

This book is the work of several months of exploration into how best to break down the complex subject of climate change to middle-grade school children in India. The content has been researched and assembled by Mala Balaji, with direction from Vamsi Shankar Kapilavai. S.Saroja and Amudha Vijayakumar, along with Benedicta Isaac from the communications team, have advised and guided on concepts, activities, artwork and text.

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Facts on Climate Change Unravelled for Students





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LEARNING OUTCOMES

- change





WEATHER AND

By the end of the lesson, learners will be able to: • Describe and differentiate weather and climate • Define and differentiate gloabal warming and climate

• Recognize and demonstrate understanding of the

What you observed now is the weather. It is for this particular moment. It is temporary. It is different in different regions of the Earth. It is a mix of atmospheric events that happen and this may keep changing every minute, hour, day or week.

There are many factors that keep changing each day in the atmosphere - the air pressure, temperature, humidity, wind speed and direction etc. All of these together determine what the weather will be like at a given time and at a given place.

Climate is the average of weather conditions in an entire region for a long period of time. This could be for a period of 30 years or more. There are four general climate regions in the world - cold, temperate, warm and tropical as shown on the map.



Weather refers to short term atmospheric conditions but climate is the average of the weather of a specific region.

RAINY **TROPICAL** a short-term state of long-term patterns of the atmosphere that weather over many can change within hours years **WEATHER CLIMATE**

ACTIVITY 1.1

Name of the place:

RECORD THE WEATHER IN THE PLACE YOU LIVE IN, FOR A WEEK

DATE	DAY	WEATHER OF THE DAY
12.11.22	SUNDAY	SUNNY

5 | WEATHER AND CLIMATE







ACTIVITY 1.2

CONDUCT RESEARCH TO FIND OUT THE CLIMATE OF THE FOLLOWING PLACES:

(Use the world map provided earlier as a reference)



Toronto

Chennai



Jeddah



Nairobi

Tokyo



LOOK AT THE PICTURE. WHAT DO YOU THINK IS HAPPENING TO EARTH? DISCUSS.

Does Earth have a fever? What do you think is causing it? Have you heard the phrase 'global warming'? Let's first try and understand what that is.



When the Earth's surface temperature rises, we call it global warming. This happens when the concentration of greenhouse gases in the atmosphere increases. These gases are important for Earth but when their concentration increases it causes problems.



KWL CHART

Carbon dioxide, methane and nitrous oxide are the major greenhouse gases that cause global warming. When their concentration increases, we can see a lot of changes in the climate such as changes in precipitation, temperature, and wind patterns over a long period of time. This long-term effect is what we call climate change.

Global warming is one of the symptoms of climate change that is happening on Earth. The "side effects" of warming are melting glaciers, hurricanes, snowstorms, heavier rain storms or more frequent drought, floods and rising temperatures. In simpler terms, global warming is one symptom of the much larger problem of climate change.

The terms global warming and climate change are being used interchangeably. But the fact is that global warming is just one of the signs, whereas, climate change is the bigger picture. We will learn about it in detail in the upcoming units.

DID YOU KNOW?

Precipitation is any liquid or frozen water that forms in the atmosphere and falls to the Earth.

WHAT I KNOW ABOUT CLIMATE CHANGE

LEARN ABOUT

WEATHER AND CLIMATE



ACTIVITY 1.4

MATCH THE WORDS AND THE IMAGES







FLOODS





SNOWSTORM







DROUGHT







RISING OCEAN





TO UNDERSTAND CLIMATE CHANGE BETTER, WE NEED TO UNDERSTAND THE GREENHOUSE EFFECT

Do you know why some vegetables are grown in a hothouse or a greenhouse? What effect does this have on the temperature within the building?

A greenhouse is basically a building with glass walls and a glass roof. Greenhouses are used to grow vegetables, fruits, flowers and other medicinal or ornamental plants. A greenhouse stays warm inside, even during the winter. In the daytime, sunlight shines into the greenhouse and warms the air inside. At night, when it's colder outside, the greenhouse stays warm inside. That's because the glass walls of the greenhouse trap the sun's heat.



Similarly, when the sun's light reaches the Earth's surface, the Earth absorbs some of the energy. The rest is reflected back. However, when there are greenhouse gases present in the atmosphere, they trap the energy (heat) without letting it escape. This heats the Earth's surface even more. This is the greenhouse effect.

Greenhouse gases in the atmosphere are good to keep the Earth warm and actually help the flora and fauna present. But large quantities of greenhouse gases can be fatal. They retain a lot of energy in the atmosphere and heat up the Earth. Human activity also has a role in increasing the greenhouse gases. This increases the impact of the greenhouse effect causing the Earth to warm up more.

ACTIVITY 1.5

FILL IN THE BLANKS WITH THE APPROPRIATE **WORDS FROM THE BOXES**



- 1. A ______ is a clear glass house that uses the sun's light to keep warm inside.
- 2. The greenhouse effect that naturally happens keeps the Earth _____
- are the greenhouse gases.
- 5. Earth's _____ has increased in the last 100 years.



CARBON DIOXIDE GREENHOUSE

> NITROUS OXIDE WARM

3. The greenhouse gases have increased because of _____

and

14 | UNIT 1

ACTIVITY 1.6

MATCH THE PHRASES TO FORM SENTENCES

Greenhouse effect refers to

For the search of the search and traps it

When the Sun's light enters the Earth's atmosphere

The Ozone Layer

the Earth's atmosphere

working like a greenhouse.

human activity also causes an

increase in greenhouse gases.

Apart from the natural process of heating

it heats up the surface.

ACTIVITY 1.7

USE THE SENTENCES FROM ACTIVITY 1.6 TO WRITE YOUR OWN SHORT ARTICLE.

Add a few more sentences and give a title for your article.



16 | UNIT

GLOSSARY

Weather: is the result of atmospheric events that happen and that keep changing with every minute, hour, day or week.

Atmospheric events: factors that cause change in the atmosphere like temperature, humidity, air pressure, wind speed and direction etc.

Climate: is the average of weather conditions in an entire region for a long period of time.

Global warming: rising temperature of the Earth's surface.

Green-house gases: gases like carbon-dioxide, methane and nitrous oxide which contribute to the warming of the Earth.

Precipitation: is the liquid or frozen water that forms in the sky

Climate change: the long term impact of several effects of global warming and other factors that happen on Earth and impact it.

REFLECTIONS

- I can define and differentiate global warming and climate change.
- I can identify and describe the greenhouse effect.

What did I learn from this unit?

17 | WEATHER AND CLIMATE



I can describe and differentiate weather and climate.

UNIT 2: GREENHOUSE GASES AND GLOBAL WARMING

LEARNING OUTCOMES By the end of the unit, students will be able to:

- Explain the relationship between the greenhouse effect and global warming.
- Describe greenhouse gases and their effects on the environment
- Predict human actions that contribute to climate change





Write down three fossil fuels we use:



HOW DOES THE GREENHOUSE EFFECT CAUSE GLOBAL WARMING AND WHY SHOULD WE BE CONCERNED?

For many years, all the dirt, dead animals, and plants were buried under the ground. These precious fossils were kept out of the atmosphere, hidden deep inside the Earth and became fossil fuels. Coal, for instance, took millions of years to form, as dead plant matter was buried under rock and dirt and then gradually changed through heat and pressure.

