer of earth, that stores freshwater. It generally holds enough water to be used as a water supply.

Antarctica— the continent centred on the South Pole. Antarctica is a plateau covered by mountains and ice, with ninety-five per cent of its surface under an ice cap, averaging one mile in thickness.

Atmosphere— a layer of invisible gases that surrounds and protects our planet and all life on it.

Barometer— an instrument that measures atmospheric pressure.

Buoy— a float placed in open waters to signal or warn ships of danger or of a shore nearby.

Carbon dioxide (CO_2)— a colourless, odourless, and non-poisonous gas found in the air in small amounts. Humans exhale it, and trees and other plants absorb it and use it to make food. It is a greenhouse gas.

Carbon footprint— the total amount of greenhouse gases given out by a product or person over its entire life cycle.

Carbon monoxide (CO)— a colourless, odourless, and poisonous gas that is released into the air when oil, coal, and wood are burned.

Chlorofluorocarbons (CFCs)— kinds of greenhouse gases found in the atmosphere. They are given out by refrigerators, air conditioners, and cleaning chemicals.

Climate— the expected long-term weather found in a region, such as a hot, dry desert or the cold, snowy arctic.

Climate change (often called global warming)— refers to: 1) rising global temperatures; 2) increasing floods and droughts; and 3) rising of sea level

Climatologist— a scientist who studies climate.

Composting— gathering together various types of plant material such as leaves, grass clippings, food waste, and sawdust usually in a pile and letting them rot naturally. This makes compost that is used as fertilizer.

Contaminants— substances that put air, water, soil or food at risk.

Ecosystem— a collection of plants and animals living in an area along with the things they need to live, such as a place to live, food, and water. An ecosystem can be as small as a tiny tide pool or as large as a vast desert.

El Niño— the name given to the changes in direction of winds over the Pacific Ocean. This causes abnormal warming of the ocean's surface in the eastern Pacific roughly every three to seven years. This ocean warming can strongly affect weather patterns all over the world.

Emissions— are gases that are given out by things like cars and burning fossil fuels.

Endangered species list— a list of animals and plants in danger of becoming extinct.

Fossil fuels— fuels such as oil, which come from decomposed living matter.

Geologists— scientists who study the history and structure of the earth.

Glaciers— large blocks of ice.

Greenhouse effect— a natural process by which gases in the earth's atmosphere trap the sun's heat and prevent the planet from freezing.

Greenhouse gases— gases that trap heat in the atmosphere. They include water vapour, carbon dioxide (CO_2), methane, and nitrous oxide.

Ice core— a sample of ice that is got by drilling a hollow steel tube into the snow and ice of many years.

Landfill— a gigantic pit that has been dug into the ground. It is where our garbage is dumped when we throw it out.

Methane— a non-poisonous gas. Ten percent of methane in the atmosphere comes from natural processes such as turning wood into coal and plant decay. More than eighty per cent comes from human activities such as burning fossil fuels.

Nitrogen— a natural gas that makes up nearly seventy-nine per cent of the earth's atmosphere.

Molecule— a group of atoms that are blended together chemically.

Nitrogen dioxide— a pollutant that causes smog and acid rain as well as eye, throat, and lung irritation. Nitrogen dioxide is mainly produced by burning fossil fuels.

Orbit— the curved path that planets follow around the sun.

Ozone (O_3)— a gas. Ozone high in the stratosphere is good, but near the earth's surface (where it is breathable), it is unhealthy.

Ozone layer— lies about fifteen to forty kilometres above the earth's surface in the stratosphere. It protects the earth from receiving harmful rays from the sun.

Ozone hole— a thinning of the ozone layer.

Photosynthesis— a process in green plants that uses the sun's light and CO_2 to produce food. Oxygen and water are also made during the process.

Pollutant— anything that makes parts of our natural environment dirty. For example, the tiny, often invisible specs of dirt that are spewed out by cars and trucks pollute our air, and are, therefore, air pollutants. Oil spilled into a lake or an ocean is a water pollutant; and garbage dumped onto land is a land pollutant.

Pollution— harm to a natural environment, such as air, water or soil through contamination with either natural or man-made materials.

Respiration— taking in and giving out air during the process of breathing.

Recycling— the process of reusing waste products.

Sea level— the level of the ocean's surface.

Smog— a word created in England in 1905 by combining 'smoke' and 'fog'. Originally it meant just that—smoke from burning coal and other fuels mixed with fog to create a haze. Now, it is used for any kind of air pollution found in cities.

Threatened Species— any plants, animals, insects, and other life form that is in danger and likely to become extinct in the near future.

Tree rings— the circular lines in a trunk of a tree. As a tree grows older it adds a layer of wood and its trunk gets thicker.

Ultraviolet (UV) radiation— a type of invisible light from the sun.