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SAVE PLANET



101 Q & A

on CLIMATE change



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 of 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 as 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 Emirates 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.

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PHENOMENA: NATURAL AND MECHANICAL

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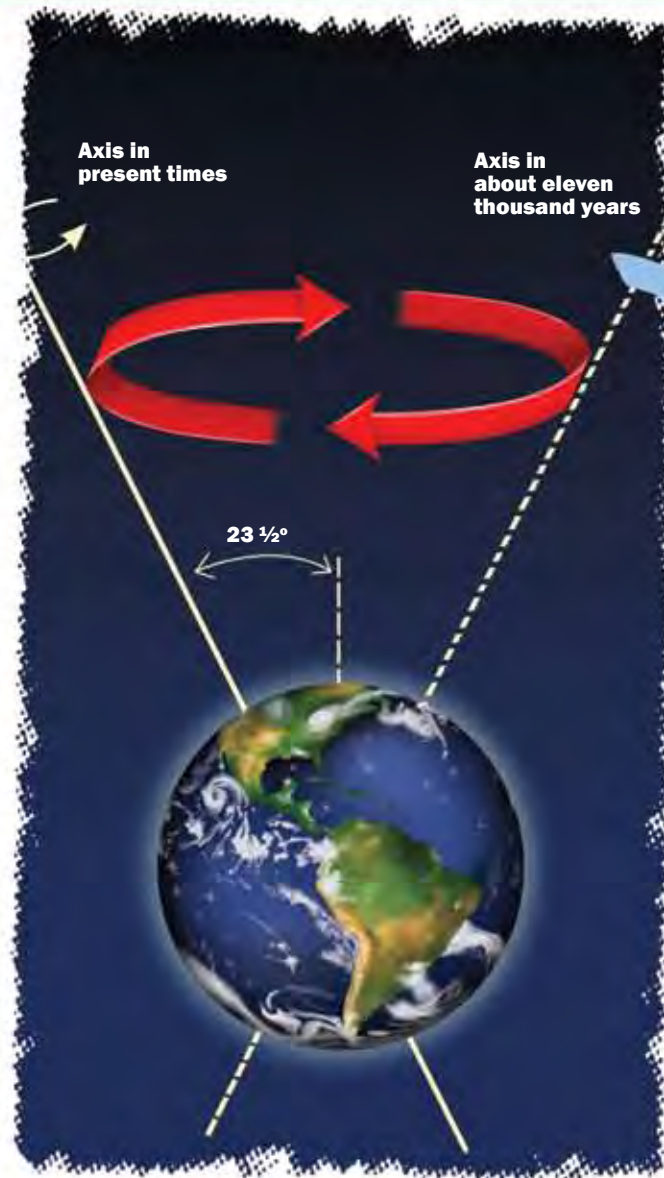
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CONSERVATION: PEOPLE AND PROTOCOLS

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1

ARE NATURAL FACTORS RESPONSIBLE FOR CLIMATE CHANGE?

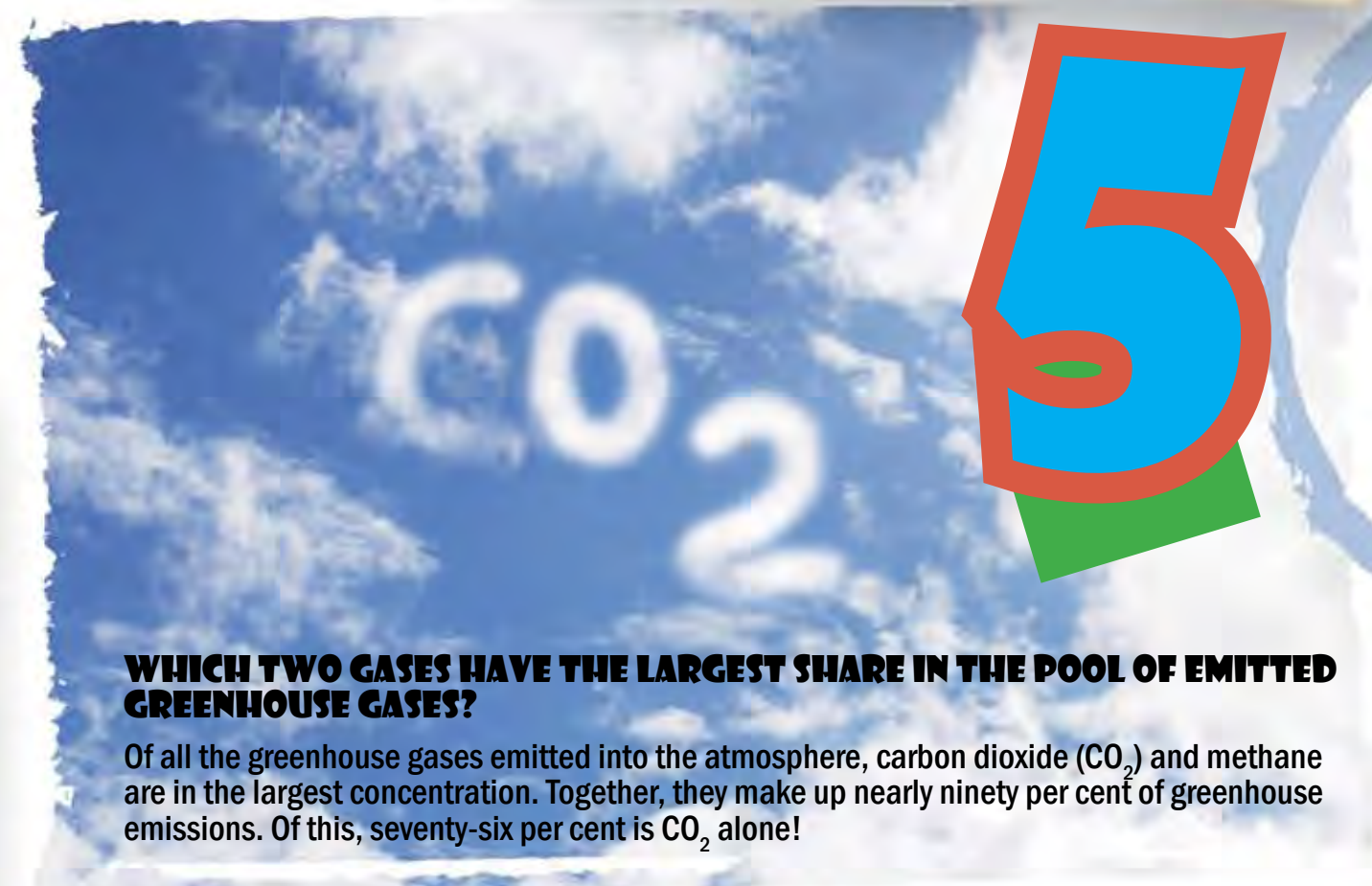
Yes, climatologists have discovered that there are some natural factors that lead to climate change. One of these is the Milankovitch Cycle, which explains how the change in the earth's orbit around the sun affects the climate. The changes influence the earth's tilt towards or away from the sun. The warming of the earth is affected by the amount of solar energy that it receives, which, in turn, depends on the tilt of the earth.