Small living creatures, plants and other animals that lived millions of years ago (some from around the time of dinosaurs) have now become fossil fuels.

Mud, dirt, stones and rock began covering all the dead matter.

A lot of heat and pressure built up on the layers, especially the ones that were at the bottom. The heat and pressure transformed them into fossil fuels.

Even materials that went into the ocean floor became fossil fuels.

Over time, human communities discovered that these deposits, in their various forms such as coal, petroleum, and natural gas were fuel sources. They started using them for heating and cooling systems, for transportation, to generate electricity, for industrial purposes and later for homes. Over the past few centuries, and particularly, since the early 1900s, human activities using these fuel sources have rapidly increased. These activities have released massive amounts of carbon dioxide and other greenhouse gases into the atmosphere. In fact, it is believed that the levels of greenhouse gases in the atmosphere have now risen to levels not seen in 3 million years.

Smaller amounts of greenhouse gases that are usually formed in the atmosphere through natural processes are good to keep the Earth warm and enable the survival of flora and fauna. This is because greenhouse gases are capable of absorbing infrared radiation. They trap and hold heat in the atmosphere. But when large amounts of greenhouse gases stay in the atmosphere, they heat up the Earth at an accelerating rate. This makes the natural process catastrophic.





By increasing the heat in the atmosphere, greenhouse gases are responsible for the greenhouse effect. This ultimately leads to global warming. We are able to see their impact in many ways, for example, rising temperatures and changes in climate are creating extreme weather events (e.g., cyclones, flooding and droughts). This is leading to destructive environmental, social and economic consequences. The natural greenhouse effect is not harmful whereas the human-enhanced greenhouse effect has a great impact on the Earth. It causes global warming which then leads to climate change.

Look at the image below to understand what happens:



ACTIVITY 2.1

Explain in your own words why the greenhouse gas effect caused by humans is different to the natural effect...





Will they always be available?

ACTIVITY 2.2

RESEARCH ON NEWS REPORTS FROM THE LAST 7 YEARS ABOUT EXTREME CLIMATIC EVENTS -CYCLONES, FLOODS, HEAT WAVES, SNOW STORMS, DROUGHT ETC. MAKE A LIST OF 10 SUCH EVENTS IN THE FOLLOWING TABLE (ONE EXAMPLE HAS BEEN DONE FOR YOU)

SI. No.	PLACE	TYPE OF EXTREME WEATHER EVENT	YEAR
EG.	CHENNAI	FLOODS	2015
1.			
2.			
3.			
Ч.			
5.			
6.			
7.			
8.			
9.			
10.			

Let us now learn about the major greenhouse gases and how they affect the environment. There are four main greenhouse gases that impact Earth the most. These are:

1. Carbon dioxide (CO₂)

Do you know which greenhouse gas is most responsible for global warming? It's carbon dioxide. While this greenhouse gas is a natural component of our atmosphere, the quantity of the gas in the atmosphere is of concern. The levels of CO₂ have been increasing because of the burning of things like wood, solid waste and fossil fuels. Apart from this, certain chemical reactions that happen in the production of materials such as cement also contribute to the increase. However, the burning of fossil fuels is the biggest contributor to the vast amounts of CO₂ which has resulted in climate change.



2. Methane

Methane concentration in the atmosphere has grown a lot as a result of human activities. These include agricultural activities like rice cultivation and livestock rearing: coal mining: oil and gas production and distribution: burning of living or dead vegetation, etc. Apart from this, creating landfills with municipal waste such as waste from hotels, factories, homes, etc can also produce methane. This gas is 25 times more harmful than CO₂ and is a big contributor to climate change.

25 | GREENHOUSE GASES AND GLOBAL WARMIN

DID YOU KNOW?

Cold storage refrigerators and air conditioners are great contributors to global warming because they run on fossil fuel powered electricity, which emits CO_2 . These appliances also emit synthetic greenhouse gases. 26 | UNIT 2

3. Nitrous Oxide (N₀)

Nitrous oxide is released through various activities - agricultural and industrial activities, burning of fossil fuels and solid waste (a range of discarded and unwanted materials generated by humans and animals), and the treatment of waste water. This gas is around 298 times more potent than carbon dioxide in causing climate change.

4. Fluorinated Gases

Sulphur hexafluoride (SF_{L}) is emitted during the manufacture and filling of electrical switchgear. This has a global warming potential 22,800 times that of CO,. Some industrial processes such as cooling equipment, foams and aerosol cans release fluorinated gases. (Examples of fluorinated gases include hydrofluorocarbons, perfluorocarbons, sulphur hexafluoride, and nitrogen trifluoride). These are synthetic greenhouse gases, that is, they are man-made and have much higher global warming potential than naturally occurring greenhouse gases. They are emitted in relatively small quantities but can still be very harmful.

DID YOU KNOW?

Sulphur hexafluoride (SF,), is emitted during the manufacture and filling of electrical switchgear. This has a global warming potential 22,800 times that of CO,.

Let us now use the picture below to understand the different greenhouse gases and their sources.

TRANSMISSION LINES

DEFORESTATION

OIL & PETROL ENGINES





ACTIVITY 2.3

FILL IN THE BLANKS WITH THE APPROPRIATE WORDS FROM THE BOXES

MAN-MA	DE	FLUOR	INATED	GASES	CARBON DIOXIDE
METHANE	FOSSIL	FUELS			
1 gas that is th	ne greatest	s the n t contri	aturally butor to	occurrin o global u	ng greenhouse varming
2. Synthetic g	greenhouse	e gases	are 🗕		
3. Bio-mass be atmosphere.	urning rele	ases _			into the
4greenhouse g	ases.	0	ire the	most pote	ent of the

5. Burning of _____ releases CO₂ into the atmosphere.

ACTIVITY 2.4

DO A CLASSROOM SURVEY BY ASKING 5 STUDENTS IN YOUR CLASS ABOUT THE FILL THE INFORMATION INTO THE TABLE AND WRITE YOUR INTERPRETATIONS

NAME OF STUDENT	APPLIANCE 1	APPLIANCE 2	APPLIANCE 3	APPLIANCE 4	APPLIANCE 5
Sara	AC	ΤV	Mixer	Hair Dryer	Washing Machine

- 1. Everyone uses
- 2. Most of them use
- 3. Some of them use _____
- 4. No one uses

•

29 | GREENHOUSE GASES AND GLOBAL WARMING



ELECTRICAL APPLIANCES THEY USE AT HOME.

HUMAN ACTIVITIES & CLIMATE CHANGE

Intergovernmental Panel on Climate Change (IPCC)

is a body of the UN that works on human-induced climate change. A report by the IPCC states, "It is unequivocal that human influence has warmed the atmosphere, ocean and land. Humans are increasingly influencing the climate and the earth's temperature by burning fossil fuels, cutting down forests and farming livestock."

A range of human activities is found to be primarily responsible for climate change. It is time we take responsibility for the climate catastrophe that affects us and the flora and fauna around us. In the next chapter, we will learn more about the human activities that cause climate change in more detail.

CLIMATE CHANGE

ACTIVITY 2.5

THINK AND WRITE: MAKE A LIST OF THINGS THAT HUMANS DO THAT YOU BELIEVE **CONTRIBUTE TO CLIMATE CHANGE**

31 | GREENHOUSE GASES AND GLOBAL WARMING



32 | UNIT 2

GLOSSARY

Fossil fuel : when dead plants and animals are buried for many years, they decompose and become fuels. These are found under the Earth's surface.