4

WHICH FOSSIL FUELS EMIT THE LARGEST QUANTITIES OF SULPHUR DIOXIDE GAS?

Coal and oil emit the largest quantities of sulphur dioxide (SO_2) gas. Both these fossil fuels contain large quantities of sulphur, which on burning releases sulphur dioxide into the air. Did you know that sixty-five per cent of the annual SO_2 emissions come from electric utilities that burn coal?



5

WHICH TWO GASES HAVE THE LARGEST SHARE IN THE POOL OF EMITTED GREENHOUSE GASES?

Of all the greenhouse gases emitted into the atmosphere, carbon dioxide (CO_2) and methane are in the largest concentration. Together, they make up nearly ninety per cent of greenhouse emissions. Of this, seventy-six per cent is CO_2 alone!

2

WHY ARE GREENHOUSE GASES IMPORTANT?

Greenhouse gases, found in the atmosphere, cover the earth like a blanket. Although a high concentration of these gases is harmful for the environment, if it were not for greenhouse gases, our planet would have been about thirty-three degrees Celsius colder than it is now!

3

WHAT IS THE PERCENTAGE OF OXYGEN IN THE ATMOSPHERE?

Oxygen is essential for the life on the planet. The atmosphere contains about twenty-one per cent of the total oxygen on the earth. Can you guess how much oxygen there was on the planet at the time of its formation? Believe it or not, at that time there was no oxygen at all! It has taken millions of years for oxygen to build up in the atmosphere.

9

WHAT IS THE OZONE SHIELD?

The ozone shield, which lies between ten and forty kilometres above the surface of the earth, is found in the stratosphere, a layer of the atmosphere. It protects the earth's surface by absorbing the harmful ultraviolet radiation from the sun.

10

WHAT HAS BEEN THE AMOUNT OF INCREASE IN THE EMISSION OF GREENHOUSE GASES IN THE LAST TWO HUNDRED AND FIFTY YEARS?

In the last quarter of a millennium there has been a massive increase in the emission of greenhouse gases into the atmosphere. The emission of nitrous oxide has risen by fifteen per cent, methane by fifty per cent, and carbon dioxide by a whopping fifty per cent!

6

WHICH CEREAL CROP, PLANTED IN ANKLE-DEEP WATER, EMITS LARGE QUANTITIES OF THE GREENHOUSE GAS METHANE?

This crop is rice. Flooded rice cultivation produces methane gas by the fermentation of the organic matter in the soil. The gas is released from submerged soils through the roots and stems of rice plants. Methane is a major greenhouse gas and can lead to more rapid global warming than carbon dioxide!

7

WHAT ARE CFCs?

CFCs, or chlorofluorocarbons, are chemical compounds that contain chlorine, fluorine, and carbon. These are artificially created, very strong greenhouse gases. Although these are non-polluting and safe to use, CFCs contribute very significantly to ozone depletion. CFCs are released from aerosol sprays, refrigerants, and the production of foams.

8

HOW DO AEROSOLS IN THE ATMOSPHERE AFFECT RAINFALL?

Research shows that aerosols affect rainfall patterns in tropical countries. The water in the atmosphere gets deposited on the aerosol particles to form clouds. The larger the number of these particles, the greater are the tiny water droplets formed. These drops take longer to form into bigger ones that can fall as rain. Rainfall is reduced because the clouds move away to drier areas and get evaporated!



11

WHAT IS GLOBAL WARMING?

Global warming can be described as the rise in the temperature of the earth due to excessive increase in the concentration of greenhouse gases. Global warming is also known as the greenhouse effect. If global warming continues at the current rate, by the year 2100, the temperature of the earth is expected to rise by 1.8–4 degrees Celsius!

12

WHICH IS THE MOST HARMFUL TYPE OF ULTRAVIOLET RADIATION?

The most dangerous ultraviolet radiation is the Type C ultraviolet radiation. But the good news is that this radiation is completely absorbed by the ozone layer and oxygen and does not reach the earth.

14

WHICH POLLUTANT, EMITTED BY SUPERSONIC JETS, IS DAMAGING THE OZONE LAYER?

Supersonic jets release high quantities of pollutants. Nitric oxide is one of the major emissions from these jets. This reddish-brown, pungent smelling gas is extremely poisonous and one of the worst air pollutants. It is also leading to the depletion of ozone.

13

HOW MUCH CARBON DIOXIDE IS EMITTED INTO THE ATMOSPHERE ANNUALLY?

We know that plants absorb carbon dioxide (CO_2). All the trees and plants of the world together take in 6.1 billion metric tonnes of this greenhouse gas. Despite that, a staggering 3.2 billion metric tonnes of CO_2 is added to the atmosphere every year! A portion of it comes back from deforestation. As soon as a tree is cut, the CO_2 stored in it escapes into atmosphere.

15

WHO WAS THE FIRST PERSON TO DESCRIBE THE PHENOMENON OF ACID RAIN?

Robert Angus Smith was the first person to describe the phenomenon of acid rain in 1852. He even coined the term 'acid rain'. Working at that time at the Royal Manchester Institution in Manchester, UK, this famous analytical chemist explained the relationship between acid rain and atmospheric pollution.

16

HOW IS SULPHUR DIOXIDE GAS EMITTED INTO THE ATMOSPHERE?

Sulphur dioxide (SO_2) gas is emitted into the air largely through industrial processes such as smelting of ore and natural processes like burning of fossil fuels and processing of natural gas. Did you know that ten per cent of the total SO_2 emission is from volcanoes!