Catastrophic : dangerous to a high magnitude.

Infrared radiation : this is that portion of the electromagnetic spectrum that extends from red. They are not visible to the eye but can be felt through warmth.

Drought : a condition that is caused because of a prolonged shortage of water supply.

Chemical reaction : when two chemical compounds react they cause a chemical reaction. As a result, new chemicals might be formed.

Livestock : animals and birds that are raised by human beings to supply their needs (such as cows, bulls, buffaloes, goats, sheep etc)

Municipal waste / solid waste : used and discarded waste that is generated by humans and animals.

Potent : has the capability to influence or affect.

Synthetic greenhouse gases : human-made greenhouse gases that are not present naturally.

IPCC : A body of the United Nations that works on climate change

REFLECTIONS

I can explain how the greenhouse effect causes global warming and why we should worry about it.

I can describe the major types of greenhouse gases and how these gases affect the environment.

I can identify human actions that cause climate change.

What do I understand about greenhouse gases and global warming?

33 | GREENHOUSE GASES AND GLOBAL WARMING



UNIT 3: HUMAN ACTIVITY AND GREENHOUSE GASES

LEARNING OUTCOMES By the end of the unit, students will be able to:

- Describe ways in which humans contribute to climate change
- Critically examine the link between human actions and climate change
- Devise an action plan on steps to reduce the impact of climate change





In the previous unit, we learnt about IPCC's findings and how human activity has contributed to global warming. Scientists affirm that human activities and their increased greenhouse gas emissions are responsible for the current climate crisis.

36 | UNIT 3

HOW DO HUMANS CONTRIBUTE TO CLIMATE CHANGE?

The presence of greenhouse gases in our atmosphere is a natural part of the Earth's climate systems but the quantity is the issue. Heating/ cooling systems for industries, corporations and homes, food processing, transportation, electricity and each thing that is dependent on power are ways in which the emissions are increased. All this has happened since the 1900s. As a result, the Earth is warming faster than at any point in recorded history.

• •

Let us now understand the different u climate change:

1. ELECTRICITY GENERATION

Today, everything in most homes runs on electricity - the appliances, gadgets and machines. So electricity generation is one of the biggest activities that humans engage in. We generate electricity by burning fossil fuels such as coal, oil, and natural gas. Electricity generation is the biggest contributor to global emissions. We depend on fossil fuels for the electricity we generate. A small share, maybe about a quarter comes from wind, solar and other renewable sources.

Do you know where electricity used in your home comes from? Look at the picture to understand the steps involved in bringing electricity to our homes.

37 | HUMAN ACTIVTY AND GREENHOUSE GASES

Let us now understand the different ways in which humans contribute to



2. MANUFACTURE OF GOODS

UNIT

Every single item we use at home from the toothbrush in the morning, plates and cups, clothes and shoes, bags and belts to the bed sheet we use at night are all manufactured in industries. These manufacturing industries produce greenhouse gas emissions as they mostly depend on energy produced by burning fossil fuels. Production of other things like cement, iron, steel, electronics, plastics, clothes, and other goods also depend on energy. Mining and other industrial processes also release greenhouse gases.

3. CUTTING DOWN FORESTS

Humans have been cutting down forests to create farms or pastures, industries or for other reasons such as creating roads and houses for centuries now. Burning of trees or leaving them to rot causes emissions. They release the carbon they have been storing for years. As a natural process, we know that plants absorb the CO_2 . Therefore, destroying them also limits nature's ability to keep emissions out of the atmosphere.

4. MOTORISED TRANSPORTATION

Transportation is heavily dependent on fossil fuels, whether they are cars, trucks, buses, or even ships, trains and planes. That makes transportation a major contributor of greenhouse gases, especially carbon-dioxide emissions. While road vehicles are the largest contributors to CO₂ emissions, ships and planes contribute their share too.

5. FOOD PRODUCTION

Food production consumes a lot of energy. Farm equipment, machinery, fishing boats and industries that engage in mass production depend on fuel derived from fossil fuels. Furthermore, the fuel consumed for food transportation also significantly contributes to greenhouse gas emissions. Similarly, growing crops, the use of fertilisers and manure, food packaging and food wastage - all of these play a part in contributing to such emissions. Cattle produce a considerable amount of methane, a powerful greenhouse gas.

39 | HUMAN ACTIVTY AND GREENHOUSE GASES



6. OVER CONSUMPTION

We have now come to understand that with every action we do, the way we use power, how we move around, what we eat and how much we throw away, how much we buy for ourselves etc., all of these contribute to greenhouse gas emissions. This also includes consumption of goods such as clothing, electronics, and plastics in large quantities.

DID YOU KNOW?

- Manufacture of toys and clothes
- Leaving lights and fans on when not necessary
- Wasting food

All of these also contribute to global warming!

ACTIVITY 3.1

0000000

CG-OCG-E

TICK THOSE PICTURES THAT SHOWS HUMAN ACTIVITY CONTRIBUTING TO CLIMATE CHANGE



41 | HUMAN ACTIVTY AND GREENHOUSE GASES



ACTIVITY 3.2

LOOK AT THE IMAGES CAREFULLY AND WRITE **HOW EACH ACTION CONTRIBUTES TO CLIMATE**

How does this affect the earth?











ACTIVITY 3.3

LET'S DEBATE. PREPARE YOUR ARGUMENTS FOR AND AGAINST THE TOPIC.

Are individual humans contributing to climate change?

		4	Irgumer	nts for				
			·					
						Co	onclu	ision
_			_		_			







ACTIVITY 3.4

44 | UNIT 3

THINK AND WRITE : WHAT BABY STEPS CAN YOU TAKE TO LIVE SUSTAINABLY?

I will switch off fans and lights when I leave the room.

I will never waste the lunch my mother sends.

I will walk or cycle to my school.

I will reduce the use of plastic and use reusable items more.

I will carry my own bag to the shop.

My action plan to be a Change Crusader for Earth Restoration:



REFLECTIONS

I can describe how humans contribute to climate change.

I can analyse causes that contribute to climate change.

I can prepare an action plan to reduce the impact of climate change.

What do I understand about human contribution to global warming and how we can act as responsible global citizens?

UNIT 4:

LEARNING OUTCOMES

By the end of the unit, students will be able to: Differentiate renewable and non-renewable resources Describe the process of power generation from fossil

- fuels

HOW IS POWER

Explain why renewable energy sources are better





Today, so much of what we do is dependent on power whether it is to draw water through a motor or run an industry. Economic growth, development and welfare of nations are heavily dependent on their capacity to generate power and ensure supply of it.

DID YOU KNOW?*

- 58.6% of India's power needs come from fossil fuels.
- 39.7% of power needs are from renewable energy sources
- 1.7% of power needs are from nuclear energy

*In 2021

In India, the sources of power are many. We generate power from fossil fuels such as coal, natural gas, crude oil and also renewable sources such as solar, hydro and wind. However, we highly depend on thermal power, that is power generated from burning coal, gas and oil.



WHY DO WE USE COAL FOR GENERATING POWER?