17

WHICH HARMFUL RADIATIONS ARE KEPT OUT OF THE ATMOSPHERE BY THE OZONE LAYER?

The ozone layer keeps ultraviolet rays from reaching the earth. These harmful radiations can cause skin cancer, damage the eyes, affect farming crops, and can also ruin ocean life and forests.

WHAT USE DID NITROUS OXIDE GAS HAVE IN THE FIELD OF DENTISTRY?

This might sound unbelievable but the poisonous nitrous oxide gas was used by dentists to numb areas in their patients' mouths. However, this practice has now been discontinued and dentists now use local anaesthesia for this purpose.

18



19

WHICH COMPONENT OF CHLOROFLUOROCARBONS IS RESPONSIBLE FOR THE DESTRUCTION OF THE OZONE LAYER?

Atoms of chlorine that are released by chlorofluorocarbons are primarily responsible for damaging the ozone layer. Chlorine breaks up the ozone into one molecule of oxygen gas and one loose, unstable oxygen ion, thereby destroying the ozone shield.

20

WHY IS THE GREENHOUSE EFFECT CALLED SO?

The greenhouse effect was given its name by French physicist Jean Baptiste Joseph Fourier in 1827. Fourier compared the earth's atmosphere to a closed glass vessel. He identified this with the greenhouses where plants are kept. He observed that the air around the earth filters in sunlight exactly like a glass roof and therefore, gave that name to the phenomenon!



22

WHICH IS THE MAIN POLLUTANT EMITTED BY COAL-BASED POWER PLANTS?

Coal-based power plants, or thermal power plants, discharge a number of pollutants in the air, the main one being fly ash. India generates hundred million tonnes of fly ash each year. Nearly ninety per cent of this ends up in waste mounds. Almost forty per cent of the fly ash can be converted into cement, which could reduce energy costs and waste!

21

WHICH IS THE HOTTEST YEAR IN RECORDED HISTORY?

The hottest year in recorded history was 2005, when the average annual global temperature shot up to 14.77 degrees Celsius! This was 0.06 degrees higher than the last record of 14.71 degrees Celsius in 1998.

23

WHAT DOES SPM STAND FOR?

SPM stands for suspended particulate matter. It is one of the most dangerous air pollutants. It affects our lungs through the air we breathe and can even cause death. SPM is a mixture of solid and liquid particles of dust, sand, wood particles, metals, and smoke that are suspended in the air and are not visible to the naked eye.

24

WHICH INDUSTRIAL SECTOR IS THE LARGEST CONTRIBUTOR OF GREENHOUSE GASES TO THE ATMOSPHERE?

The largest amount of greenhouse gas emission – almost eighty per cent – comes from the energy sector. It is very important, therefore, that we look for alternatives, such as solar and hydel power generators, for generating power.

25

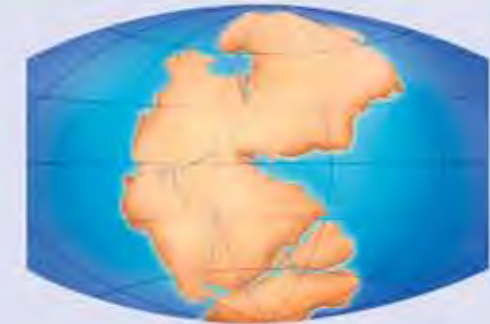
DO YOU KNOW WHY VEHICLES EMIT CARBON MONOXIDE?

Carbon is a major constituent of the fuel on which vehicles run. Vehicles emit carbon monoxide (CO) gas due to incomplete combustion, or burning of carbon in the carburettor of the engine. When there isn't enough oxygen for the carbon to burn up completely, the poisonous CO is produced and released into the air.

29

HOW DOES CONTINENTAL DRIFT LEAD TO CLIMATE CHANGE?

At the time of the formation of the earth, all the continents were merged into one solid land mass. Continental drift is the phenomenon by which the continents have very slowly drifted apart. This phenomenon leads to changes in the composition of the earth and that of mountains and oceans. Change in the flow of wind and ocean currents lead to climate change.



225 million years ago



150 million years ago



Continents today

30

WHAT ARE AEROSOLS?

Aerosols are very tiny airborne particles suspended in the air that absorb the sun's radiations, thus causing the greenhouse effect. It may also cause a cooling effect by scattering and reflecting the solar radiation. Natural aerosols are generated from forest fires, dust storms, volcanoes, and sea spray. Ten per cent of the aerosols in the atmosphere are there as a result of human activities such as burning of fossil fuels and the use of deodorants!



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WHAT IS FLY ASH?

Fly ash is made up of very fine particles of ash that are produced when coal is burned. These are very light and rise up to mix with the air. It is a major source of air pollution. One can only imagine the damage it causes to the environment!

27

WHICH CFC IS MOST COMMONLY USED IN REFRIGERATORS?

Chlorofluorocarbons (CFCs) are hugely responsible for lowering the concentration of ozone in the atmosphere. They are widely used in many industries as well as in our homes. The CFC used most commonly in refrigerators is freon.

28

HOW DO HUMAN BEINGS CONTRIBUTE TO INCREASE IN EMISSIONS INTO THE ATMOSPHERE?

Experts believe that over half of the increase in greenhouse gases in the atmosphere was due to emissions from human sources, such as landfills, natural gas and petroleum systems, agricultural activities, coal mining, waste-water treatment, stationary and mobile combustion, and certain industrial processes. Over the last two and a half centuries, the concentration of methane in the atmosphere has increased by 143 per cent!

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WHICH IS THE ONLY GREENHOUSE GAS PRODUCED WITHOUT ANY INTERFERENCE FROM HUMAN BEINGS?