India has the fourth-largest global reserves of coal and more than 50% of India's installed electricity generation capacity is from coal. It is relatively cheap, available in abundance and also is a stable source of energy. Therefore it is widely used for generating power in India.



WHERE AND HOW IS POWER GENERATED USING COAL?

Coal is used in thermal power plants to generate power. Coal is burnt in a boiler to produce steam. The steam produced, under tremendous pressure, flows into a turbine, which spins a generator to produce electricity. The steam is then cooled, condensed back into water and returned to the boiler to start the process over.

WHY IS IT BAD FOR HUMANS AND THE ENVIRONMENT?

The use of coal has several environmental and health concerns. Coal combustion emits fly ash particles into the atmosphere, which contributes to air pollution. When coal is burnt, it produces a number of gaseous by-products, including greenhouse gases- nitrogen oxide, carbon dioxide and methane.

Some of the environmental and health impacts these gases cause are:





TAL IMPACT	ΗΕΑΙΤΗ ΙΜΡΑCΤ
	Eye irritation, nose and throat irritation, headache and anxiety, asthma and other respiratory infections and even lung cancer
	Respiratory infections, asthma and chronic lung disease
	Respiratory illness/ lung diseases
n water laid ere it converts hylmercury the food	Neurological and developmental damage in humans and animals

GAS / BY-PRODUCT	ENVIRONMENTAL IMPACT	HEALTH IMPACT
Fly ash/ bottom ash	Groundwater contamination affects flora and fauna	Water borne diseases
Methane	Ground-level ozone that can harm humans and crops	Slurred speech, vision problems, memory loss, nausea, vomiting and headache, changes in heart rate, balance problems, and unconsciousness.

DID YOU KNOW?

- Particulate matter (also known as particle pollution) or PM) is a complex mixture of extremely small particles and liquid droplets. Particulate matter is made up of a number of components including acids, organic chemicals, metals and soil or dust particles. These are so small that when inhaled, they cause serious health problems
- Fly ash and bottom ash residues are created when power plants burn coal. These are generally stored near power plants or placed in landfills or fly ash ponds.

Look at the following image to understand the impact of air pollution on human health

Irritation of eyes nose and throat Breathing problems

> Effects on liver spleen and blood

Headache and anxiety

Cardivascular diseases

- Irritation, Inflammations and infections
- Asthma and reduced lung functions
- Lung cancer

Effects on reproductive systems

ACTIVITY 4.1

FILL IN THE BLANKS WITH THE CORRECT ANSWERS

FLY ASH	FLY ASH RESPIRATORY		EASILY
СНЕАР	FOSSIL FUELS	STABLE	MERCURY
1 Coal is widel	u used for nower	generation be	ecouse it is

relatively ______, _____ available and is a _______ source of energy.

- 2. India's power demands are met mostly from _____
- 3. Smog has the potential to cause ______ illness.
- 4. Neurological damage is caused by _____
- 5. Apart from the greenhouse gases, another by-product of coal combustion is _____

ACTIVITY 4.2

MARK THE COUNTRIES THAT USE COAL AS ITS PRIMARY SOURCE OF ENERGY IN THE MAP PROVIDED



55 | HOW IS POWER GENERATED?



RENEWABLE ENERGY

Energy that is generated from renewable sources is called renewable energy. Renewable energy sources are available in abundance and can always be replenished. They can never be depleted. Some examples of renewable energy sources are solar energy, wind energy, hydropower, geothermal energy, and biomass energy.



WHAT ARE THE ADVANTAGES OF **USING RENEWABLE ENERGY TO GENERATE POWER?**

Renewable energy is a smart choice for us and the environment. Here are some reasons why we should use renewable sources for our energy supply:

- They'll never run out. These natural energy sources can replace resources.
- These clean energy sources are environment friendly as they warming.
- They're low-maintenance energy sources, that is the equipment traditional generators.

WHY SHOULD WE SHIFT TO **RENEWABLES/ GREEN ENERGY?**

Renewable energy sources generate more energy and produce far less greenhouse gas emissions when compared to fossil fuel sources, over their lifetime. Therefore, it is important to shift to renewable sources so that the impact on global temperatures is reduced over a period of time. This can also reduce the catastrophic effects of climate change in the long run.

themselves, making them sustainable and abundant natural

are non-polluting, meaning they do not pollute, produce minimal or no waste products, and therefore don't contribute to global

and machines would not require regular service. Renewable energy facilities usually require less maintenance than

ACTIVITY 4.3

THINK AND ANSWER 1. LOOK AT THE IMAGE BELOW AND WRITE WHICH YOU THINK IS A NICER **WORLD? GIVE THREE REASONS.**



2. ANSWER THE FOLLOWING SET OF QUESTIONS

- i. Have you seen solar panels?
- ii. Where?

switch to solar energy.

- 3. _____

iii. Think of three reasons you can give your parents to help them

ACTIVITY 4.4

DESIGN A POSTER TO PROMOTE USE OF RE-NEWABLE ENERGY



GI

Thermal power : power generated from burning coal, gas and petroleum

Turbine : a machine that converts the energy from a fluid (such as water, steam, or gas) into mechanical energy.

Combustion : the process of burning something.

By-product : a secondary product that is made in the manufacture of something else

Particulate matter : these contain microscopic solids or liquids droplets in the air such as dust, dirt, etc.

Replenished : that can be filled up again

Depleted : diminish in number or quantity: use up the supply of a resource

Fly Ash & Bottom Ash : residues created when power plants burn coal. These are generally stored near power plants or placed in landfills.

61 HOW IS POWER GENERATED?

GLOSSARY



REFLECTIONS

I can differentiate renewable and non-renewable resources

I can describe the process of power generation from fossil fuels

I can explain why renewable energy sources are better

What do I understand about renewable and non-renewable energy?

UNIT 5: HOW DOES GLOBAL WARMING CAUSE **CLIMATE CHANGE?**

LEARNING OUTCOMES

- change
- events around them

63 | HOW DOES GLOBAL WARMING CAUSE CLIMATE CHANGE?

By the end of the unit, students will be able to:

Describe how global warming leads to climate

Identity, examine and describe the impact of climate change on the ecosystem Identify and describe instances of climate change



We have learnt that when the concentration of greenhouse gases increases in the atmosphere, there is a rise in temperature. This rise in temperature leads to climate change resulting in a change in precipitation patterns, a rise in sea level, and other extreme climatic events like floods, droughts, cyclones, wildfires etc. Scientific research on climate change shows that global warming causes more than just surface temperature changes.



CONSEQUENCES OF CLIMATE CHANGE ON THE ECOSYSTEM

Climate change is causing dangerous weather events that are becoming more frequent and severe. It has a great impact on the ecosystem and the health of people. Some of these effects are:

1. HOTTER TEMPERATURES

Higher temperatures increase heat-related illnesses in humans. The exposure to heat can make people weak causing a cascade of illnesses such as exhaustion and fatigue, heat stroke, etc. This can also make it difficult for people to work and move around.

Rise in temperature has a huge impact on the food chain and the food supply in turn. Apart from humans, plants and animals also are affected due to the heat.

Yet another impact of the rising temperatures is that the moisture from the ground evaporates and makes the soil dry resulting in the forests being dry for a longer period of time. This makes the vegetation flammable because of which wildfires start more easily. With wildfires on one side, we also experience the melting of snowpacks almost one month earlier than usual.