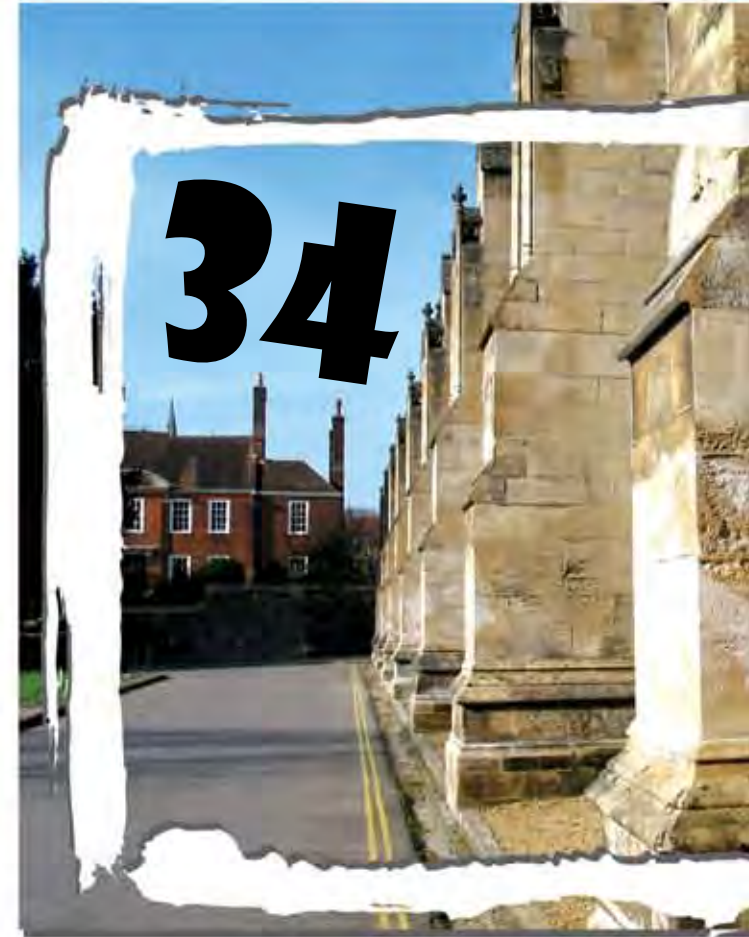
The only greenhouse gas that is produced naturally, with no interference from humans, is water vapour! The process of evaporation from the many water bodies on the earth forms water vapour. Did you know that these tiny water droplets that rise up in the air can actually lead to ozone depletion?



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WHAT IS BLACK LIGHT?

Ultraviolet (UV) radiation is also known as black light. Black light is used in some light bulbs, which when switched on, emit a glowing purplish light. Black light causes white objects to glow in the dark. Fluorescent ink from highlighter pens glows under black light!



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CAN ACID PRECIPITATION OCCUR DURING DRY PERIODS?

Acid precipitation occurs during dry periods as well. Most of the materials added to the atmosphere return to the ground through a process known as deposition. Deposition occurs when it rains and snows, but it can also occur when dust settles during dry periods. This is because the earth's gravity works to continually pull dry particles back to earth.

33

WHAT IS ACID PRECIPITATION?

Acid precipitation is the term used to describe the acid pollution that can be found in the various forms of precipitation like rain, snow, hail, and fog. Acids like nitric acid and sulphuric acid are produced when pollutants nitrous oxide and sulphur dioxide react with water. These acids then come down to the earth as acid precipitation.



13	Liquid drain cleaner, caustic soda	14
11	Bleaches, oven cleaner	12
9	Soapy water	10
7	Household ammonia	8
5	Milk of magnesium	6
3	Toothpaste	4
1	Baking soda, seawater, eggs	2
	"Pure" water	0
	Urine, milk	
	Acid rain, black coffee	
	Tomato juice	
	Grapefruit and orange juice, soft drink	
	Lemon juice	
	vinegar	
	Hydrochloric acid secreted from the stomach lining	
	Battery acid	

35

ON WHAT SCALE IS THE ACIDITY OF RAIN MEASURED?

The acidity of rain or the amount of acid present in rainwater is measured on the pH scale. The maximum acidity any substance can have is zero on the pH scale. The lesser the pH, the greater is the acidity of a substance. Rainwater with a pH below 5.6 is considered to be acid rain.

36

HOW DOES CLIMATE CHANGE AFFECT SEA LEVELS ?

One of the most serious impacts of climate change is the rise in sea levels. The increase in global temperature has led to the melting of glaciers and ice caps, as a result of which the water level in seas has gone up. Over the last hundred years, global sea level has risen by about ten to twenty-five centimetres!

WHY ARE TROUT AND SALMON IN DANGER?

Coldwater fish trout and salmon are the most vulnerable to global warming. The ideal temperature in which these fish thrive is ten to twenty degrees Celsius. These fish cannot live in warm water, and global warming is raising the temperature of the waters that they inhabit. If the greenhouse emissions are not reduced, the numbers of these fish will drop by thirty-eight per cent by 2090.

38

WHICH WELL-KNOWN FOREST IN GERMANY HAS BEEN SEVERELY AFFECTED BY ACID RAIN?

It is the Black Forest, located in south-west Germany. The Black Forest is famous for its pines and firs. It is the primary source of wood for the country's massive timber and woodwork industry. Unfortunately, the forest has been damaged due to acid rain, which has affected its flora and fauna.

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WHAT IS THE GOLDEN PAGODA?

If you thought the golden pagoda was a monument in the Far East, you guessed wrong! It is actually a flower that is native to the Western Cape, South Africa. This plant was discovered as recently as 1987, but it is already facing the threat of extinction due to the rise in temperature.

WHAT IS CORAL BLEACHING?

Due to global warming, the temperature of oceans has also risen. When an ocean's temperature becomes much higher than what corals can withstand, the algae found there are expelled. The corals lose the green-blue colour that is imparted to them by the algae. They begin to appear as though they have been bleached white. This is known as coral bleaching.

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HOW DO CORAL REEFS REDUCE GLOBAL WARMING?

Coral reefs act as natural sinks for carbon dioxide (CO₂). This means that they absorb CO₂, which is a major contributor to global warming. The largest coral reef on the earth is the Great Barrier Reef, located in the Coral Sea, north-east of Australia.

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WHICH COUNTRY EMITS THE LARGEST QUANTITIES OF GREENHOUSE GASES?

The US is the largest emitter of greenhouse gases in the world. Carbon dioxide is the major greenhouse gas emitted. It constitutes about eighty-five per cent of the country's total greenhouse gas emissions! Recently, China surpassed the US as the largest emitter of these emissions per year. But if we take past emissions into account, then the US remains the biggest emitter to date.

43

DOES CHLORINE RELEASED FROM NATURAL SOURCES SUCH AS OCEANS AND VOLCANOES LEAD TO OZONE DEPLETION?

It might sound surprising, but no, it does not! A large amount of chlorine is released from natural sources such as oceans and volcanoes. However, the chlorine released through these sources is easily dissolved in water. Therefore, it mixes with the falling rain and causes no damage to the ozone layer!

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WHY IS THERE A RAPID FALL IN THE POPULATION OF FROGS AND TOADS ALL ACROSS THE WORLD?

Frogs and toads, of the amphibian class of vertebrates, are extremely sensitive to changes in climate. They cannot survive even the slightest rise in temperature than what they are used to. Many different species have died out and many are on the verge of extinction. The shiny, bright orange golden toad that once inhabited the tropical forests of South America is already extinct.



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WHAT IS PECULIAR ABOUT EMPEROR PENGUINS?

Emperor penguins, a species threatened because of global warming, have a peculiar way of tending to their eggs. After laying their eggs in winter, instead of making nests, these birds move around carrying the eggs on their feet!

**WHAT IS THE OZONE HOLE?**

'Ozone hole' refers to a huge reduction in the amount of ozone in the stratosphere. This allows harmful ultraviolet rays to enter the earth. In September 2006, the ozone hole measured a staggering twenty-nine million square kilometres! The amount of ozone lost was about forty million tonnes.

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WHAT HAS BEEN THE RISE IN THE TEMPERATURE OF THE EARTH IN THE LAST HUNDRED YEARS?

Global warming has led to a significant heating up of the earth in the last hundred years, and particularly in the past few decades. The earth has become warmer by almost 0.5 degrees Celsius in the last century. The 1980s and 1990s have been the warmest decades in the last thousand years. Eight of the ten warmest years since 1860 have occurred within last decade, and the hottest years on record have all been in the last six years!

48

WHY DID THE WOOLLY MAMMOTH BECOME EXTINCT?

The earliest woolly mammoths are believed to have walked the planet some one hundred and fifty thousand years ago! Their natural habitat was in the frozen regions of northern North America, Asia, and Europe. Woolly mammoths became extinct for two important reasons. First, they were hunted down in large numbers. Second, they were not able to adapt to the climate of the earth that was increasingly becoming warm!



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OVER WHICH CONTINENT IS THE OZONE HOLE FOUND?

The ozone hole occurs over the continent of Antarctica. Unlike ozone depletion, which is a global phenomenon, the ozone hole is located only over this icy continent. The ozone hole was discovered in the year 1985.

HOW WILL GLOBAL WARMING IMPACT THE PEOPLE OF MALDIVES?

If global warming leads to an increase in the sea level of the Indian Ocean, the people of the islands of Maldives will be faced with a terrible crisis. Maldives is made up of one thousand, one hundred, and ninety islands that are located at an average height of just one-and-a-half metres above sea level. If the sea level rises, their homes will get submerged and more than two hundred thousand people will be rendered homeless!



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HOW HAS THE RISE IN TEMPERATURE AFFECTED HUMAN HABITAT?

The rise in temperature has led to a change in the duration of seasons—winter is shorter, while summer is longer. Droughts have become more frequent and a rise in sea level is submerging islands and low-lying coastal areas. Heatwaves too occur more frequently in places they were unheard of. For instance, Chicago, which is called the Windy City because of the cold breeze that used to blow in from Lake Michigan, suffered a heatwave in 1995 that led to over five hundred deaths!

52

WHICH CITY HAS THE DUBIOUS DISTINCTION OF RECORDING THE WORST NUCLEAR POWER PLANT ACCIDENT?

This is the city of Chernobyl in Russia. The accident, in 1986, was caused by a flawed reactor design that was operated by inadequately trained people and without proper safety measures. Radioactive emissions were released into the atmosphere by the steam explosion and fire. By 2004, about fifty-six people had died due to radiation, thermal burns, and thyroid cancer due to this accident.



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WHAT ILL EFFECTS CAN GLOBAL WARMING HAVE ON THE HEALTH AND WELL-BEING OF HUMAN BEINGS?

Due to rising global temperatures human beings face a huge risk to their health and life. There is increased danger of suffering because of heatwaves and infectious diseases. Failing crops can lead to food crises. With an increase of every one degree Celsius in temperature above the optimum level, the yield of crops like wheat, rice, and corn drops by ten per cent. The spread of diseases such as malaria and dengue will also increase.

WHY IS ACID RAIN MORE OF A PROBLEM IN PLACES SUCH AS EASTERN CANADA?

Many water and soil systems in certain areas such as eastern Canada are unable to naturally neutralize the acid component of acid rain. These areas are largely made of hard granite that is deficient in alkalinity, which is essential to counter the acid. This is why regions like Ontario, New Brunswick, and Nova Scotia are severely affected by acid rain.

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56

WHICH ANIMALS RELEASE THE GREENHOUSE GAS METHANE?

Farm animals such as cows, sheep, and goats as well as other cud-chewing animals like camels release methane.

The bacteria in the stomachs of these animals decompose the food and convert a part of it to methane. Methane is released from their bodies when they belch! Did you know that termites also let out methane? These tiny creatures let loose five per cent of the total methane emissions into the atmosphere!



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WHAT WAS THE RELATION BETWEEN GLOBAL WARMING AND HURRICANE KATRINA?

Simply put, Hurricane Katrina was a result of rising global temperatures. Hurricanes are caused by a rise in the surface temperatures of oceans. Katrina was the most devastating of the several hurricanes that rocked the Atlantic in 2005, killing more than one thousand people. The US suffered damages worth seventy-five billion dollars, making Katrina the most expensive natural disaster in American history.



55

WHAT WAS THE ACHIEVEMENT OF THE NIMBUS-7 SATELLITE?

The Nimbus-7 satellite was launched into space in 1978 to observe the polar regions. The satellite's most spectacular achievement came in 1984-85, when it detected the ozone hole in the atmosphere! This was the first time the ozone hole and the concentration of other gases in the atmosphere were measured.



60

WHICH ANIMAL IN THE NORTH AMERICAN TUNDRA REGION IS UNDER THE GREATEST THREAT FROM CLIMATE CHANGE?

The caribou, living in the North American tundra region, is the most threatened by climate change. Its original home is Canada's western Arctic Islands. The caribou cannot withstand the rising temperatures. According to a report, the numbers of caribou have dropped by ninety-five per cent in just sixteen years!