All the above changes in climatic conditions give us a clear indication and understanding of the fact that an event happening in one part of the earth can in turn impact another part of the earth.

DID YOU KNOW?

India recorded its average maximum temperature in 122 years: 33.1°C (91.6°F), March 2022. This broke the record of a 32.7°C in March 2021.



2. FREQUENT SEVERE STORMS

Changes in temperature cause changes in rainfall. This results in more severe and frequent storms. Natural calamities are causing large-scale destruction to human habitation and among them, one of the worst are tropical cyclones. Cyclones are formed in the ocean: they move towards land bringing violent winds and heavy rain which floods homes and causes loss of lives and livelihood. In hilly areas, landslides are a result of such frequent storms. The damage to houses, property, crops etc has a big impact on the economy because the rebuilding of everything can cost governments billions of rupees.

Monsoon season is when it rains and certain places in India have heavy rains during the season. We need to understand how these tropical cyclones in India function. These cyclones originate over the Bay of Bengal, the Arabian Sea and the Indian Ocean. By nature, these cyclones are stronger with the wind blowing at very high speeds, and rainfall being very heavy. Coastal areas are usually more affected by these cyclones and states in India that suffer are Odisha, West Bengal, Andhra Pradesh, Tamil Nadu, Kerala, Maharashtra and Gujarat.

> HAVE YOU EXPERIENCED **BEING AFFECTED BY A FLOOD OR A CYCLONE?** DISCUSS

Cyclone Ockhi

This was an intense and strong tropical cyclone which originated from the Arabian Sea and affected coastal areas of Kerala, Tamil Nadu and Gujarat. This cyclone caused flooding and landslides in many areas.

> Cyclone Fani This was an extremely severe cyclonic storm that hit Odisha in May 2019. This was categorised as a major hurricane. This caused a lot of damage to people and property.

Cyclone Amphan

2019

This was called a Super Cyclonic Storm and was powerful and more deadly than any other. West Bengal and Bangladesh were worst affected by this in May 2020.

Yaas

This Very Severe Cyclonic Storm affected Odisha in May 2021.

2021

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Look at this list of severe cyclones India has seen in the last 5 years:





Cyclone Tauktae This was the first cyclonic storm of 2021. Cyclone Tauktae hit Gujarat in May 2021. This was also classified as a Very Severe Cyclonic Storm (VSCS).

2021

MARK THOSE SCENARIOS WHICH ARE CAUSED **DUE TO HOTTER TEMPERATURES**



















ACTIVITY 5.2

EXPLORE. MAKE A LIST OF CYCLONES THAT HAVE AFFECTED OTHER COUNTRIES IN THE LAST **FIVE YEARS**

One has been done for you!









3. INCREASED OCCURRENCE OF DROUGHT

Water is becoming scarce in many regions of the world. Water scarcity occurs when the use of water resources is more than the availability of it. Bigger cities face water shortage because of the number of people living there. Climate change-induced droughts have made the situation worse in many areas. Droughts can create destructive effects such as low moisture levels in the soil and reduction of groundwater levels.

When there is drought, you can notice the following signs: reduced flow of rivers, lowered levels of lakes, dry river beds, crop damage, increased dust storms, etc. Sand and dust storms can move billions of tons of sand across continents. Deserts are expanding because of which land for growing food is reducing. Many people now face the threat of not having enough water even for their day-to-day needs.

ACTIVITY 5.3

THINK AND WRITE WHAT WILL HAPPEN IF THERE IS NOT **ENOUGH RAIN? WHAT COULD BE THE EFFECTS OF THIS ON PEOPLE AND ANIMALS?**

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DID YOU KNOW?

Polar cubs drown in the sea because of melting ice. Polar bear mothers and cubs swim in the water for food and training. When they get tired, they climb on ice floes, float along for a bit and then continue swimming. But due to the melting of ice sheets, the cubs drown as there are no ice floes to break their journey.

4. OCEAN WARMING AND RISING SEA LEVELS

Oceans absorb most of the heat from global warming. This results in the melting of ice sheets, which raises sea levels, threatening coastal and island communities. The ocean also absorbs carbon dioxide, keeping it from the atmosphere. More carbon dioxide in the ocean makes it more acidic resulting in the bleaching of coral reefs, which endangers marine life.

ACTIVITY 5.4

DRAW 5 SPECIES OF ANIMALS LIVING IN THE OCEAN.





5. LOSS OF SPECIES

Climate change stands as a threat to the survival of many species on land and in the ocean. These threats keep increasing as temperatures rise.

We all know that animals and insects collect and transport pollen when they move from spot to spot aiding in plant reproduction. Bees especially play a pivotal role in pollination. They are called super pollinators for this reason. The Food and Agriculture Organization of the United Nations has stated that one-third of the world's food production is dependent on bees.

However, climate change is impacting the bee population. Increasing temperatures and changes in weather patterns are interfering with the natural process of plant flowering and pollinators affecting their synchrony. This will in turn affect crop reproduction. Climate change is also changing precipitation patterns. Rain can limit the ability of bees to collect food for their offspring, which is associated with fewer bees the following year.

The reduction in the bee population will cause a serious threat to the food supply to humans. We depend on these insects for pollination and fruit production. Without these pollinators, our own food production will be affected causing global food insecurity.

Like the bees, many other species are becoming endangered. Each of them has a role to play in the ecosystem and contributes to biodiversity. Forest fires, and extreme weather, can be threats to many species. Some species will be able to relocate and survive, but many others may not.





MY VERSION OF THE STORY -BEES GO ON A STRIKE!









Exhaustion and fatigue : extreme tiredness

Heat stroke : this happens when the body is not able to control the temperature on its own. It is one of the most serious illnesses related to heat.

Flammable : can catch fire easily

Calamities : an event that causes sudden and severe damage

Human habitation : places where human live- villages, cities, homes etc

Tropical cyclones/ hurricane : a storm that has very high-speed and violent winds

Scarce/ scarcity : available in less quantity

Dust storm : dust and sand that are carried by whirl- wind and that moves across regions

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GLOSSARY

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Endanger : something in danger

Species : a set of plants, animals, organisms that have similar characteristics

Super pollinator : one that helps the most in pollination

Offspring : young one of animals, birds, insects

Biodiversity : the variety of life on Earth

Coral reefs : an underwater ecosystem characterized by reef-building corals which protect coastlines from storms and erosion.

REFLECTIONS

I can identify and describe impacts of climate change on the ecosystem

events around me

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- I can describe how global warming leads to climate change
- I can identify and describe instances of climate change

What are the impacts of climate change that you have seen yourself?

UNIT 6: EFFECTS OF CLIMATE CHANGE ON HUMANS

LEARNING OUTCOMES

By the end of the unit, students will be able to:

- Describe climate change-induced impact on physical and mental health
- Identify vulnerable populations that can be worst affected by climate change
- Define climate justice





CLIMATE CHANGE & HUMAN HEALTH

We saw in the earlier chapter that climate change may affect our health and well-being. In this unit, we will learn about the effects of climate change on humans in detail. These include the effects of extreme weather events, worsening air quality, the spread of infectious diseases, and threats to food and water quality and quantity. These climate change events are said to affect the physical and mental health of human beings.