HOW IS CLIMATE CHANGE AFFECTING THE ARCTIC SHELVES, CLOSE TO THE NORTH POLE?

Due to the rise in global temperature, ice caps are drifting away from the North Pole and several hundred miles of ice cover have already turned to water. According to one research, summer ice could disappear completely by 2100! This would wreak havoc on people who live in that area and drive animals like the polar bears towards extinction.

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WHICH ICE-CAPPED ISLAND WILL MELT IN THE NEXT HUNDRED YEARS?

Scientists have calculated that the island of Greenland, near the Arctic Circle, will melt in the next hundred years due to global warming. Greenland is the largest non-continental ice-capped island in the world. Scientists believe that as it melts, the sea-level will rise by about half a metre.

WHAT THREAT DO THE SUNDARBANS FACE FROM GLOBAL WARMING?

The Sunderbans, spread over parts of India and Bangladesh, are a large group of islands that have the famous mangrove forests and are home to the mighty Bengal tiger. The sea level around the Sunderbans is rising due to global warming and the islands are under threat of being submerged. Did you know that two of the hundred and two islands have already been swallowed up by the rising sea level of the Bay of Bengal?

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HOW DO FORESTS AND OCEANS HELP IN CONTROLLING GLOBAL WARMING?

Identified as 'natural sinks', growing forests and oceans can take in greenhouse gases and clean the air in our environment. It is believed that oceans have already absorbed eighty per cent of the heat added to the climate till now.

59



WHAT HAPPENS WHEN CFCs ARE EXPOSED TO ULTRAVIOLET RADIATIONS?

When chlorofluorocarbons (CFCs) come in contact with ultraviolet radiations in the stratosphere, chlorine gas is released. Chlorine converts the ozone into oxygen, thereby destroying the ozone layer. One chlorine atom can destroy up to ten thousand ozone molecules!

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HOW ARE KRILL IN THE ANTARCTIC AFFECTED BY CLIMATE CHANGE?

Krill live in cracks in the ocean ice sheets. These small creatures are of big importance to life in the Southern Ocean. They are food for whales, seals, fish, and penguins. Antarctic Peninsula, a key breeding ground for the krill, has warmed by two-and-a-half degrees Celsius in the last fifty years. This warming, along with the industrial fishing of krill, has led to a decline in the creature's population.

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WHAT CRISIS ARE THE POLAR BEARS FACING?

The polar bears are drowning! These white, furry animals that inhabit the Arctic look for food in the ice shelves. Due to rising global temperatures, these ice shelves are melting and polar bears now have to swim very long distances to find their food. The bears get exhausted and ultimately drown.

67

WHICH OCEAN OCCURRENCE IS KNOWN AS 'LITTLE BOY'?

El Niño – a phenomenon which occurs in the Pacific Ocean – in English translates to 'little boy'. The normal high temperature area of the central Pacific gets extended up to coastal Peru in a typical El Niño episode. Trade winds blowing across the Pacific slow down and warm water accumulates at the ocean surface. The result is a change in weather patterns that lead to storms, floods, droughts, and forest fires in different parts of the world.

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FOR WHICH GAS DO FORESTS ACT AS NATURAL SINKS?

Forests act as natural sinks for carbon dioxide (CO_2). CO_2 emissions have been growing at a rapid pace over the past century. This is mainly due to the increasing consumption of fossil fuels. Apart from preventing the depletion of forests, a switch to eco-friendly fuels is a good way to reduce the concentration of this gas.

65

HOW DOES ACID RAIN LEAD TO GLOBAL WARMING AND CLIMATE CHANGE?

Acid rain causes severe damage to trees and forests. Trees take in carbon dioxide (CO_2) and give out oxygen (O_2). If trees are depleted, then they are unable to perform this function of converting CO_2 into O_2 efficiently enough. As a result, the concentration of CO_2 in the atmosphere goes up. This leads to increased absorption of heat from the sun, which leads to global warming.

69

WHY IS SOLAR ENERGY IMPORTANT?

Solar energy is the most abundant source of energy on the earth. It is readily available, renewable, and non-polluting. It helps reduce the greenhouse effect by replacing conventional sources of energy such as oil and coal. Did you know that of the total solar energy that reaches the earth's atmosphere, seventy per cent is used up for warming up the air, land, and water!

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WHO WAS SVANTE ARRHENIUS?

Svante Arrhenius was a Swedish chemist. He was the first to give a written explanation about why the earth is at the temperature that it is. Through his path-breaking study, he suggested that the earth's atmosphere should be thought of as a greenhouse. If we did so, it would help us understand why and how the earth got warm. Arrhenius won the Nobel Prize for chemistry in 1903.



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WHAT ARE WIND FARMS?

Wind farms are areas where a large number of windmills are used to generate pollution-free electricity. Holland is famous for its windmills, and the De Noord windmill in Shiedam, Holland, is the tallest windmill in the world. The blades of its fans go up to a height of forty-four-and-a-half metres.



72

WHICH PROTOCOL HAS BEEN DESCRIBED AS 'PERHAPS THE SINGLE MOST SUCCESSFUL INTERNATIONAL AGREEMENT TO DATE...'?

This international agreement is the Montreal Protocol. It is an international agreement signed in 1987 that is designed to reduce the emission of chlorofluorocarbons and protect the ozone layer. Several countries came together to pledge their support to this agreement.

73

WHO WAS GMB DOBSON?

Gordon MB Dobson was a researcher at the University of Oxford. He invented an instrument to measure ozone from the ground. The instrument, known as the Dobson ozone spectrometer, is used widely for this purpose.



WHAT IS EMISSIONS TRADING?

Emissions trading refers to a strategy of pollution control adopted by developed countries. These countries collaborate to lessen greenhouse emissions. A strict emission limit is set for all countries, and all groups that emit greenhouse gases are given credits (something like points), which they cannot exceed. Those that exceed the limit may buy credits from countries that have less emission. This way, developed countries are encouraged to lower their emissions, while developing countries that have lower emissions can earn money by trading their credits!

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WHY IS CNG CONSIDERED TO BE AN ENVIRONMENT-FRIENDLY FUEL?

CNG, or compressed natural gas, is considered environment friendly. This means that in comparison to other fuels, it causes lesser damage to the environment. It is so because CNG-run vehicles emit the least amount of toxic gases. Moreover, CNG causes lesser wear and tear of the engine, thereby also increasing the vehicle's life.

76

HOW ARE HYBRID CARS USEFUL?

Plug-in electric cars produce almost half the emissions as compared to conventional combustible engines. They also use less fuel. The idea of combining combustion with an electric engine is rather old—in fact, it is over a hundred years old, invented by Professor Ferdinand Porsche.



77

WHAT ARE CYCLONES, HURRICANES AND TYPHOONS?

These natural occurrences may have different names but hurricanes, cyclones and typhoons mean the same thing. Each of these is a huge collection of thunderstorms caught in a spiralling mass of air. They can travel over vast areas of water and land, causing widespread destruction. Over the last decade the world has seen a rise in these phenomena due to global warming. With growing temperatures, the sea levels are increasing giving rise to stronger and more dangerous storms.



78

WHAT IS THE KYOTO PROTOCOL?

The Kyoto Protocol is an international agreement that makes nations responsible for reducing their greenhouse emissions. The protocol has been signed by 176 countries. It prescribes targets for these countries to limit or reduce their greenhouse gas emissions. The protocol was adopted in Kyoto, Japan, on December 11, 1997, and it came into force on February 16, 2005, after Russia signed it. UAE acceded to it in January, 2005.

79

WHAT IS THE RELATION BETWEEN THE KYOTO PROTOCOL AND THE YEAR 2012?

The Kyoto Protocol has set a deadline of 2012 as the year by which industrialized countries such as the US and the UK have to reduce the emission of greenhouse gases in their own countries by 5.2 per cent of the level they had in 1990.

81

UNDER WHICH AGREEMENT ARE HALONS AND CARBON TETRACHLORIDE REGULATED?

Halons and carbon tetrachloride are the two other ozone-depleting chemicals, apart from chlorofluorocarbons (CFCs), that the Montreal Protocol specifies should be phased out by 2012. These are as harmful to the ozone layer as CFCs. The earlier we are able to reduce their concentration in the atmosphere, the better it will be for the environment.

WHAT ARE AIR TRAVEL EMISSIONS?

Did you know that for every hundred kilometres that you fly, twenty-two kilograms of greenhouse gases (GHGs) are added to the atmosphere? Just one trip between UAE and the UK would release more than one tonne or one thousand kilograms of CO₂. To travel a thousand kilometres by train would produce about hundred and fifty kilograms of carbon dioxide, whereas flying the same distance would emit two hundred and fifty kilograms of the gas.

80



82

WHAT IS CDM?

Clean development mechanism (CDM) is a system decided upon by the Kyoto Protocol of 1997. Under it, industrialized countries like the US may invest in greenhouse emission-reducing projects in developing countries, instead of reducing emissions in their own countries that is far more expensive.

83



WHERE WAS THE FIRST HYDEL ENERGY PLANT SET UP?

Hydel energy is the energy from falling water. It is one of the best, cheapest, and cleanest sources of energy. It is renewable and, therefore, good for the environment. On September 30, 1882, the world's first hydroelectric power plant began operation on the Fox River in Appleton, Wisconsin, USA. The plant, later named the Appleton Edison Light Company, was initiated by Appleton paper manufacturer HF Rogers, who had been inspired by Thomas Edison's plans for an electricity-producing station in New York.

86

WHAT WAS THE GREAT LONDON SMOG?

The Great London Smog was a formation of heavy smog over Britain and neighbouring areas, which occurred in 1952 and left about four thousand people dead! Households that earlier used wood had begun using coal for heating and cooking. Industries already used coal. Due to the burning of all the coal, the emissions of smoke and sulphur dioxide got trapped in the fog and settled over the city, blocking sunlight and causing breathing problems.



84

WHAT IS THE UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE?

The United Nations Framework Convention on Climate Change (UNFCCC) was introduced in June 1992. It was signed by 154 countries that came forward to work together to find solutions to climate change. All the countries pledged that they would consciously work towards reducing greenhouse emissions to help protect the environment.

85

WHAT IS THE GEF?

The GEF, or Global Environment Facility, was set up in 1991 jointly by the World Bank, the United Nations Environment Programme (UNEP), and the United Nations Development Programme (UNDP). It aimed to address environmental issues like global warming, international waters, and biodiversity. Its first assembly was held in New Delhi in 1998.

87

WILL GLOBAL WARMING RESULT IN MORE FLOODS?

Due to global warming, glaciers and various ice bodies across the world are melting fast. Some of these could disappear as early as 2035. As they melt, there could be devastating floods. Hundreds of glaciers on the Antarctic Peninsula are flowing faster, adding to the sea levels. Climate warming is also causing an increased summer snow melt. Scientists tracking the flow rate of over 300 previously unstudied glaciers found a 12 per cent increase in glacier speed from 1993 to 2003. Countries like the Maldives and Bangladesh are under great risk of being submerged completely.





88

WHICH RENEWABLE SOURCE OF ENERGY IS FOUND BELOW THE SURFACE OF THE EARTH?

Found below the surface of the earth – in hot rocks, geysers, and volcanoes – is a treasure called geothermal energy. The use of this non-polluting source of energy can help in reducing environmental pollution and the greenhouse effect, which causes ozone depletion.

89

WHAT IS THE UNIT FOR MEASURING OZONE?

Ozone is measured in Dobson units (DU). A Dobson unit is the physical thickness of the ozone layer if it were brought to the earth's surface. It is estimated that if three hundred DU of ozone were brought down to the earth's surface at zero degree Celsius, it would occupy a three-millimetre thick layer! One can determine geographically whether an area is part of the ozone hole if the total ozone amount in that area is less than two hundred and twenty Dobson units.

90

WHAT EFFECT IS GLOBAL WARMING HAVING OVER FRESHWATER BODIES?

Rising temperatures are going to have a huge impact on the freshwater bodies across the world. For example, Lake Baikal, the world's largest lake, located in frigid Siberia, is gradually warming up. The lake contains 20 per cent of the world's fresh water and has about 2500 plant and animal species, with most, including the freshwater seal, found nowhere else in the world. Along with the lake, these plants and creatures also run the risk of being wiped out!

91

WHAT IS COP?

COP, or the Conference of the Parties, is a part of the United Nations Framework Convention on Climate Change. It refers to the annual meetings held between countries that have signed the UNFCCC. These are held in different parts of the world since 1995, when it was held in Berlin. Similarly countries that have ratified the Kyoto Protocol participate in what is known as the MOP (Meeting of the Parties to the Kyoto Protocol).



92

WHAT IS THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE?

The Intergovernmental Panel on Climate Change (IPCC) is the world's leading organization on global warming. Set up in 1988, the IPCC is a scientific body that assesses scientific, technical, and socio-economic information necessary for understanding climate change. It looks at the potential impacts of climate change and searches for solutions. Its work against climate change, under the chairmanship of Dr R K Pachauri, won it the Nobel Peace Prize in 2007.



97

CAN THE SUN CAUSE SKIN CANCER?

Yes, indeed. Harmful ultraviolet (UV-B) radiations of the sun are a major cause of skin cancer. Skin cancer may be prevented by avoiding too much exposure to the sun and by using a good sunscreen lotion every time we step out in the sun.

98

WHICH AUTOMOBILE MANUFACTURER WAS AWARDED FOR PRODUCING CARS THAT EMIT LOW POLLUTION?

The automaker was Toyota, and it received the first ever UN Environment Protocol Global 500 award in 1999. For many years now, Toyota has focused on protecting and improving the environment. The United Nations Environment Programme granted this award to Toyota for its commitment to environmental concerns.

99

WHY IS SYNTHESIZED HFC IMPORTANT?

Synthesized hydrofluorocarbon (HFC) is a kind of fluorocarbon that can be used in place of the chlorofluorocarbons (CFCs). It is a man-made gas. As compared to CFCs, synthesized HFC is less dangerous because it causes lesser damage to the ozone layer.

WHICH FUEL IS CONSIDERED CLEAN BECAUSE IT IS FREE OF MAJOR AIR-POLLUTING EMISSIONS?

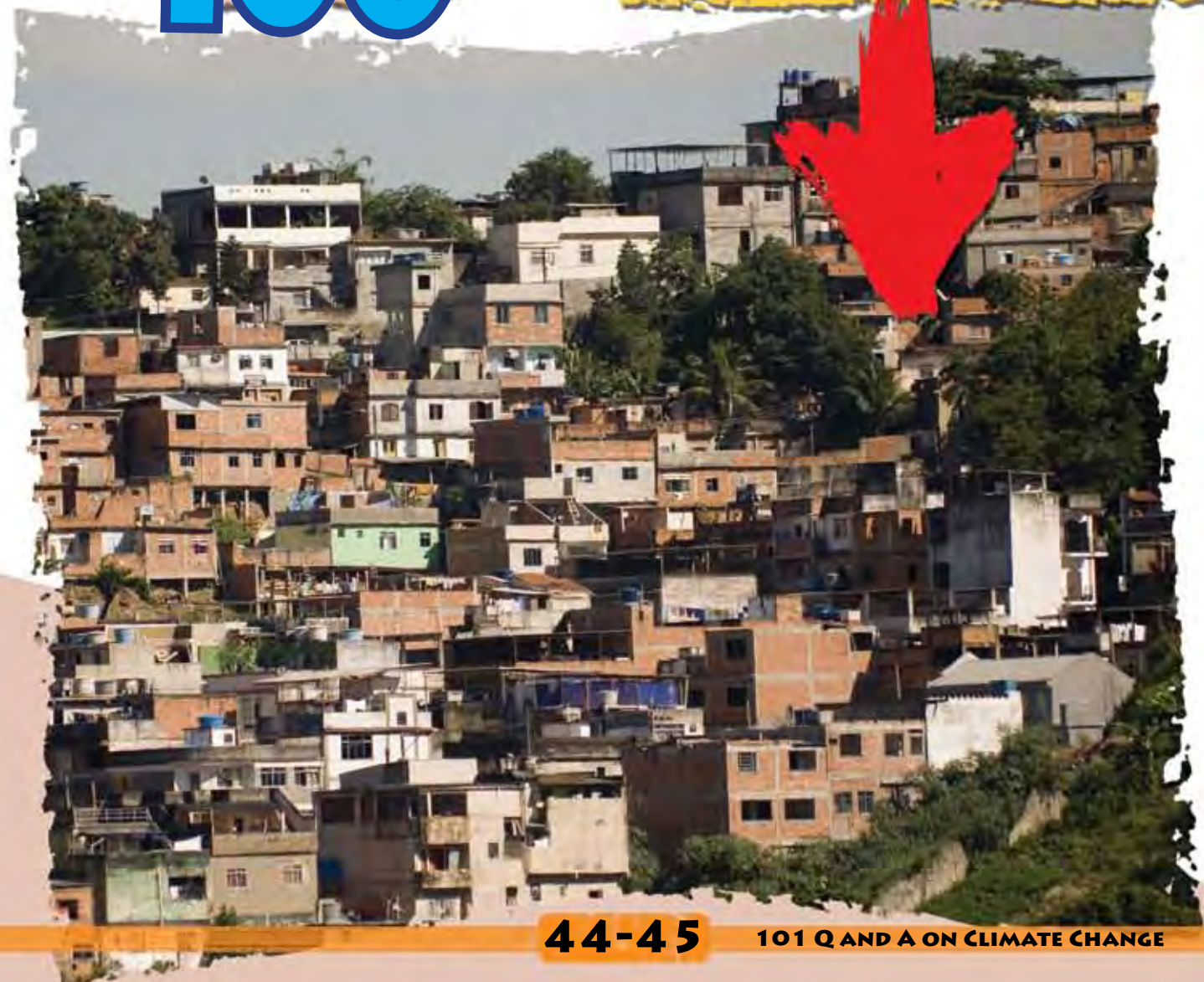
This fuel is natural gas, which is environment friendly and cheaply available. Its main constituent is methane. It is free of carbon monoxide, nitrogen oxide, and soot, which are emitted when other fossil fuels are burned. Natural gas is found in coal beds, oilfields, and natural gas fields.

100

101

WHAT WAS THE EARTH SUMMIT?

The Earth Summit was a conference that addressed issues related environment, energy, and development on a global scale. It was held at Rio de Janeiro, Brazil, in 1992. One hundred and seventy governments from across the world and two thousand four hundred representatives of non-governmental organizations participated in the summit! In 2007, the Rio+15 was organized to mark the fifteenth anniversary of the Earth Summit.



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