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DISEASES AND HEALTH RISKS IN HUMANS

Changing weather patterns are conducive to the spreading of diseases. Additionally, when the temperature is hotter, people are more exposed to heat and heat related health impacts. Our country especially is expected to face a host of health effects due to climate change because of our high population. Not everyone is fortunate enough to have access to resources such as nutritious food and drinking water. Changing patterns of rainfall also has a great impact on the availability of clean drinking water.

We are already experiencing a rise in cases of water-borne diseases such as typhoid, cholera and vector-borne diseases. (Vector-borne diseases are diseases caused by insects and parasites such as mosquitoes. These include diseases such as malaria, chikungunya, and dengue). It is the responsibility of the government to provide healthcare to all. This becomes difficult when a large proportion of the population falls ill. Extreme weather events not only increase diseases and deaths but also makes it difficult for health care systems to treat everyone.



WHAT HAPPENS WHEN A LOT OF **PEOPLE GET SICK AT THE SAME TIME? THINK ABOUT WHAT HAPPENED DURING THE PANDEMIC.**

Apart from the spread of disease, other risks to health include increased hunger and poor nutrition. In places where people cannot grow food or find sufficient food, people may suffer more. Fisheries, crops, and livestock may be destroyed or become less productive. Increased temperatures can impact the availability of water and reduce grasslands for grazing. This can have a multiplied impact on the food security of the nation, which means that countries may not be able to provide food for all.

WHO IS AT THE HIGHEST RISK **BECAUSE OF CLIMATE CHANGE?**

Children, low-income communities, people with disabilities, people with long-term illnesses, senior citizens, and pregnant women are the worst affected by climate change-related extreme weather events. Such a population may be more prone to disease, because of their already poor health conditions. People who live in areas that do not promote good health or well-being are also at risk. Climate change, unfortunately, increases the factors that push people into poverty.

Instances such as floods sweeping away urban slums, and destroying homes and livelihoods are examples of climate change pushing people to poverty. Extreme heat conditions may push these vulnerable populations, such as poor people to heat-related tiredness and other related health impacts.

WHO IN THIS PICTURE WILL BE MOST AFFECTED BY CLIMATE CHANGE?

ACTIVITY 6.1

SAY TRUE OR FALSE

1. When the heat increases, heat-related health problems decrease.

2. Climate change impacts poor people more.

3. Extreme weather can result in the death of people in some cases.

4. People with poor nutrition are at a lower risk of being affected.

5. When we talk about food security being threatened, it refers to the fact that people have no access to food.





CLIMATE CHANGE & MENTAL HEALTH

Let us first understand what mental health and well-being are. When people are able to think well, learn well, work well and contribute to their community, and are happy, they are in good mental health.

Climate change and events around it can affect people's mental health. When there are continuous events of floods or droughts, it can make people anxious and can cause a lot of fear in them. Natural calamities can result in loss of life of family members, loss of jobs, loss of property, and it can also disconnect people from their communities. These can have a long-lasting impact on people.

Extreme weather events can cause an increase in aggressive behaviour and domestic violence. Heat-related illnesses such as exhaustion and heat stroke can increase cases of hospital emergencies: this can then increase people's anxiety and cause unhappiness.

ACTIVITY 6.2

COMPLETE THE POSTER BY PROVIDING SIMPLE SOLUTIONS THAT PEOPLE CAN FOLLOW TO **PROTECT THEMSELVES FROM HEATWAVES. GIVE** THE POSTER A TITLE.

HEALTH IMPACTS FROM HEATWAVES

- DEHYDRATION
- **KIDNEY DISEASE**
- MENTAL HEALTH
- RESPIRATORY DISEASE
- HEAT CRAMPS
- HEAT STROKE





CLIMATE JUSTICE

We just learnt that vulnerable populations are at the highest risk with the events of climate change. It is believed that the responsibility for climate change lies with wealthy and powerful people and nations. It is unfair that the wealthy and powerful make decisions that cause climate change: but the poor are the ones that pay the price for it.

Climate justice recognises the issues associated with climate change as a social, political and environmental problem. It acknowledges that different communities feel the effects of climate change differently. For example, people living in slums that are flooded during heavy rains feel the impact differently from those living in concrete houses. We learnt that human actions contribute to climate change - some countries and companies contribute a lot more to climate change crisis than others. Therefore, the responsibility for corrective action also lies more with them. Climate justice stands up for the point of view that the lives of the vulnerable population, especially the poor and marginalised are made harder by the impacts of the climate crisis.

Have you ever thought about how poor families suffer with extreme weather events? Families that live in poverty, occupy land that is exposed to extreme weather events, such as mudslides, cyclones, sea-level rise, water contamination and flooding. This worsens their living conditions even more. The poor and marginalised are compelled to live in regions which are vulnerable to the impacts of climate change because they do not have the resources to live in safer areas. It takes them several months to recover from a natural calamity or an extreme weather event.



ACTIVITY 6.3

CHOOSE THE BEST OPTION TO COMPLETE THE SENTENCE

- 1. Climate justice is
- \square a concept to address issues of extreme weather impacts
- a concept that talks about the rights of marginalised people
- \square a concept which promotes fair sharing of the burden and benefits of climate change
- \square a concept that promotes rich and poor as equal
- 2. Some countries contribute more to the climate crisis because
- \square they depend on natural resources for everything
- \Box they have industries and factories that pollute
- \square they are highly populated
- \square they have bigger geographical area compared to others
- 3. Marginalised population are those who
- r depend on farming alone for their livelihood
- \square have a lot of demands
- $\hfill\square$ are always affected by floods and other calamities
- \square are considered insignificant

4. Vulnerable people are prone to impacts of extreme weather because

- \square they cannot afford to live in safer areas
- \square they cannot adjust to a new set up
- \square they have been living in that place for many years
- \square they have their jobs in and around the area, they live in





Water borne diseases : diseases that are caused because of consuming contaminated water



Less productive : produce less in quantity

everybody

low

Prone : likely to suffer

the burden and benefits of climate change

events happening around us are dangerous

EFFECTS OF CLIMATE CHANGE ON HUMANS

GLOSSARY

- Food security : a situation where nutritious food is available for
- Low income : where the wages or money people earn is very
- Long-term illness : any illness that lasts for 6 months or more
- Climate justice : it is a concept which promotes fair sharing of
- Climate change crisis : a term used to imply that the climate

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Marginalised : when people are considered insignificant, they are marginalised

Aggressive behaviour : any behaviour that is aimed at harming someone or something

Domestic violence : physically harming family members



UNIT 7: ADAPTING TO AND MITIGATING THE EFFECTS OF CLIMATE CHANGE

LEARNING OUTCOMES

By the end of the unit, students will be able to:

- Describe the meaning of adapting to climate change
- Describe the meaning of mitigation of climate change
- Examine and evaluate the methods which can be used to mitigate and adapt





ADAPTING TO CLIMATE CHANGE

Climate change adaptation refers to a way of coping and making adjustments to live with the changes happening around us. For this, individuals, communities, regions and countries need to be informed and prepared. We are aware that things are changing around us so we come up with solutions that can reduce the impact of climate change on us. For example, to cope with floods and rising sea levels, people living in those low-lying areas can move to higher grounds. Similarly, when there is drought, farmers can shift to crops that consume lesser water.

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Adaptation efforts can be taken before an extreme event happens or after it has happened. For example, we have weather forecasts which helps us with information about cyclones and their intensity in advance. With that information, people who are living in areas that are prone to be affected the most can be shifted to safer areas. Similarly, after an extreme event has happened a disaster management team comes up with adaptation efforts.

To summarize, we must adapt to climate consequences so we can protect ourselves and our communities. These include: • Make buildings and infrastructure that is safer and more

- sustainable.
- Restore forests and damaged ecosystems.
- to changing climates.
- Investigate and develop innovative solutions to prevent and manage natural catastrophes.
- Develop action and disaster management plans to handle climate emergencies.

Our country is taking several steps for climate change adaptation. Some of the efforts taken by the Government are Wetland management, Clean India Mission- Swachh Bharath Abhyan, Jal Jeevan Mission and the development of appropriate disaster management efforts.



HOW DO YOU THINK THESE PEOPLE ARE FEELING? WRITE ALL THE EMOTIONS THAT YOU CAN THINK THAT PEOPLE **MIGHT FEEL WHEN FORCED TO MIGRATE.**

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• Grow a variety of crops so that they are better able to adapt

MITIGATING CLIMATE CHANGE

Mitigation is any action we do to keep climate change under check by reducing the release of greenhouse gas emissions that are warming our planet. This could mean using renewable energies and other new technologies instead of fossil fuel energy, Other steps to mitigate climate change could include making older equipment more energy-efficient and promoting more sustainable uses of land and forests.

Here are some action points that individuals, communities and countries can do to mitigate climate change:

USE OF RENEWABLE ENERGY

We have learnt that renewable energy is always available in abundance and they can be replenished. They are called clean energy sources because they do not release greenhouse gases into the atmosphere. Energy that can be generated from the sun, wind and water are the renewable energy sources.



India gets a lot of sunshine. But how much solar energy do we actually use to power our homes? Think about it. Powering industries, schools and homes with solar energy can reduce the burning of fossil fuels to a large extent.



SUSTAINABLE MOBILITY

Sustainable mobility refers to the use of sustainable options for transportation. This means making choices that will reduce CO, emissions. Some of the sustainable mobility options that countries around the world are adopting are public transport, shared car rides or carpool, cycling and walking short distances.

Why do a few people only cycle or walk these days? Tell us what you think.

THE 3 R's

The famous 3 R's are Reduce, Reuse and Recycle. Practising the 3 R's will help mitigate climate change to a great extent. The 3 R's help to cut down on the amount of waste we throw away. They conserve natural resources, landfill space and energy.









ACTIVITY 7.2

INTO THE VENN DIAGRAM BELOW:

MITIGATION

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SORT THE IMAGES FROM THE PAGE PROVIDED

ADAPTATION



ACTIVITY 7.3

THINK OF AS MANY R'S AS YOU CAN TO **MITIGATE CLIMATE CHANGE AND ADD THEM BELOW THE EXAMPLES PROVIDED.**

R	euse educe		
	ecycle		

ACTIVITY 7.4

THINK PAIR SHARE (SPEAKING ACTIVITY)

Situation: An unexpected flood happens in your place. You need to keep your family and pets safe. Discuss the following and create your disaster management plan.

1. Name 5 things you will take along with you.

2. Who will you call for help?

3. Where will you go?

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GLOSSARY

Climate change adaptation: coping or making adjustments to live with climate change events happening around us

Low-lying areas: areas that are prone to flooding or areas that are below the sea level

Disaster management: refers to efforts to prepare for and take measures to manage any disasters or extreme weather events

Mitigation: any action taken to reduce climate change

Clean energy: energy that does not release greenhouse gases

Sustainable Mobility: use of sustainable options for transportation

Car pool: a group of people using one vehicle to travel to the same place usually taking turns

REFLECTIONS

adapt

I can describe the meaning of adapting to climate change I can describe the meaning of mitigation to climate change I can evaluate methods which can be used to mitigate and

What steps can I take to mitigate climate change?

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UNIT 8: FROM ANXIETY TO EMPOWERMENT

LEARNING OUTCOMES

By the end of the unit, students will be able to:

- Describe climate change denial
- Inspect and explain why people deny climate change
- Analyse and devise a plan on how students can help tackle climate change

CLIMATE CHANGE DENIAL

Denial means that we do not want to accept something. Unfortunately, there is an opinion that climate change is not true at all. We have learnt and understood that greenhouse gas emissions from burning of fossil fuels are warming our planet and causing climate change. This has adverse impacts on humans and ecosystems.

We are able to see and experience extreme weather events that are creating a record each year. This is the evidence of how the planet is experiencing a climate crisis. While scientists and Governments are mapping climate change events, there are others who do not accept that climate change is true. This concept of not accepting that climate change is really happening is called climate denial.



DO YOU ACCEPT CLIMATE CHANGE OR DENY CLIMATE CHANGE?



NOT SURE DENY

There are numerous reasons why people deny climate change. Let us now analyse the different arguments used for denial.



2. Economic denial

The idea that climate change is too expensive to fix is also a form of climate denial. Some people are of the view that fixing climate change is not something we can handle: so they decide not to take any action.



1. Science denial

The idea that climate change is part of the natural cycle and that CO₂ which is in such small quantities cannot have a large heating effect is science denial. The deniers propagate that the science behind climate change is not correct. They even feel that scientists fix data to show that climate change is happening.



3. Humanitarian denial

The idea that climate change is good for us and that longer, warmer summers in the temperate zone will make farming more productive is humanitarian denial.







4. Political denial

The idea that one country cannot take action because other countries are not taking action is political denial.



ACTIVITY 8.1

LOOK AT THE PICTURE AND WRITE WHAT KIND OF DENIERS THESE PEOPLE ARE:



5. Crisis denial

The idea is that we should not rush into changing things keeping in mind the ideas of science, economic, humanitarian and political denial. People who deny believe that climate change is not as bad as what scientists claim. They believe that we will be prosperous in the future and will be able to fix climate change in a better way.







It's now time to think about what we can do to help tackle climate change. Here is a list of things we can do to make this planet a better place.

SAVE ENERGY AT HOME

We have learnt that much of our electricity and heat is created by burning fossil fuels. We could save energy by taking the following steps:

- Reducing the usage of heating and cooling appliances.
- Switching regular lights to LED lights
- Switching to energy-efficient electrical appliances.
- Switching off fans and lights when not in use,
- Keeping windows open to allow natural light to come in instead of using bulbs and tube lights during the day time.
- Switching off appliances like TV, mixie, laptop, chargers at the plug point every time, after use to avoid standby power loss.



EAT MORE VEGETABLES

Producing plant-based foods generally have lower greenhouse gas emissions. They also require less energy, land, and water. Therefore, consuming more vegetables, fruits, whole grains, legumes, nuts, and seeds can reduce environmental impacts.



WALK, CYCLE, OR TAKE **PUBLIC TRANSPORT**

We know about the traffic in all our busy cities. All roads are clogged with vehicles most of them either diesel or petrol run vehicles. Walking or riding a bicycle instead of driving will reduce greenhouse gas emissions; and keep us healthy and fit. While car and bike sharing also help, the best would be to use public transport wherever available.

AVOID WASTING FOOD

We have learnt that wasted food that rots in the landfills produces methane and carbon dioxide. Apart from that, when food is wasted a lot of resources are wasted too. We should buy quantities we require and if there is extra, feed others who need food.



REDUCING AIR TRAVEL

Aeroplanes are said to use up huge amounts of fossil fuels and they produce significant greenhouse gas emissions. So, reducing the number of flights and promoting alternate modes of travel or meeting virtually to reduce air travel may be considered.



REDUCE, REUSE & RECYCLE

We learnt that all products we buy, electronics, clothes, appliances etc., cause carbon emissions at each point in their life cycle - from the stage of extraction of raw materials to manufacturing and transporting goods to market. We could think about only buying things that are necessary, and remembering to reuse and recycle wherever possible.

Reducing the amount of waste we all generate is a great way to benefit the environment. This can be done by

- Buying only what we need
- Choosing products with less packaging
- Buying in bulk
- Looking for items that we can re-use
- Avoiding plastics



Reusing/repairing certain items can help the environment as well as save some money too. This can be done by • Refilling a water bottle with water from home instead of

- buying a new one
- Updating our computer rather than throwing it out and getting a replacement
- Ditching plastic bags and choosing reusable, environmentally-friendly bags instead

Recycling means certain used products can be reused for a new purpose. The most commonly recycled products are

- Paper and cardboard
- Glass bottles and jars.
- Rigid plastic products.
- Metal containers, including tin, aluminum, and steel cans







SWITCH TO RENEWABLE SOURCES OF ENERGY GENERATION AT HOME

Only a few homes use solar power as their main source of power. We could think of solar or wind power as a clean energy option as opposed to energy that comes from oil, coal or gas.



SWITCH TO AN ELECTRIC VEHICLE

Electric vehicles (EV) help reduce carbon emissions as it uses energy stored in its rechargeable batteries. Currently in India, though these batteries are recharged mostly by electricity that is generated by burning fossil fuels, the overall greenhouse emissions are lesser in EVs than vehicles that run on petrol or diesel. Therefore, choosing an electric vehicle may be a good option. As we increase our renewable energy power generation these vehicles can be charged by renewable energy.

CHOOSE ECO-FRIENDLY PRODUCTS

Buying local and seasonal foods can reduce the impact on the environment. We could choose products that are environmentally-friendly. Encouraging companies who use resources responsibly and are committed to cutting their gas emissions and waste will also help in cutting down emissions. For instance, the production and disposal of plastic generates greenhouse gases and hazardous waste damaging human and ecological health

There are a lot of eco friendly products that could be used instead of what we are using today. To name a few

Food Container

We can use a reusable glass or stainless steel food container to bring/ buy lunch to/ at work or school instead of single-use plastic containers.

Straws

The same goes for straws. We can use reusable stainless steel straws instead of single-use straws.

Cutlery

Single-use plastic cutlery could be replaced by either reusable stainless steel cutlery or cutleries made from eco-friendly materials like wood.

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Shopping Bags

Instead of your usual shopping bags you can bring reusable cloth bags

Batteries

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Rechargeable batteries could be used instead of single-use batteries..

Diapers and sanitary napkins

Using eco-friendly napkins can help conserve the environment and is also better for our health.

SPEAK UP FOR ACCOUNTABILITY AND TRANSPARENCY FROM THE GOVERNMENTS

As a citizen of the planet, it is your duty to be responsible and also ask people to be responsible. Get informed, then speak up and get others to join in and take action. Talk to your neighbours, colleagues, friends, and family. Let business owners know you support bold changes. Appeal to local and world leaders to take action on the changing climate and to save the planet.





ANSWER THE FOLLOWING QUESTIONS

1. How does air travel contribute to climate change?

2. Switching off fans and lights when not in use can help reduce the impact of climate change. How?

3. What do you think you can do to let people know about ways to tackle climate change?

ACTIVITY 8.3

CREATE A POSTER ON THE THEME 'REDUCE, REUSE AND RECYCLE'. YOU CAN ADD MORE 'R's TO YOUR POSTER.



Your poster should have a title, a tagline and images that are relevant.

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GLOSSARY

Climate denial : the concept of not accepting that climate change is really happening

Natural cycle : a series of natural events that are repeated again and again in the same order

Propagate : it is to make people believe or support an idea

Electric vehicles : An automobile that is powered entirely or partially by electricity from a battery that requires recharging

REFLECTIONS

I can describe climate change denial
I can explain why people deny climate science
I can analyse and plan what we can do to help tackle climate change

Do I feel I can tackle climate change? How am I going to do it?

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Unit 1: Weather and climate

Activity 1.2

Chennai - Warm Melbourne - Temperate Toronto - Cold Paris - Temperate Jeddah - Warm Oslo - Cold Nairobi - Tropical Beijing - Warm Tokyo - Warm Bali - Tropical

Activity 1.4



Activity 1.5

- 1. greenhouse
- 2. warm
- 3. human activity

ANSWER KEY

- Carbon dioxide, methane and nitrous oxide
- 5. temperature

Activity 1.6

Greenhouse effect refers to - the Earth's atmosphere working like a greenhouse When the Sun's light enters the Earth's atmosphere - it heats up the surface The ozone layer - reflects the heat on to the Earth and taps it Apart from the natural process of heating - human activity also causes an increase in greenhouse gases

Unit 2: Greenhouse gases and global warming

Activity 2.3

- 1. carbon dioxide
- 2. man-made
- 3. methane
- **4**. Fluorinated gases
- 5. fossil fuels

Unit 3: Human activity and greenhouse gases

Activity 3.1



Unit 4: How is power generated?

Activity 4.1

- 1. Cheap, easily, stable
- 2. Fossil fuels
- 3. Respiratory
- 4. Mercury
- 5. Fly ash

Unit 5: How does global warming cause climate change?

Activity 5.1



Unit 6: Human activity and greenhouse gases

Activity 6.1

- 1. False
- 2. True
- 3. True
- 4. False
- 5. True

Activity 6.3

1. Climate justice is a concept that talks about the rights of marginalised people

2. Some countries contribute more to the climate crisis because they have industries and factories that pollute

3. Marginalised population are those who are always affected by floods and other calamities

4. Vulnerable people are prone to impacts of extreme weather because they cannot afford to live in safer areas

Unit 7: Adapting to and mitigating the effects of climate change

Activity 7.1

1. Adaptation - Action to manage risks of climate change

 Example of adaptation - Using crops that are drought resistant
Mitigation - Action to reduce climate change

4. Example of mitigation - Adapting renewable energy sources for power generation

Activity 7.2

Mitigation

- 1. Active transportation
- 2. Low carbon transportation
- 3. Waste reduction
- 4. Energy-efficient buildings
- 5. Smart growth
- 6. Water conservation
- 7. Local food
- 8. Renewable energy

+

- 1. Waste management
- 2. Public engagement
- 3. Emergency management

Adaptation

- 1. Flood protection
- 2. Preparing for sea level rise
- 3. Wildlife resilience
- 4. Climate resilient buildings

Unit 8:

From anxiety to empowerment

Activity 7.1

- 1. Science denial
- 2. Economic denial
- 3. Political denial

As we fight for our planet's survival, those children that will inherit this, should not be left behind. This book aims to demystify climate action for young scholars through thought provoking lessons, fun activities, and interesting illustrations. We are creating the next generation of climate leaders - aware, empowered, and ready to act.







Visit us at www.cag.org.in or scan the QR Code: