



# Global Warming

and its Effect  
in the Himalayas

CLIMATE CHANGE HANDBOOK



**Global Warming and its Effect  
in the Himalayas**

CLIMATE CHANGE HANDBOOK

**Text and Concept:**

Ang Rita Sherpa & Bheem Raj Rai

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# Global Warming

and its Effect  
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CLIMATE CHANGE HANDBOOK



THE PARTNERS NEPAL



# ABOUT THIS HANDBOOK

Everyone is affected by climate change, including us in Solukhumbu, Nepal. Rising temperatures have reduced permafrost and glacier areas in many alpine regions over the last 50 years. Mountain dwellers believed that greenhouse gas emissions were to blame for global warming over the previous 50 years. Nepal is vulnerable to climate change due to its diverse topography, fragile ecosystems, and extreme poverty. Most people are unaware of how climate change and global warming affect the mountains. Climate change education is lacking in poor countries such as Nepal.

This handbook teaches middle and high school students about the effects of climate change on mountain ecosystems and people. It focuses on Solukhumbu and its inhabitants. TPN believes that publishing this Climate Change and Global Warming handbook will educate Solukhumbu's children and parents and assist them in adapting to the effects of global warming. This Climate

Change and Global Warming handbook is the result of serious debates, seminars, and meetings in Solukhumbu. As proof, photos and cards were used.

The book should teach children the following concepts:

- 1) Climate vs. weather
- 2) What are climate change and global warming?
- 3) Why are there climate change and global warming?
- 4) What is the impact? n What should we do?

To engage children, this manual employs drawings rather than images. Our booklet, Climate Change in the Himalayas: A Case from Solukhumbu, will be distributed to all Solukhumbu schools. The Partners Nepal is grateful to Peak Aid Japan for supporting the publication of this handbook on climate change and global warming in the Khumbu region of Sagarmatha National Park and its buffer zone.





## FORWARD

I'm delighted to learn that The Partners Nepal, a non-governmental organization dedicated to assisting mountain communities and the mountain environment, will publish a handbook on climate change, global warming, and their global consequences. Climate change and global warming are major concerns for people worldwide. They are also some of the most serious environmental threats people face today, particularly those living in mountainous areas.

As a result, The Partners Nepal felt compelled to publish a handbook on Climate Change and Global Warming for secondary and higher secondary students to assist communities and children in understanding and being aware of these issues and how they affect mountain regions.

This handbook will help these students learn more about Climate Change and Global Warming. I also hope that it will motivate them to spread the word and take action to keep our environment clean, safe, and healthy. I'd like to thank The Partners Nepal once more for publishing a handbook on climate change, global warming, and how to deal with their consequences. I'd also like to thank everyone on the team who contributed to the creation of this handbook.

**KEN NOGUCHI**  
CHAIRMAN  
PEAK AID JAPAN





**Namaste!**

Hello everyone! My name is Ang Chokpa Sherpa and these are my friends from Solukhumbu. We are climate change activists in our community.



## ACRONYMS

<b>BZ</b>	Buffer Zone
<b>CAHC</b>	Climate Alliance of Himalayan Communities
<b>CAPA</b>	Community Adaptation Plans for Action
<b>CC</b>	Climate Change
<b>CEN</b>	Clean Energy Nepal
<b>CO<sub>2</sub></b>	Carbon Dioxide
<b>EBC</b>	Everest Base Camp
<b>GHG</b>	Green House Gas
<b>GLOFs</b>	Glacial Lake Outburst Floods
<b>ICIMOD</b>	International Centre for Integrated Mountain Development
<b>IPCC</b>	Intergovernmental Panel on Climate Change
<b>KACC</b>	Khumbu Alpine Conservation Council
<b>LAPA</b>	Local Adaptation Plan for Action
<b>NAPA</b>	National Adaptation Programme of Action
<b>SNP</b>	Sagarmatha National Park
<b>SNPBZ</b>	Sagarmatha National Park & Buffer Zone
<b>TMI</b>	The Mountain Institute
<b>TPN</b>	The Partners Nepal
<b>UNDP</b>	United Nations Development Programme
<b>UNEP</b>	United Nations Environment Programme
<b>UNESCO</b>	United Nations Educational, Scientific and Cultural Organization
<b>UNFCCC</b>	United Nations Framework Convention on Climate Change
<b>VDC</b>	Village Development Committee
<b>VIP</b>	Volunteers in Park Service
<b>WGMS</b>	World Glacier Monitoring Service
<b>WHS</b>	World Heritage Site
<b>WMO</b>	World Meteorological Organization
<b>WWF</b>	World Wildlife Fund



# SAGARMATHA NATIONAL PARK AND BUFFER ZONE

Sagarmatha National Park and Buffer Zone, located in Nepal's northeastern region, is a UNESCO World Heritage Site and one of the world's most popular trekking destinations. Mount Everest (also known as Sagarmatha in Nepali) is located in the park, as are several other notable peaks, such as Lhotse, Cho Oyu, and Makalu.

The park is 1,148 square kilometers in size and is known for its breathtaking landscapes, which include glaciers, alpine meadows, and high-altitude deserts. The park also has a diverse flora and fauna, including the endangered snow leopard, red panda, and Himalayan Thar. The park was founded in 1976 and named a UNESCO World Heritage Site in 1979. The Sagarmatha National Park and Buffer Zone Management Committee is in charge of safeguarding the park's natural resources and promoting sustainable tourism.

The buffer zone, which adds 1,620 square kilometers to the park's size, is an important part of the park's conservation efforts. It acts as a buffer between the park's protected area and the surrounding communities and is used for

## Fact Sheet

Location:	Solukhumbu District
Park Established:	19th July 1976
IUCN Category:	II
National Park Area:	1,148 Sq.
World Heritage Site Declared:	1979
Buffer Zone Declared:	1st January 2002
Buffer Zone Area:	275 Sq.
Buffer Zone Population:	5,869
Major Ethnic Group:	Sherpa
Major Religion:	Buddhism
Major Rivers:	Dudh Koshi, Nangpa Khola, Imja Khola
Major Glacier:	Khumbu, Imja, Ngozumpa, and Nangpa
Bioclimatic Zone:	Lower Temperature, Upper Temperature, Sub-Alpine, Alpine and Nival
Major Peaks:	Sagarmatha (8,848m), Lhotse (8,501m), Nuptse (7,895m), Cho Oyu (8,153m)
Climate:	Temperate to Arctic with Altitudinal and Seasonal Moisture and Temperature Variations
Elevation Range:	2,300 -8,848m
Endangered Mammals:	Snow Leopard, Musk Deer, Red Panda
Major Tree Species:	Blue Pine, Hemlock, Fir, Juniper, Birch, and Rhododendron

agricultural, livestock grazing, and forestry activities. Many of the park's residents live in this area and rely on the park's resources for a living.

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## CHAPTER ONE

# THE EARTH AND ITS CLIMATE

This Chapter will teach you more about the following topics:

1. The atmosphere and its relationship to the earth.
2. The atmosphere and its constituents.
3. What exactly is weather?
4. What exactly is climate?
5. The distinction between weather and climate.

There will be a short activity at the end to help you remember what you have learned.



# WHAT IS EARTH?

Earth is the third planet from the Sun and the only planet known to have life on it. It has a diverse climate and is mostly made up of rock and metal. The Moon is its only natural satellite.



Earth is the fifth largest planet in our solar system, and it's the only one known to have liquid water on its surface. Its diameter is about 12,742 km.

# WHAT IS ATMOSPHERE?

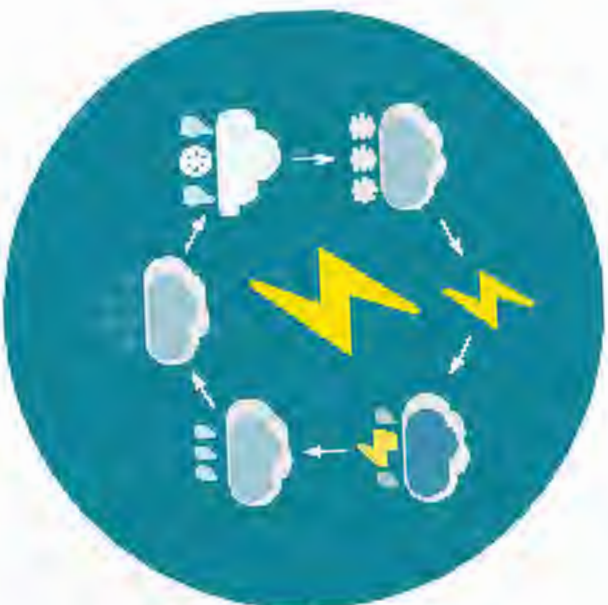
The layer of gases that surrounds a planet or other celestial body is known as the atmosphere. The atmosphere on Earth is mostly made up of nitrogen and oxygen, with trace amounts of other gases like carbon dioxide and argon. It protects life on Earth by absorbing sun ultraviolet radiation and aids in temperature regulation.

The Earth's atmosphere comprises mostly nitrogen 78%, oxygen 21%, and one percent other gases.

# WHAT IS THE WEATHER?



The term "weather" refers to the immediate state of the atmosphere, which includes temperature, humidity, wind, and precipitation. It is the constant change in the atmosphere daily. Weather factors include temperature, pressure, humidity, wind, and precipitation. The movement of air masses, high- and low-pressure systems, and several other factors, such as the Earth's rotation, tilt, and heat from the sun, all influence weather patterns. Because weather varies greatly from place to place and changes rapidly, accurate forecasting is an important and difficult study area.



What you see outside on any given day is the weather. So, for example, it could be 75° F and sunny or 20° F and snowing hard.

The weather is what is visible outside on any given day. Thus, it might be, for instance, 20 degrees with heavy snow or 75 degrees and sunny.

# WHAT IS CLIMATE?



Climate refers to the long-term patterns of temperature, humidity, wind, and rain in a given area. Many factors influence it, including the Earth's rotation and tilt, the amount of solar radiation reaching its surface, and the atmosphere and oceans. Climate can also refer to the overall state of the weather on Earth, including how frequently and severe the worst weather occurs.



I hope you understand the distinction between weather and climate. The state of the atmosphere over a short period of time is referred to as weather. The climate is the average weather over the last 30 years.





THE ACTIVITY PAGE			
1.	Climate and weather are the same thing.	<input type="checkbox"/> True	<input type="checkbox"/> False
2.	Climate refers to the average weather conditions for a given time and location.	<input type="checkbox"/> True	<input type="checkbox"/> False
3.	The climate is determined over 30 years.	<input type="checkbox"/> True	<input type="checkbox"/> False
4.	The climate is what you expect, while the weather is what you get.	<input type="checkbox"/> True	<input type="checkbox"/> False
5.	Climate change is caused by both natural and human activities.	<input type="checkbox"/> True	<input type="checkbox"/> False
6.	The air we breathe is a component of the atmosphere.	<input type="checkbox"/> True	<input type="checkbox"/> False
7.	Weather refers to the state of the atmosphere over a short period of time.	<input type="checkbox"/> True	<input type="checkbox"/> False
8.	The climate has four seasons.	<input type="checkbox"/> True	<input type="checkbox"/> False
9.	Wind, rain, and temperature are weather elements.	<input type="checkbox"/> True	<input type="checkbox"/> False
10.	The Earth is the only known planet with life.	<input type="checkbox"/> True	<input type="checkbox"/> False
11.	Weather refers to current conditions.	<input type="checkbox"/> True	<input type="checkbox"/> False
12.	The temperature this morning is an example of weather.	<input type="checkbox"/> True	<input type="checkbox"/> False







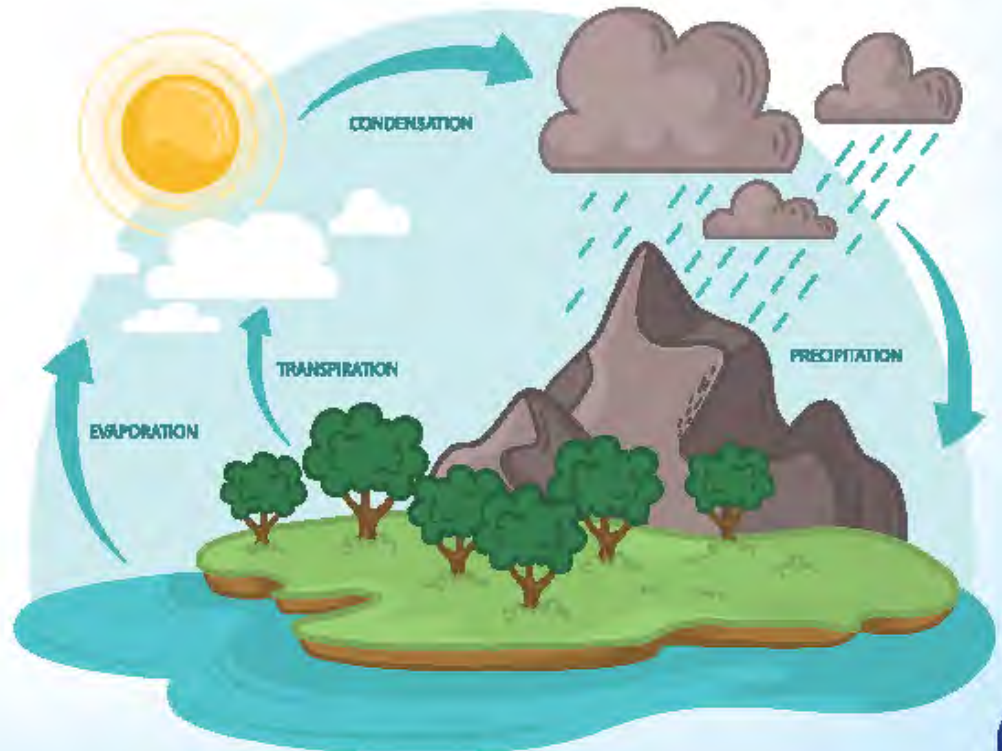
## CHAPTER TWO

# CLIMATE IN THE PAST AND PRESENT

In this Chapter you will:

1. Learn more about how rain and temperature, water supply, food supply, trees, and vegetation cover can be used to demonstrate a changing climate.
2. Be able to compare historical and current climates

You will have the opportunity to practice your investigative skills and draw conclusions at the end of Chapter 2.



# 1. RAIN AND TEMPERATURE

## Past rainy seasons

- The main rainy season began in July and ended in September.
- Post rainy season began from October and ended in December.
- Winter begins from December and ended in March

## Present rainy seasons

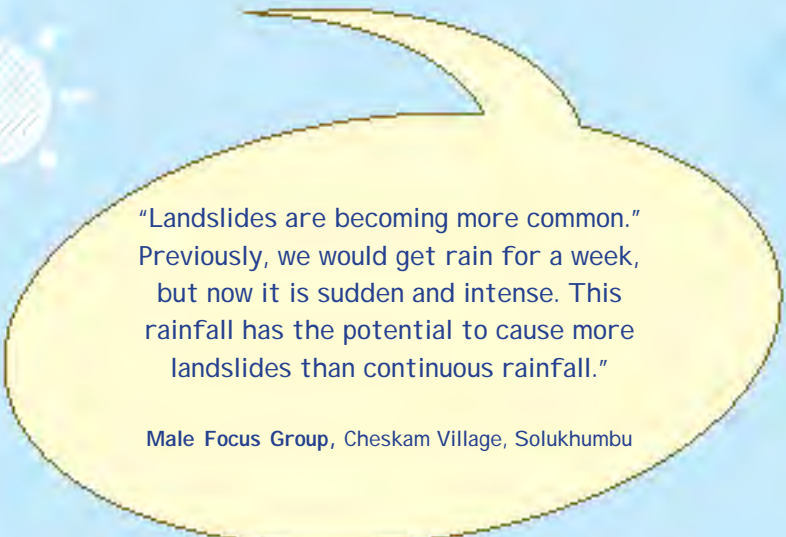

- Unpredictable rain patterns.
- Heavy rain in a short period of time, which can occur only once a year.
- Heavy rains with **thunderstorms and flash floods.**



"We've been noticing a warming trend for about 20 years - the rain is arriving later and the land is drier." There hasn't been enough rain in three years, so the wheat we grow is nearly dry, and the seed isn't fit for planting."

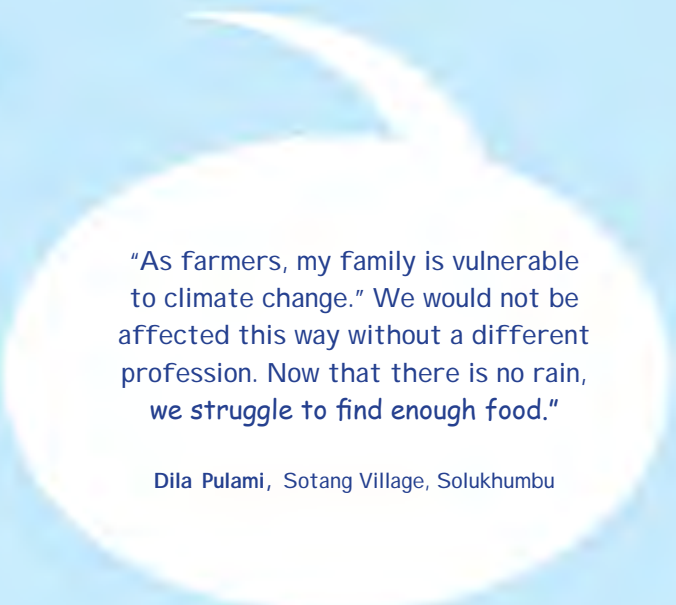


We used to have enough water for drinking, washing clothes, and raising goats, but the water supply is now depleted. We used to wear warm jackets in January and February when I was younger because it was cold, but now it's very hot."





“Landslides are becoming more common.” Previously, we would get rain for a week, but now it is sudden and intense. This rainfall has the potential to cause more landslides than continuous rainfall.”

Male Focus Group, Cheskam Village, Solukhumbu



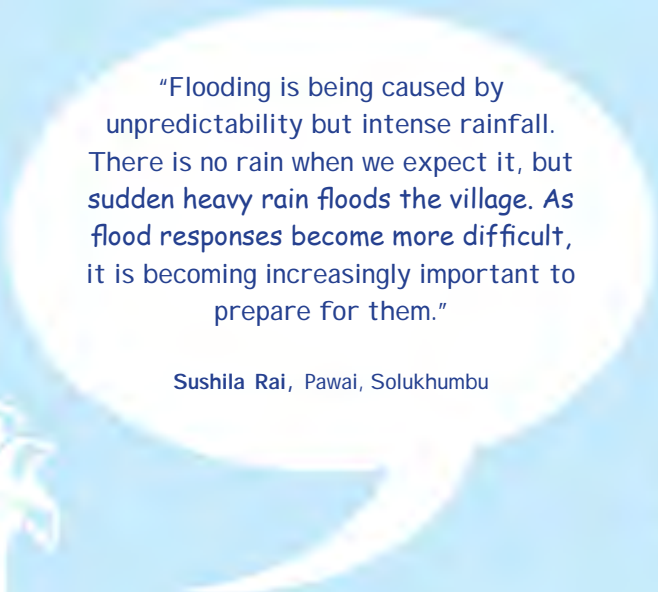
“As farmers, my family is vulnerable to climate change.” We would not be affected this way without a different profession. Now that there is no rain, we struggle to find enough food.”

Dila Pulami, Sotang Village, Solukhumbu



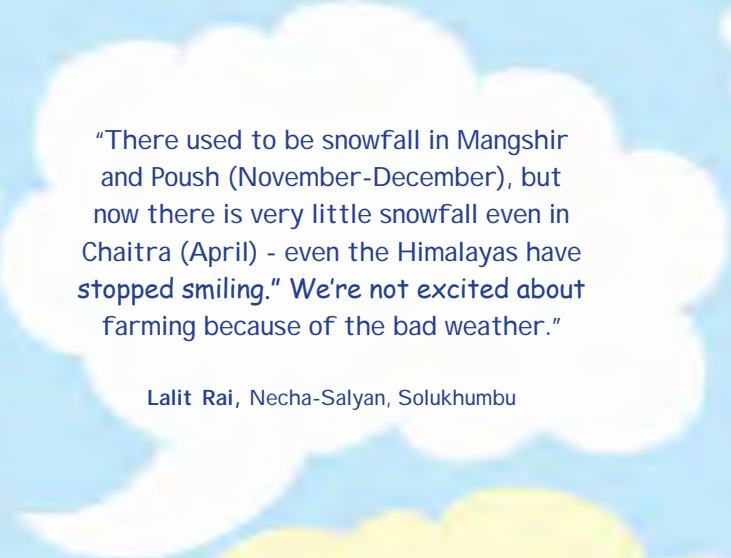
“Normally, we would plant maize during the summer monsoon and wheat during the winter, but wheat production has declined significantly in recent years. Due to a lack of winter rainfall and irrigation, we only harvest one crop yearly”.

Dil Maya Rai, Patale, Solukhumbu




“Flooding is being caused by unpredictability but intense rainfall. There is no rain when we expect it, but sudden heavy rain floods the village. As flood responses become more difficult, it is becoming increasingly important to prepare for them.”

Sushila Rai, Pawai, Solukhumbu



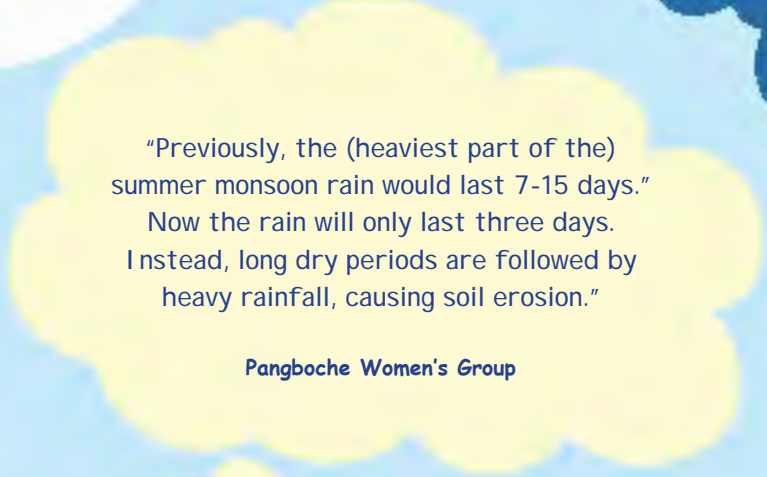
"There used to be snowfall in Mangshir and Poush (November-December), but now there is very little snowfall even in Chaitra (April) - even the Himalayas have stopped smiling." *We're not excited about farming because of the bad weather.*"

Lalit Rai, Necha-Salyan, Solukhumbu



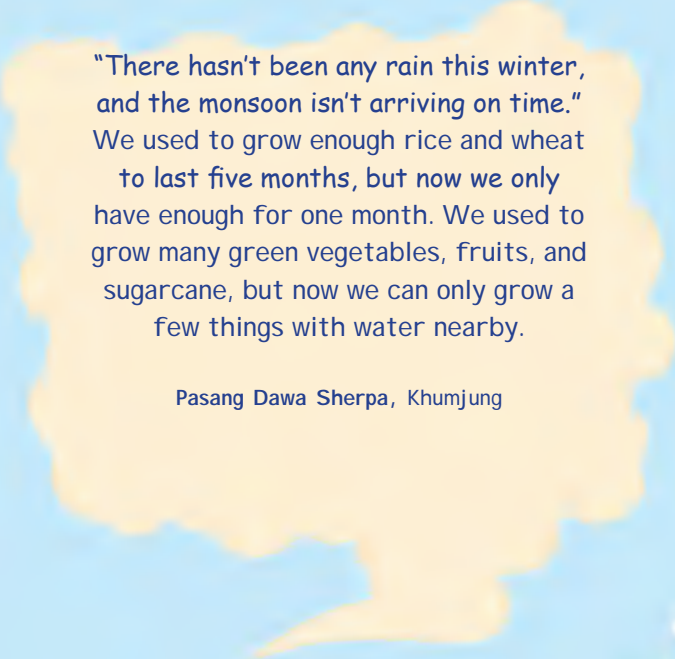
"Our maize crops are being destroyed by excessive rainfall and wind. Hail has been frequent and intense over the last 15 years. Hailstorms are now following rainfall. Hail has generally destroyed standing crops in Ashoj (September) and Falgun/Chaitra (February/April)."

Shree Dhoj Rai, Bung Village, Solukhumbu




"Previously, the (heaviest part of the) summer monsoon rain would last 7-15 days." Now the rain will only last three days. Instead, long dry periods are followed by heavy rainfall, causing soil erosion."

Pangboche Women's Group




"There hasn't been any rain this winter, and the monsoon isn't arriving on time." We used to grow enough rice and wheat to last five months, but now we only have enough for one month. We used to grow many green vegetables, fruits, and sugarcane, but now we can only grow a few things with water nearby.

Pasang Dawa Sherpa, Khumjung




"We rely on rain for agriculture." If it doesn't rain, we women work as casual laborers and domestic servants. Irrigation is critical; we require assistance irrigating our crops due to recent weather conditions."

Karma Chamji Sherpa, Phortse Village



**BEFORE**, Life was plentiful and rich. There were numerous forest products and wildlife to be found. The rivers flowed freely.



**Currently**, The weather is changing rapidly right now. I believe our world is getting hotter. Many factors are influencing our lives and livelihoods.

# TEMPERATURE

## Temperatures in the past

1. Summers are hot.
2. Harsh winters
3. Temperatures that are predictable

We could predict what the temperature would be at a given time of year.

Temperatures in Nepal have been rising at an alarming rate. This trend has been consistent and unbroken since the mid-1970s, with an increase in the average annual mean temperature of  $0.06^{\circ}\text{C}$  between 1977 and 2000. Furthermore, the warming was found to be more pronounced in areas with higher altitudes and during the winter compared to other times of the year.

"A rise in temperature extremes." Warm days and nights are becoming more common, while cool days and nights are becoming less common. This is especially true at higher altitudes."

Tenzing Sherpa,  
Pemba, Pangboche, 2012



## 2. WATER SUPPLY

### Rainfall in the past

- Previously, rainfall was sufficient to meet the needs of people and other living creatures.
- Rivers flowed all year.

Nepal experienced one of its worst droughts in 2015. Due to a severe lack of water, a large number of cattle, domestic animals, and wildlife died.

### Current rainfall

Water for domestic and commercial use is currently a major issue—domestic (for the home) and Commercial (for the workplace). Today, many people on Earth face water scarcity, and it is feared that this problem will worsen in the future, sparking conflict over water resources.



“Winter precipitation is decreasing. A lack of winter rainfall and snow has hampered wheat production. Villagers have planted wheat twice this year, but the harvest has been poor. The timing of the rain has shifted. The monsoon has been delayed; there has been no rain in Ashad and Shrawan (June-July). The intensity of the rain has also changed dramatically.”

### 3. FOOD HARVESTS

People used to harvest more food on the same piece of land than they do now.

Families are currently failing to harvest enough to carry over to the next harvest.





## 4. COVERAGE OF TREES AND VEGETATION

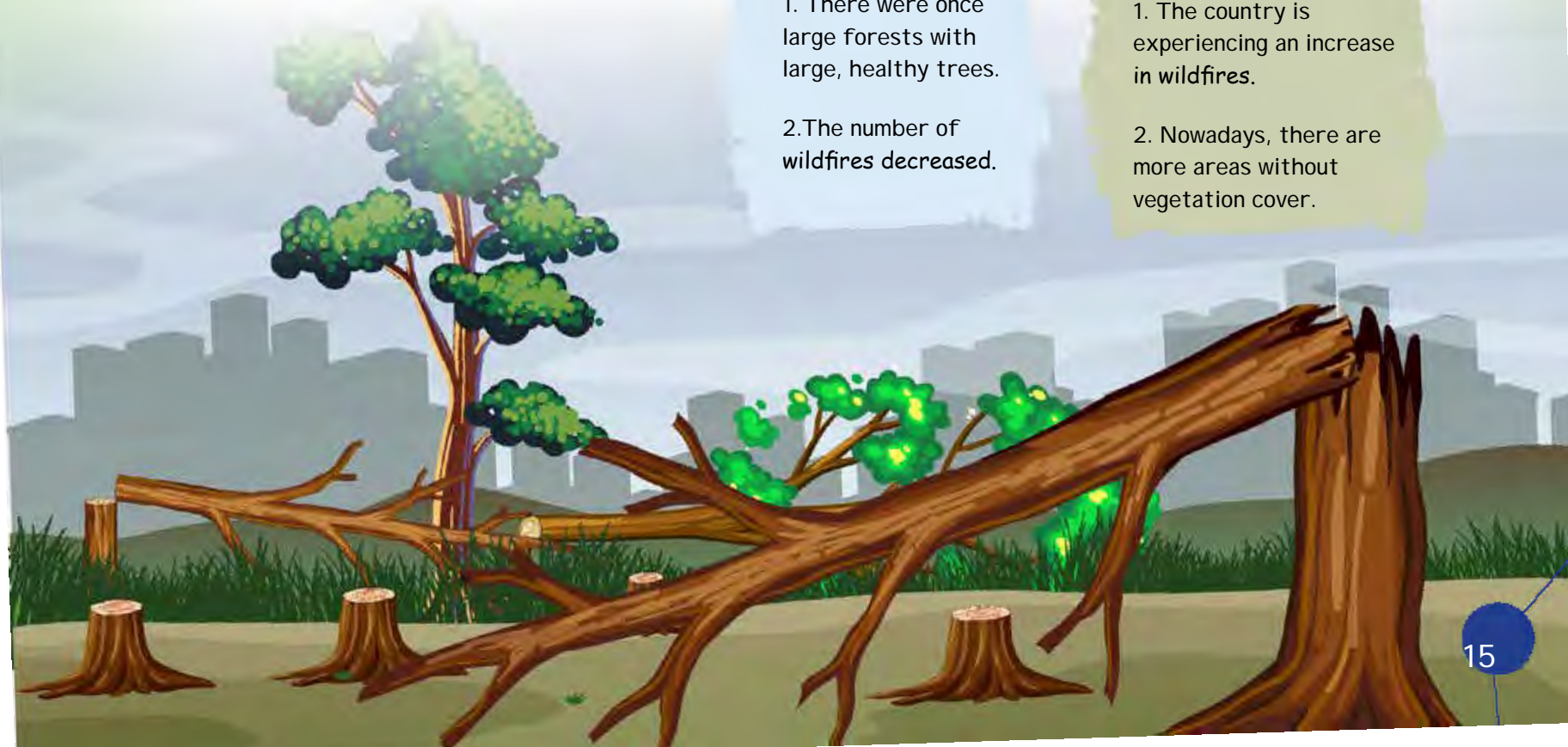
We can see that our climate is changing by comparing past and present conditions. These changes are having an impact on our environment.

### Vegetation from the Past

1. There were once large forests with large, healthy trees.
2. The number of wildfires decreased.

### Currently Existing Vegetation

1. The country is experiencing an increase in wildfires.
2. Nowadays, there are more areas without vegetation cover.





## THE ACTIVITY PAGE

### TRENDS IN CLIMATE CHANGE

Fill in the table with information on how the following topics have changed over multiple generations with the help of your family members to see how the climate has been affected over time for this activity.

HAPPENING	GRANDPARENTS	PARENTS	ME
WINTER TEMPERATURE			
SUMMER TEMPERATURE			
RAINFALL STARTS (Month)			
RAINFALL ENDS (Month)			
SNOW FALL STARTS (Month)			
SNOW FALL ENDS (Month)			
CROP PLANTING SEASON			
CROP HARVESTING SEASON			
FLOOD			
DROUGHT			
FLOWERING PLANTS			
CROP RIPES			
GOOD HARVEST			





## CHAPTER THREE

# GLOBAL WARMING

**This chapter will teach you more about:**

1. What are global warming and its natural and man-made causes?
2. The greenhouse effect and greenhouse gases.
3. Human activity's role in global warming.

Finally, a couple of activities will refresh your memory and test your understanding of the topics covered.



# GLOBAL WARMING



## What is global warming?

Global warming is the gradual rise in the overall temperature of the Earth's atmosphere caused primarily by the combustion of fossil fuels such as coal, oil, and natural gas, which emits large amounts of carbon dioxide and other greenhouse gases into the atmosphere.

These gases trap heat from the sun, raising the Earth's temperature and causing various negative environmental effects, such as rising sea levels, changes in precipitation patterns, and more severe weather events.

## NATURAL CAUSES OF GLOBAL WARMING

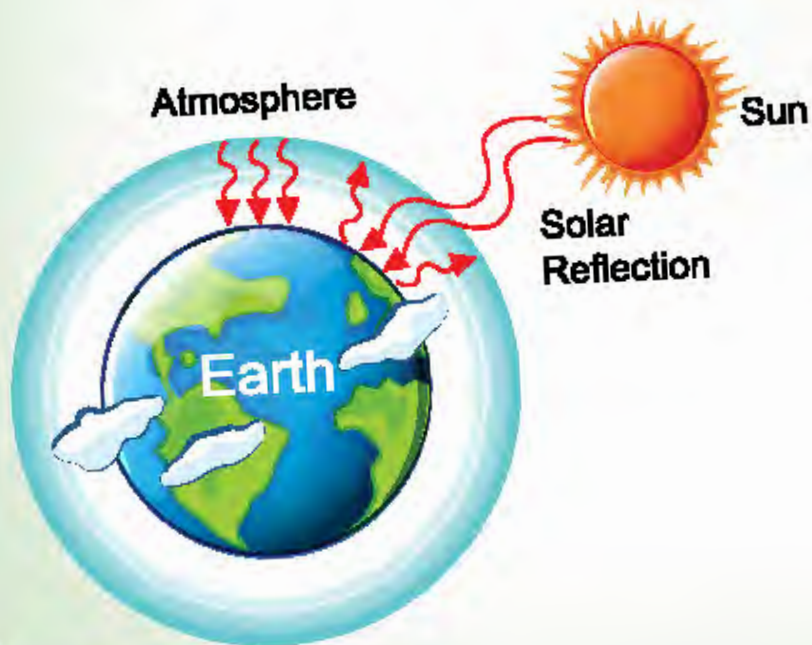
Burning fossil fuels such as coal, oil, and natural gas, which emit large amounts of carbon dioxide and other greenhouse gases into the atmosphere, is the primary cause of global warming. These gases trap heat from the sun, raising the Earth's temperature. Other human activities that emit carbon dioxide into the atmosphere, such as deforestation and agriculture, also contribute to global warming.

### What is volcanic eruption?

A volcanic eruption is a natural event that occurs when molten rock, ash, and gas spewing from a hole in the Earth's surface, typically at the top or side of a volcano. Volcanic eruptions are classified according to their size, shape, explosive power, and the type of magma (molten rock) involved. Explosive eruptions, which release a large amount of ash and gas, and effusive eruptions, which release lava more gently, are two common types of volcanic eruptions. Volcanic eruptions can cause damage to nearby towns and infrastructure, as well as change the global climate.



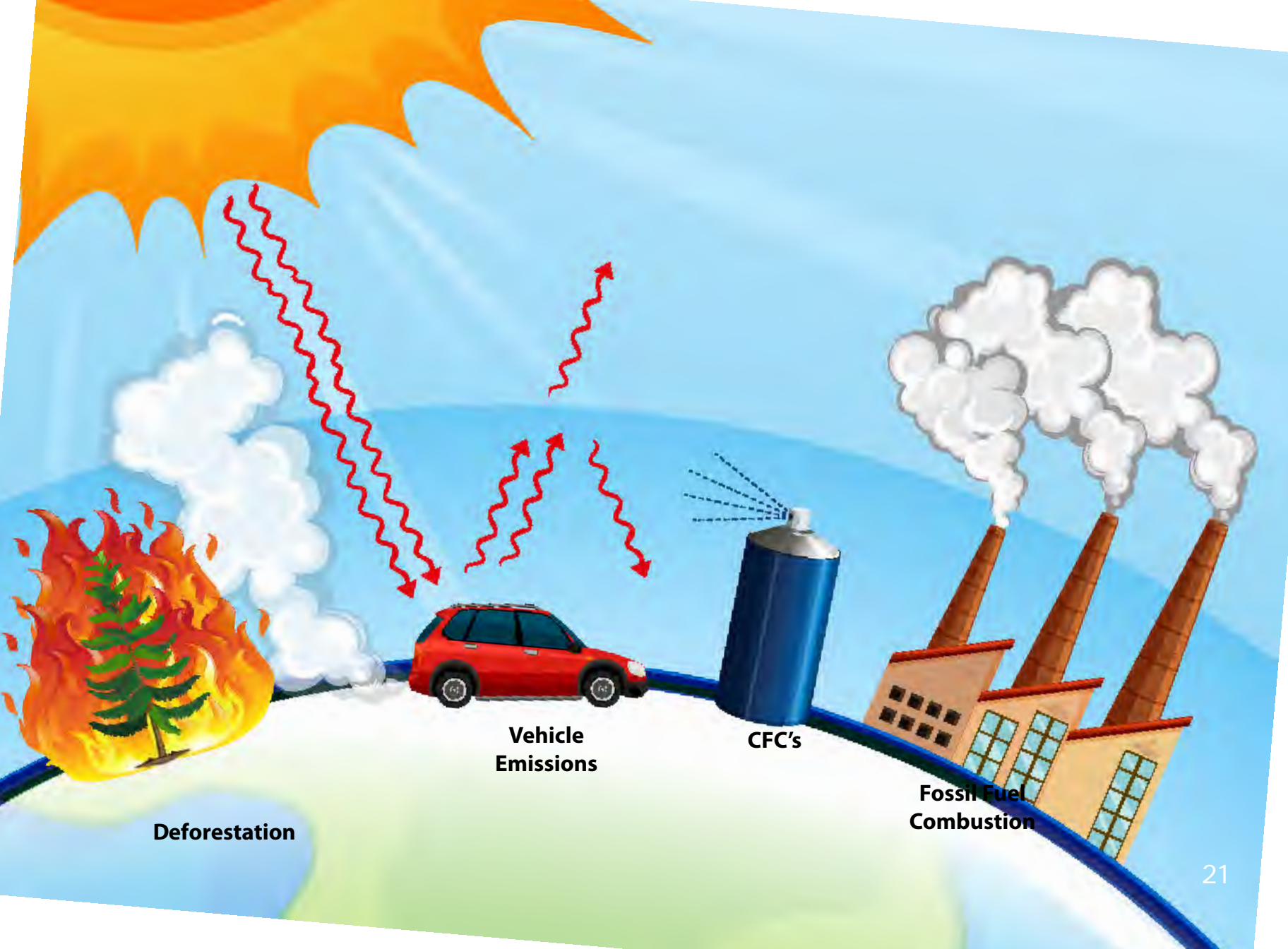
# GLOBAL WARMING FROM HUMAN ACTIVITIES



The primary cause of global warming caused by human activities is the release of greenhouse gases into the atmosphere, such as carbon dioxide (CO<sub>2</sub>). The largest source of human-caused CO<sub>2</sub> emissions is the combustion of fossil fuels such as coal, oil, and natural gas. Among the other human activities that contribute to global warming are:

1. Deforestation
2. Processes in industry
3. Agriculture,
4. Transportation, and waste disposal

Overall, these activities emit large amounts of greenhouse gases into the atmosphere, trapping more heat from the sun and contributing to global warming. Most scientific evidence suggests that human activities are the primary cause of global warming.



**Deforestation**

**Vehicle  
Emissions**

**CFC's**

**Fossil Fuel  
Combustion**



## 1. GREENHOUSE GAS AND ITS EFFECT

A greenhouse gas is a gas that absorbs and emits thermal infrared radiation. The *greenhouse effect* warms the Earth's surface and lower atmosphere. Greenhouse gases include carbon dioxide, methane, water vapor, and ozone.

Human activities primarily emit greenhouse gases, such as using fossil fuels (coal, oil, and natural gas) for energy, deforestation, agriculture, waste disposal, and other industrial processes.

## 2. DEFORESTATION

Deforestation is the cutting and clearing forests for agricultural or urban development purposes. It is a significant environmental issue because it contributes to climate change, biodiversity loss, and other negative effects on the ecosystem. Deforestation has significant social and economic consequences, such as displacement of local communities and reduced availability of natural resources.







### 3. FOREST FIRE

A forest fire is a natural or man-made event that causes a forested area to burn. Forest fires can have an impact on the ecosystem in both positive and negative ways. They can aid in removing dead and dry vegetation, allowing new growth and promoting biodiversity. On the other hand, large and intense fires can cause significant damage to the forest, destroying habitats and killing wildlife. Human-caused fires, such as arson, can also result in property loss and human lives.

### 4. INDUSTRIALIZATION

While running industries, various gases such as carbon dioxide, sulfur oxide, and others are released into the atmosphere. These gases contribute to climate change by increasing the greenhouse effect.

Greenhouse gas emissions from industry are primarily caused by the use of fossil fuels for energy and certain chemical reactions required to produce goods from raw materials. This waste generated by industries ends up in landfills, contaminating our environment. The chemicals and materials used in industrialization have the potential to pollute the atmosphere and the soil beneath it.



## 5. TRANSPORTATION

Most vehicles run on fossil fuels, including cars, trucks, ships, and planes. Transportation contributes significantly to greenhouse gas emissions, particularly carbon dioxide emissions. The combustion of fossil fuels emits carbon and other pollutants into the atmosphere. As a result, transportation contributes to greenhouse gas emissions.

Road vehicles account for most of the total, owing to the consumption of petroleum-based products. Transportation accounts for nearly a quarter of global energy-related CO<sub>2</sub> emissions.



## 6. WASTE

Many non-recyclable items, waste, and packaging end up in landfills. When waste in landfills decomposes/breaks down, it emits harmful gases into the atmosphere, contributing to global warming. Dumping waste and burning any material contribute to global warming by releasing greenhouse gases into the atmosphere. Because of the amount of packaging used and the short life cycle of products, humans are producing more waste than ever before.

## 7. OIL AND GAS

Almost every industry relies on oil and gas daily. Its primary applications are in construction, transportation, and energy generation. The combustion of coal, oil, and gases significantly contributes to the climate crisis. Consumption of fossil fuels also harms nearby species and ecosystems; its toxicity wipes out plant life and renders areas uninhabitable.



## 8. FARMING

Farming necessitates a large amount of green land, so local ecosystems may be destroyed to make way for farming. Animals produce a lot of waste and greenhouse gases like methane. They also generate a large amount of waste. Because it produces more pollution, factory farming contributes to even more climatic issues.



## 9. POWER PLANTS

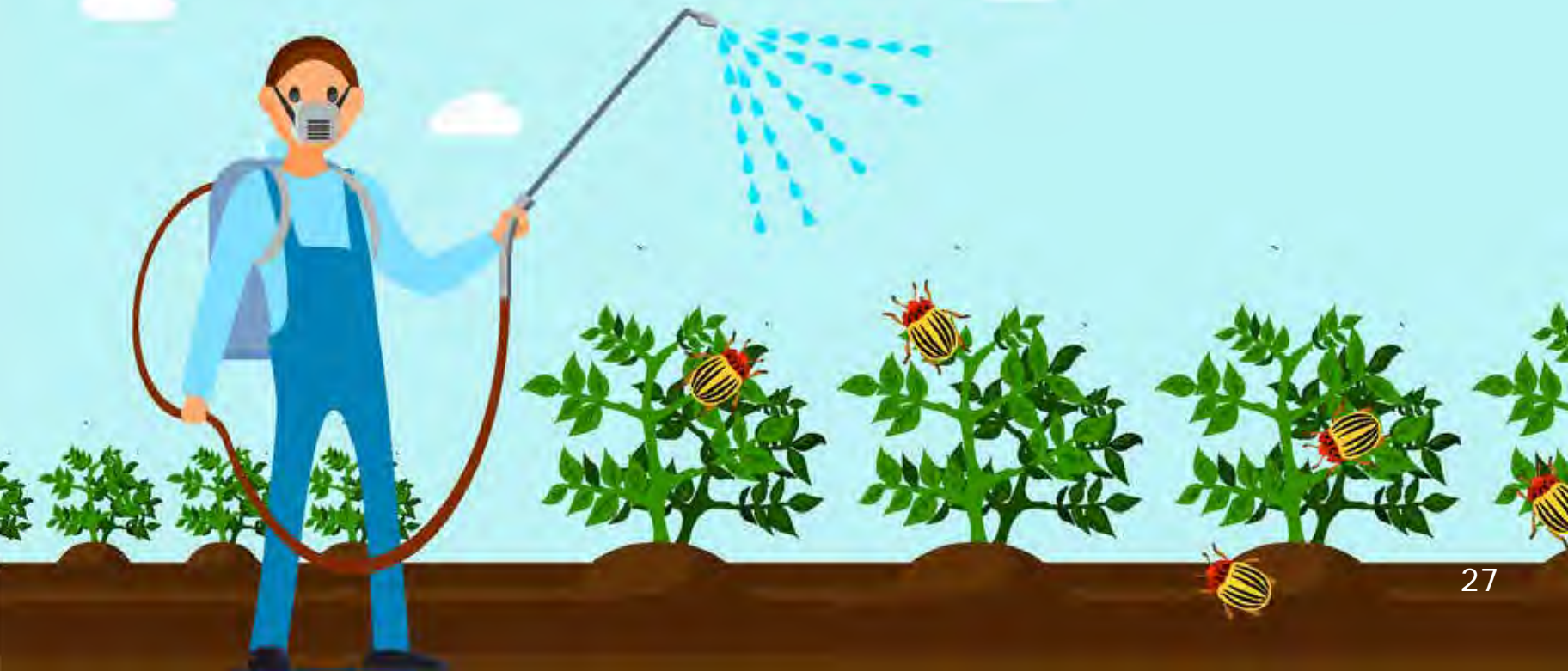
Because power plants use fossil fuels to operate, they emit many pollutants. They emit pollution that ends up not only in the atmosphere but also in the waterways, contributing significantly to global warming. Coal combustion in power plants accounts for approximately 46% of total carbon emissions. The combustion of fossil fuels produces a large portion of the electricity used in factories.

## 10. BURNING OPEN FIRES

In rural areas, open flames are frequently used for cooking. They primarily use wood for heat and cooking. While burning wood over an open flame, many gases are released into the atmosphere as smoke. Burning wood over an open flame causes deforestation and emits significant greenhouse gases, contributing to global warming.

## 11. OVERUSE OF CHEMICAL FERTILIZERS

Chemical fertilizers contribute to greenhouse gas emissions. When too many chemical fertilizers are used, the land dries out, causing climate change. Chemical fertilizers can cause the soil to become acidic and crusty, reduce organic matter, slow plant growth, change the pH of the soil, attract pests, and emit greenhouse gases.



# IMPACTS OF GLOBAL WARMING

## Impacts of global warming

1. Sea-level rise
2. Changes in rainfall patterns
3. An increased livelihood of extreme events such as heat waves, flooding, and hurricanes.
4. The melting of the polar ice caps
5. Glacier melting
6. Widespread extinction of animal populations due to habitat loss
7. Coral reef bleaching
8. Loss of plankton due to sea-level rise

- 
- 
1. Rising Sea Levels
  2. Weather effects
  3. Health effects
  4. Biodiversity loss
  5. Ocean acidification
  6. The impact on agriculture

The consequences of global warming are far-reaching and potentially disastrous for our planet. Temperature rise is one of the most serious consequences of global warming. Many plant and animal species are forced to adapt as temperatures rise, which may lead to extinction. The increased frequency of wildfires and rising sea levels are two other devastating effects of global warming.

Other global warming effects include:

1. More strong storms
2. Drought is becoming more severe
3. Sea levels are rising
4. Species extinction and
5. Not enough food



## 1. MORE STRONG STORMS

Storms are becoming stronger and more frequent in many areas. More water evaporates as the temperature rises. This exacerbates heavy rain and flooding and makes storms more destructive. The warming ocean impacts the number and size of tropical storms.

More water evaporates as the temperature rises. This exacerbates heavy rain and flooding and makes storms more destructive.

As the temperature goes up, more water evaporates. This makes extreme rain and flooding worse and makes storms more destructive.





## 2. INCREASED DROUGHT

Due to climate change, water is becoming more difficult to find in more places. Global warming exacerbates water scarcity in places where there is already a scarcity. It also increases the likelihood of agricultural droughts, which harm crops, and ecological droughts, making ecosystems more vulnerable.

Droughts can also cause sand and dust storms, transporting billions of tons of sand across continents. Food production is becoming more difficult as deserts expand. Many people are now at risk of running out of water regularly.

## 3. INCREASING SEA LEVELS

The ocean absorbs the majority of the heat from global warming. The rate at which the ocean has warmed has accelerated dramatically over the last 20 years at all depths. Because water expands as it warms, the ocean expands as it warms. When ice sheets melt, sea levels rise, posing a risk to people who live near the coast or on islands.





## 4. LOSS OF SPECIES

Climate change endangers the survival of species on land and in the sea. These dangers worsen as the temperature rises. Climate change is causing species to become extinct 1,000 times faster than at any other point in human history. One million species may become extinct within the next few decades. Forest fires, bad weather, invasive pests, and diseases threaten climate change. Some species can move while remaining alive, while others cannot.



## 5. NOT ENOUGH FOOD

Climate change and more extreme weather are to blame for increased hunger and poor nutrition worldwide. There is a possibility that fisheries, crops, and animals will perish or have less food to eat. As the oceans become more acidic, marine resources that feed many people are threatened. Changes in snow and ice have made it more difficult to obtain food through herding, hunting, and fishing in many parts of the Arctic. Heat stress can make it more difficult to graze on grasslands and water. This can be harmful to both crops and animals.



## THE ACTIVITY PAGE



### Answer True or False

1.	The use of fossil fuels does not contribute to global warming.	<input type="checkbox"/> True	<input type="checkbox"/> False
2.	Climate change is caused by global warming.	<input type="checkbox"/> True	<input type="checkbox"/> False
3.	<b>The greenhouse effect is beneficial to our climate.</b>	<input type="checkbox"/> True	<input type="checkbox"/> False
4.	Global warming is the average increase in the temperature of the Earth.	<input type="checkbox"/> True	<input type="checkbox"/> False
5.	Climate and weather are the same thing.	<input type="checkbox"/> True	<input type="checkbox"/> False
6.	<b>Open fire does not harm the environment.</b>	<input type="checkbox"/> True	<input type="checkbox"/> False
7.	Human activities do not cause global warming.	<input type="checkbox"/> True	<input type="checkbox"/> False
8.	People in the past harvested more food than today.	<input type="checkbox"/> True	<input type="checkbox"/> False
9.	<b>Energy efficient activities contribute to global warming.</b>	<input type="checkbox"/> True	<input type="checkbox"/> False
10.	Burning waste releases greenhouse gases.	<input type="checkbox"/> True	<input type="checkbox"/> False
11.	<b>Global warming is beneficial to the environment.</b>	<input type="checkbox"/> True	<input type="checkbox"/> False





## CHAPTER FOUR

# CLIMATE CHANGE

In this Chapter you will:

1. Investigate the relationship between global warming and climate change in this Chapter.
2. Examine the local and global effects of climate change.
3. Discover how to combat climate change and what is being done locally.

Fun exercises will put your knowledge of the chapter you just read to the test, and a fun activity at the end will allow you to self-assess and take climate action.



## WHAT IS CLIMATE CHANGE?



Long-term temperature and weather changes are part of climate change. Variations in the solar cycle could cause these movements. Human activities such as using fossil fuels such as coal, oil, and gas have contributed to climate change since the 1800s. It has caused global warming that has never occurred in the last few decades.

## NATURAL CAUSES OF CLIMATE CHANGE

Natural and man-made activities have caused climate change since the Earth's formation 4.5 billion years ago. Volcanic eruptions, the Earth's orbit, and crustal changes all impact climate (this is known as plate tectonics).

Nature is the source of all things. One reason is methane from polar tundra and wetlands. Methane is a carcinogenic greenhouse gas. Another natural reason is climate change. Climate change has a half-life of 40,000 years.

Ang Chhutin and Mingma went up the hill to fetch a pail of water. There was none, an extreme weather due to climate change had caused a drought.

## HUMAN CAUSES OF CLIMATE CHANGE

Humans cause the majority of environmental damage. Climate change is caused by carbon dioxide and other heat-trapping gases. Carbon dioxide levels in the atmosphere have reached their highest level in 2 million years. Between 1900 and 2000, carbon dioxide levels increased by 40%.

Human activity raises the levels of greenhouse gases. Burning coal and oil has increased the amount of carbon dioxide (CO<sub>2</sub>) in the atmosphere over the last century. CO<sub>2</sub> is produced when carbon and oxygen from the atmosphere combine with coal or fire.

The following are the primary causes of climate change:

1. Burning fossil fuels
2. Cutting down trees
3. Agriculture
4. Energy use
5. Manufacturing goods
6. Producing food



# 1. BURNING FOSSIL FUELS

The primary cause of climate change is using fossil fuels such as oil, gas, and coal. The combustion of fossil fuels occurs when oil, natural gas, and coal are burned to generate energy. We convert this energy into electricity and use it to generate power. When fossil fuels are burned, they emit a large amount of carbon dioxide. Carbon emissions trap heat in the atmosphere, causing climate change. When fossil fuels are produced and burned, they pollute the air and emit toxic gases contributing to climate change.





## 2. CUTTING DOWN TREES

Trees help to balance CO<sub>2</sub> levels in the atmosphere by absorbing CO<sub>2</sub>. However, trees are cut down to build homes, businesses, and other structures, and industrialization destroys forests.

Cutting down forests to make way for farms, pastures, or other uses increases emissions because trees release the carbon they have stored into the atmosphere when they are cut down. According to estimates, about 12 million hectares of forest are burned each year.



### 3. AGRICULTURE

Growing crops and raising livestock emit many greenhouse gases into the atmosphere. Animals, for example, produce methane, a greenhouse gas 30 times more powerful than carbon dioxide.



## 4. ENERGY USE

Using fossil fuels to generate electricity and heat contributes significantly to global emissions. Some of the electrical devices we use consume far too much energy. The power plant must burn more fossil fuels to produce enough electricity to meet rising demand. More greenhouse gases are released into the atmosphere as more people use electricity. They waste energy and contribute to global warming.



## 5. MANUFACTURING GOODS

Most pollution from manufacturing and industry is caused by using fossil fuels to generate the energy required to produce cement, iron, steel, electronics, plastics, clothing, and other goods. Mining, other industrial processes, and the construction industry all produce gases. Most manufacturing machines run on coal, oil, or gas, and some materials, such as plastics, are made from chemicals derived from fossil fuels. The manufacturing industry is one of the largest contributors to global greenhouse gas emissions.



## 6. PRODUCING FOOD

Deforestation from food production emits carbon dioxide, methane, and other greenhouse gases. Food production contributes significantly to climate change because food must be grown, processed, packaged, transported, and consumed, generating greenhouse gas emissions. Greenhouse gases are also produced during the packaging and distribution of food.



## IMPACTS OF CLIMATE CHANGE

Climate change has a significant impact on our environment and weather patterns. Climate change causes extreme weather events like heavy rain, drought, and heat waves, which can lead to crop failure and water shortages. Climate change has the potential to have serious consequences for human health. Extreme weather can injure and kill people, and pollution in the air and water can exacerbate respiratory and cardiovascular diseases. Climate change also increases the likelihood of diseases spread by bugs, such as malaria and dengue fever.

Some of the major impacts of climate change include:

1. Agriculture
2. Water Resources
3. Forests
4. Human Health
5. Food
6. Glaciers
7. Biodiversity
8. Tourism
9. Extreme Heat



# 1. AGRICULTURE

Farming is one of the primary means of subsistence in Nepal. Approximately 80% of the population is involved in agriculture, either directly or indirectly. However, climate change can impact how much food is available, how easy it is to obtain, and how good it is. Temperature increases, changes in how it rains, changes in how frequently and how severe extreme weather events occur, and decreases in the amount of water available, for example, can all lead to a drop in agricultural production. This is likely to make future food security more difficult.

Weather patterns are changing as a result of climate change, which has an impact on agriculture. This is due to changes in the way rain falls. Farmers find it more difficult to do their jobs due to increased droughts and floods. Because of this, it's difficult to get enough food. People fight over what little there is when there isn't enough food.

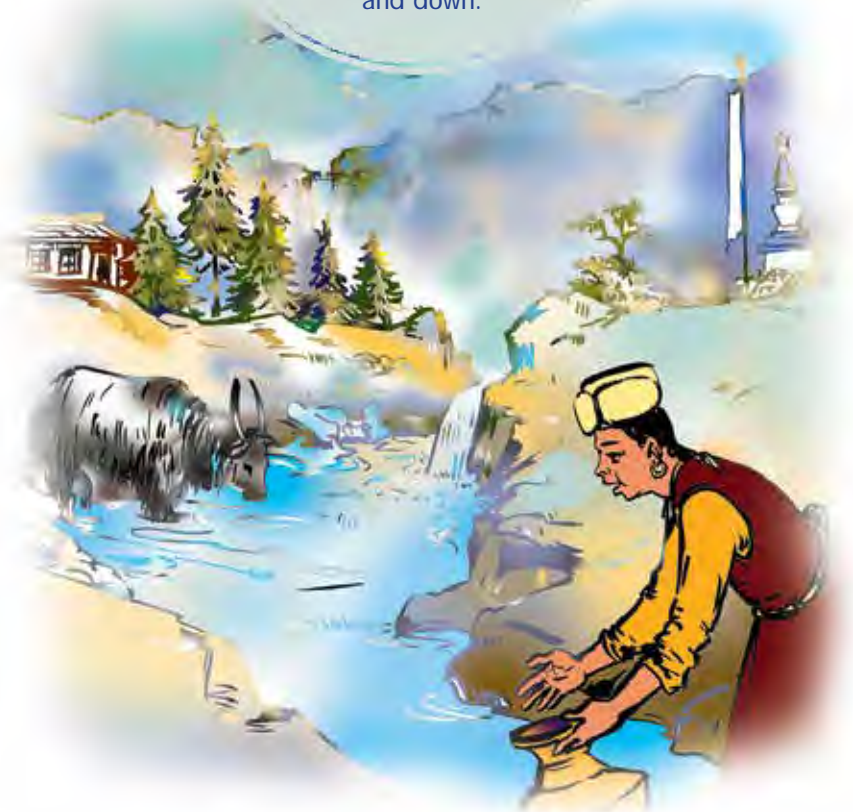


## 2. WATER RESOURCES

Changes in water resources have an impact on our world and our lives. Many people on Earth do not have enough water, and some fear that this problem will worsen, leading to battles over water resources. Climate models predict that glaciers will melt quickly. This means less water and increased seasonal river flow. A lack of water causes both droughts and floods. Flood damage makes it more difficult to obtain safe drinking water. During droughts, people get water from unsafe sources. The Himalayas are likely the most affected because they provide water to approximately a billion people in India, China, Pakistan, and Nepal.

Droughts and floods are caused by global warming. Flooding destroys water supply facilities, reducing clean water availability. Droughts reduce available water, forcing people to rely on unsafe sources.

Hello, my name is Kanchhi Sherpa, and I'm from Solukhumbu. We used to get water close to our house, but removing trees and destroying the environment has made it difficult to get water. The water in my village is 30 minutes up and down.





### 3. FORESTS

Forests are critical for protecting watersheds and river flow. Today, forests are cut down for various reasons, the most common of which are to build homes, expand farmland, and transform them into other uses. This is known as deforestation, and it occurs as people's needs increase. When trees are cut down, the amount of CO<sub>2</sub> in the atmosphere increases. This exacerbates the problem of global warming.

## 4. HUMAN HEALTH

Climate change is already having an impact on people's health. Climate change is currently the most dangerous to people's health. Climate change already affects people's health by causing air pollution, diseases, extreme weather events, increased hunger, and poor nutrition in places where people can't grow or find enough food.

Diseases are spreading as a result of climate change. Extreme weather kills more people and makes it more difficult for healthcare systems to keep up.



## 5. FOOD

The climate and weather influence our food choices. Farmers and researchers may be able to change or develop new farming methods, but some changes will be difficult to accept. Farmers and ranchers who grow and raise our food face rising temperatures, drought and water scarcity, disease, and extreme weather. Because of the heat, farm workers can tire, suffer from heat stroke, or even have a heart attack. Animals can also be harmed by rising temperatures and heat stress, which can make food harvesting difficult.



## 6. GLACIERS

The Himalayan glaciers supply water to over a billion people. However, as the mountains continue to warm, the Himalayan glaciers are melting at an unprecedented rate. Because the Earth is warming, glaciers are melting and shrinking. As the Himalayan glaciers *shrink and snow melts, less water flows* into rivers, and more glacial lakes form. This will impact the freshwater supply that billions of people rely on to drink, grow food, and maintain the health of ecosystems.



## 7. BIODIVERSITY

Because of global warming, the lives of many plant and animal species are changing. This is because plants and animals do not live in isolation from one another or their surroundings. Instead, they are linked in systems known as ecosystems.

Many plant and animal species have become extinct in recent decades, owing primarily to human activity. Many parts of the world's biodiversity are under threat. One of the primary causes is the destruction of forests, other natural ecosystems, and traditional crops. Introducing plants and animals from other places can also destabilize an ecosystem and rapidly lose biodiversity.



## 8. TOURISM

Tourism is the primary source of income and a way of life for many people worldwide, particularly in Himalayan communities. Many people enjoy hiking, climbing, and other activities in mountainous areas. However, climate change will significantly impact tourism around the world because weather affects the length and quality of the tourist season, as well as where people go and how much they spend.

Because of how mountains are formed, mountain tourist destinations appear to be more vulnerable to climate change, particularly in higher parts of Nepal. As a result, climate change will likely impact people's businesses at some point.



## 9. EXTREME TEMPERATURE

Extreme temperatures are caused by climate change, which leads to heat waves and the spread of pests and diseases. As the amount of greenhouse gases in the atmosphere increases, so does the temperature of the Earth's surface. Extreme temperatures cause heat waves and are harmful to our health. Extremely high temperatures cause heat waves. We get headaches, rashes, and other illnesses, feel sick and tired, and have trouble breathing due to the heat. People can become ill from excessive heat, and in some cases, it can even kill them.





## CLIMATE CHANGE ACTIVITY

### Complete the Sentence

Use the words in the list below to complete the sentence

1. Climate change affects farming which leads to-----shortages.
2. Droughts means less-----is available for people to use.
3. Flooding damages water facilities and this means water may not be-----to use.
4. Lack of clean and adequate water leads to ----- outbreaks such as cholera.
5. Increase in temperatures leads to spread of ----- and diseases.
6. Extreme-----make wild fires difficult to control.
7. People who are----- not able to cope with climate change.
8. People who can adapt to the changes brought by climate change are-----.
9. Climate change results----- in as people fight for food, land and other resources.
10. Climate change destroys----- such as roads and schools.

- Infrastructure
- Pests
- Vulnerable
- Food
- Temperatures
- Safe
- Resilient
- Water
- Disease
- Conflicts







## ACTIVITY PAGE

### Complete the Sentence

Use the words in the list below to complete the sentence

1. Are the impacts of climate change\_\_\_\_\_.
2. Flooding damages water facilities and this means water may not be\_\_\_\_\_to use.
3. Lack of clean and adequate water leads to \_\_\_\_\_outbreaks such as cholera.
4. Increase in temperatures leads to spread of\_\_\_\_\_and diseases.
5. People who can adapt to the changes brought by climate change are\_\_\_\_\_.
6. Climate change results\_\_\_\_\_ in as people fight for food, land and other resources.
7. \_\_\_\_\_tells us how much water vapour is in the air at a given time.

- Positive
- Negative
- Vulnerable
- Food
- Temperatures
- Safe
- Resilient
- Water
- Disease
- Conflicts
- Humidity





# CLIMATE CHANGE ACTIVITY PAGE



## Answer True or False

1.	Climate and weather are the same thing	<input type="checkbox"/> True	<input type="checkbox"/> False
2.	<b>Climate is the average weather conditions for a specific time and place.</b>	<input type="checkbox"/> True	<input type="checkbox"/> False
3.	Climate is determined over a 30 years period.	<input type="checkbox"/> True	<input type="checkbox"/> False
4.	Climate is what you expect, weather is you get.	<input type="checkbox"/> True	<input type="checkbox"/> False
5.	Climate change is caused by natural as well as human activities.	<input type="checkbox"/> True	<input type="checkbox"/> False
6.	<b>Solukhumbu's climate is generally cool throughout the year.</b>	<input type="checkbox"/> True	<input type="checkbox"/> False
7.	The air we breathe is part of the atmosphere.	<input type="checkbox"/> True	<input type="checkbox"/> False
8.	Weather is the state of the atmosphere over a short period of time.	<input type="checkbox"/> True	<input type="checkbox"/> False
9.	Climate is the average weather over 30 years.	<input type="checkbox"/> True	<input type="checkbox"/> False
10.	Wind, rain and temperature are elements of weather.	<input type="checkbox"/> True	<input type="checkbox"/> False
11.	The Earth is the only planet known to have life.	<input type="checkbox"/> True	<input type="checkbox"/> False
12.	Weather refers to short-term conditions.	<input type="checkbox"/> True	<input type="checkbox"/> False
13.	Temperature of this morning is the example of weather.	<input type="checkbox"/> True	<input type="checkbox"/> False





## CLIMATE CHANGE ACTIVITY PAGE



### Answer True or False

1.	Climate change is not an issue.	<input type="checkbox"/> True	<input type="checkbox"/> False
2.	<b>Rising temperatures do not affect drought and wildfires.</b>	<input type="checkbox"/> True	<input type="checkbox"/> False
3.	Climate change has no impact on agricultural production.	<input type="checkbox"/> True	<input type="checkbox"/> False
4.	Climate change is causing more severe droughts, storms, heat waves, rising sea levels, melting glaciers, and warming oceans.	<input type="checkbox"/> True	<input type="checkbox"/> False
5.	Drought can harm food production and human health due to climate change.	<input type="checkbox"/> True	<input type="checkbox"/> False
6.	Melting glaciers, rising CO2 levels in the atmosphere, forests, and wildlife declining have nothing to do with declining.	<input type="checkbox"/> True	<input type="checkbox"/> False
7.	Climate change will have an impact on biodiversity.	<input type="checkbox"/> True	<input type="checkbox"/> False
8.	Tourism and climate change are unrelated.	<input type="checkbox"/> True	<input type="checkbox"/> False
9.	Glacier retreat and melting diminish water sources.	<input type="checkbox"/> True	<input type="checkbox"/> False
10.	Extreme heat has nothing to do with climate change.	<input type="checkbox"/> True	<input type="checkbox"/> False
11.	Glacier retreats and melting glaciers will have an impact on GLOFs.	<input type="checkbox"/> True	<input type="checkbox"/> False
12.	Weather refers to current conditions.	<input type="checkbox"/> True	<input type="checkbox"/> False



# STEPS TO REDUCE GLOBAL WARMING

People, businesses, and governments can all help to limit global warming in different ways. Solar, wind, and hydropower can all help to reduce greenhouse gas emissions. These energy sources do not contribute to global warming. Energy efficiency has the potential to slow global warming. For example, using energy-efficient appliances, lights, and automobiles can help reduce pollution and energy costs. Stopping deforestation and encouraging more tree planting can help slow global warming. Finally, governments can reduce emissions while also promoting clean energy. Carbon taxes, emissions trading, and requiring renewable energy are all examples.

People, businesses, and governments must cooperate to prevent global warming. Global warming can be slowed by using more renewable energy, making energy use more efficient, reducing deforestation, and adhering to government regulations. There are two ways to slow climate change: adaptation and mitigation.



# ADAPTATION AND MITIGATION

## ADAPTATION

Climate change adaptation is the process by which people, communities, and ecosystems deal with the negative effects of climate change. This could imply improving infrastructure, water management and encouraging environmentally friendly land use. It can also include developing drought-resistant crops, establishing early warning systems for extreme weather, and protecting the habitats of endangered species. Climate change adaptation aims to make people and ecosystems less vulnerable to the effects of climate change.



## MITIGATION

Climate change mitigation is the process of reducing or preventing the emission of greenhouse gases. This is done to slow the rate of global warming and its consequences. This includes shifting to renewable energy sources, reducing deforestation, and increasing the use of renewable energy sources. According to the Intergovernmental Panel on Climate Change (IPCC), "mitigation" is defined as "anything people do to reduce greenhouse gas sources or increase sinks."



# ACTION TO FIGHT CLIMATE CHANGE

Climate change is a critical issue that must be addressed. We can accomplish this in a variety of ways, including:

1. Reducing the use of fossil fuels is critical in the fight against climate change. This includes investing in solar and wind energy and improving building and transportation energy efficiency.
2. Protecting and restoring forests, wetlands, and oceans is another critical step. These ecosystems regulate the Earth's climate and absorb CO2. We can reduce our carbon footprint by eating less meat, taking public transportation, and conserving water.
3. Collaborating to develop and implement global climate change policies.

Other ways we can help stop climate change are:

1. Planting trees
2. Prevention of fire
3. Renewable energy
4. Hydroelectricity
5. Wind energy
6. Efficient cooking
7. Fuel saving
8. Electric vehicle
9. Saving electricity
10. Saving water
11. Create less waste

This is the most important aspect of global warming. Scientists will determine whether humans are to blame for the majority of climate change, but it is all of our responsibility to leave this planet in better shape than we found it.

– Mike Huckabee



## 1. PLANTING TREES

Planting trees can help to reduce climate change because trees absorb and store carbon dioxide (CO<sub>2</sub>) from the atmosphere. This reduces the amount of CO<sub>2</sub> in the atmosphere, which is one of the primary causes of climate change. Trees also add oxygen to the air, improving the air quality and making it easier to breathe. Trees can also help to prevent soil erosion and natural disasters such as floods and landslides. Planting trees is a simple and effective way to combat climate change and improve the world.





## 2. PREVENTION OF FIRE

Because fires emit large amounts of CO<sub>2</sub> and other greenhouse gases into the atmosphere, preventing them helps to mitigate climate change. These greenhouse gases contribute to climate change by trapping heat in the Earth's atmosphere, causing temperatures to rise globally. Fires can also destroy many plants and forests, important carbon storage sites. When these trees and plants burn, the carbon they contain is released into the atmosphere.

Fires can also cause soil erosion and wildlife extinction, both detrimental to the environment in the long run. Fires can also cause harm to local communities and economies, as well as make people sick.



### 3. RENEWABLE ENERGY

Renewable energy reduces the use of fossil fuels, the primary source of greenhouse gas emissions that cause climate change. Solar, wind, and hydropower do not contribute to climate change because they emit no emissions.

Renewable energy helps to clean the air and improves public health. Unlike finite fossil fuels, renewable energy sources are more stable and can be used indefinitely.

Renewable energy can also reduce reliance on foreign oil and gas. Price volatility and economic instability are reduced as a result. **Renewable energy also benefits employment, the economy, and poverty alleviation.**

Finally, increasing the use of renewable energy reduces greenhouse gas emissions and slows the rate of climate change. It helps reduce air pollution while promoting energy security, economic growth, and job creation.



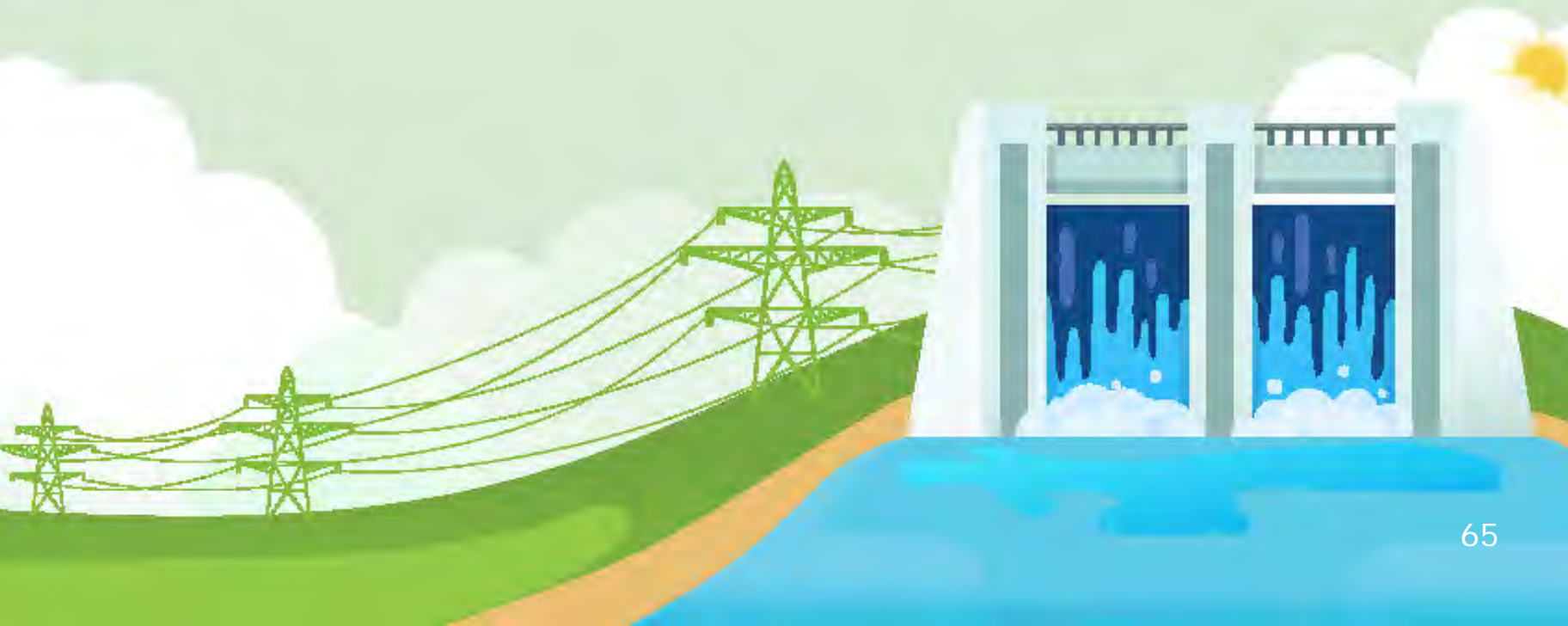
## 4. HYDROELECTRICITY

Hydroelectricity, a clean, sustainable energy source, contributes to the fight against climate change. Hydroelectric power plants generate electricity without the use of fuel. They produce no greenhouse gases.

Water, a renewable resource, is used in hydroelectric power plants. They can also store excess renewable energy from solar or wind power for use when output is low.

This helps to stabilize the power grid and promotes renewable energy.

Hydroelectric power plants protect the environment by preventing soil erosion and supporting aquatic life. Local communities can benefit from hydroelectric power stations through electricity sales and tourism. Because it is clean, renewable, and sustainable, hydroelectricity helps to reduce climate change.



## 5. WIND ENERGY

Wind energy slows climate change because it is clean, renewable, and long-lasting. Wind turbines generate electricity without emitting greenhouse gases or contributing to climate change. Wind energy is efficient and can be used to power cities or towns. It can also help balance the energy system and make renewable energy more reliable

when combined with solar and hydro. Wind energy is a low-cost source of electricity. Wind energy has recently become less expensive than fossil fuels. There is less land required than for coal or nuclear power. Wind energy slows climate change because it is clean, renewable, and long-lasting. It is also advantageous because it is inexpensive and requires little land.



## 6. EFFICIENT COOKING

Because it uses less energy to prepare food, **efficient cooking can help slow down climate change**. This can be accomplished by using **energy-efficient appliances** such as induction cooktops and pressure cookers and properly using and maintaining these appliances. Cooking methods that use less energy than boiling or roasting, such as stir-frying, steaming, and microwaving, can also help reduce energy consumption. We can help reduce greenhouse gas emissions and our overall carbon footprint by cooking with less energy.



## 7. FUEL SAVING

Fuel conservation is important in the fight against climate change because it reduces fossil fuel consumption, which reduces greenhouse gas release into the atmosphere. When natural gas, coal, or oil are burned, carbon dioxide is released into the atmosphere, contributing to climate change and global warming. We can reduce pollution and slow climate change by using less gasoline.

There are several ways to save money on gasoline, including:

1. Making cars, appliances, and other appliances use less energy.
2. Take public transportation, bike, or walk rather than drive.
3. Using a carpool
4. Overall, fuel conservation is an important step that individuals, groups, and governments can take to help mitigate the effects of climate change.

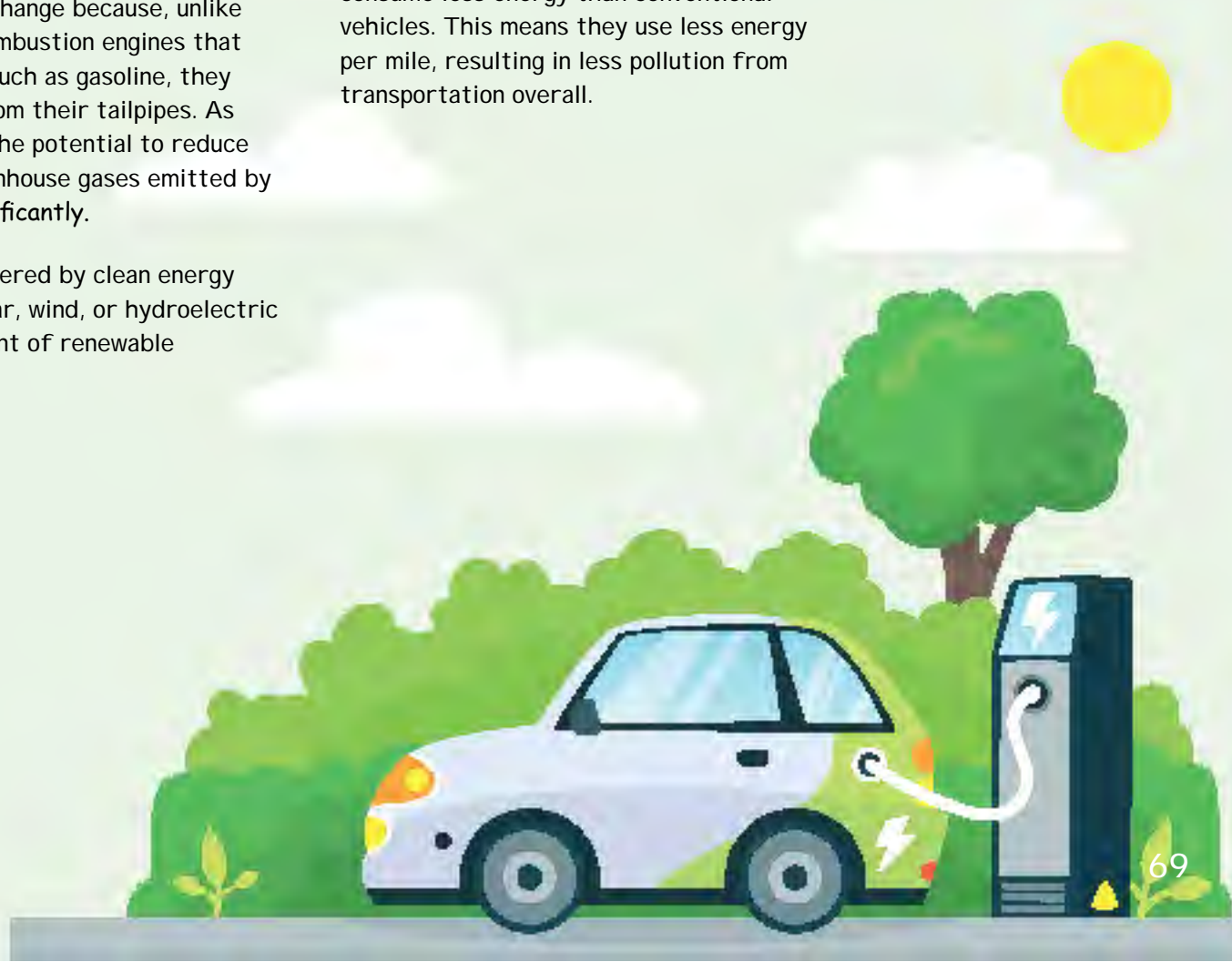


## 8. ELECTRIC VEHICLE

Electric vehicles (EVs) are important for combating climate change because, unlike cars powered by combustion engines that run on fossil fuels such as gasoline, they emit no pollution from their tailpipes. As a result, EVs have the potential to reduce the amount of greenhouse gases emitted by transportation significantly.

EVs can also be powered by clean energy sources such as solar, wind, or hydroelectric power. As the amount of renewable

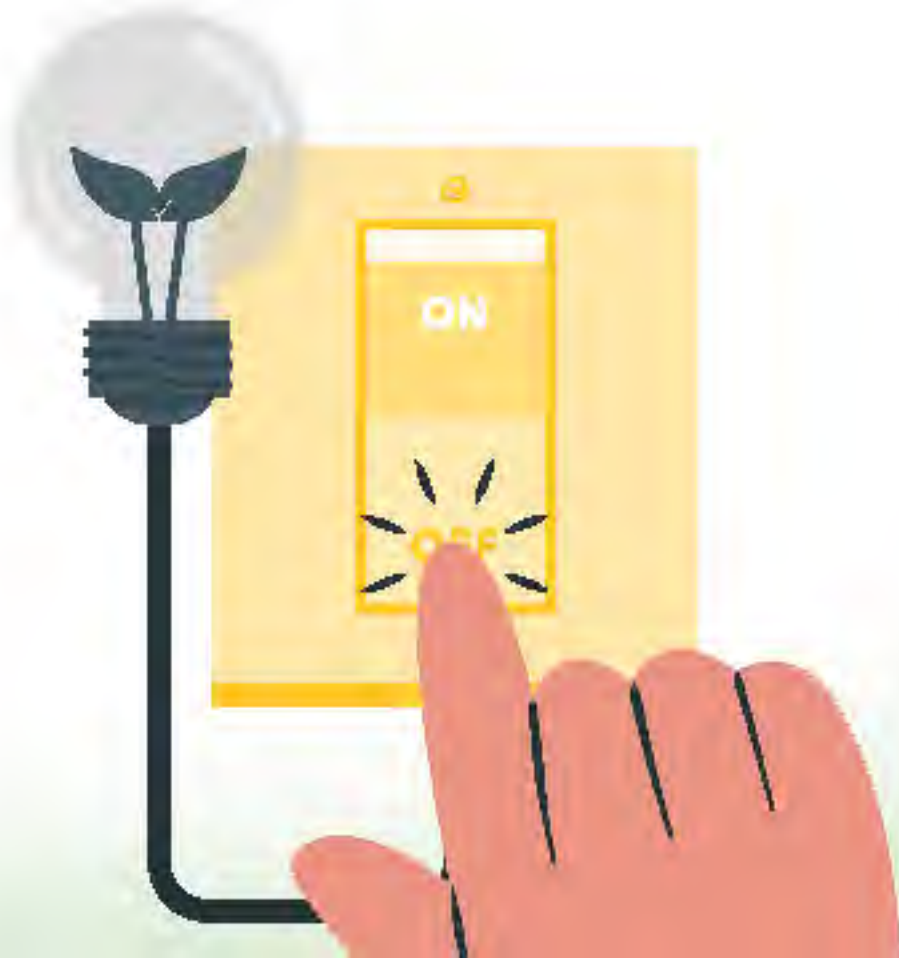
energy in the grid increases, so will EV emissions. Furthermore, electric vehicles consume less energy than conventional vehicles. This means they use less energy per mile, resulting in less pollution from transportation overall.



## 9. SAVING ELECTRICITY

Because most electricity is generated by fossil fuels such as coal, oil, and natural gas, **conserving it aids in the fight against climate change.** The combustion of these fuels emits greenhouse gases, primarily carbon dioxide. These gases contribute to climate change.

*We must use energy-efficient appliances, turn off lights and electronics, take advantage of natural light, and reduce standby power to save electricity. Less power consumption reduces the use of fossil fuels and the emission of greenhouse gases.*





## 10. SAVING WATER

Because purifying and pumping water uses fossil fuels, conserving water helps to mitigate climate change. Greenhouse gas emissions cause climate change. Emissions are also increased by energy-intensive water treatment and pumping. We can save water in various ways, including:

1. Using water-efficient appliances and fixtures.
2. Resolving water leaks.
3. Shortening showers.

Saving water reduces greenhouse gas emissions by using less energy to clean and pump water. It can help reduce greenhouse gas emissions in areas with limited water supplies and energy-intensive activities.



## 11. CREATE LESS WASTE

Proper waste disposal reduces greenhouse gas emissions, which helps to mitigate climate change.

The trash in landfills decomposes and emits methane, a potent greenhouse gas. Trash burning in open dumps emits carbon dioxide and other air pollutants. There are numerous ways to reduce waste:

- Reusable bags, containers, and water bottles should be used instead of disposable ones.
- Dispose of food scraps and yard waste in compost bins.
- Purchase items that do not require much or any packaging or come in easily recyclable packaging.
- Repair or repurpose what you already have rather than purchasing new items.
- Explain to others why waste reduction is important and encourage them to do the same.



## WHAT CAN WE DO AS INDIVIDUALS?

Individuals can do several things to reduce their carbon footprint and help combat climate change:

- We can reduce landfill emissions by reducing the waste we generate.
- To reduce carbon emissions, we should make every effort to use public transportation, carpool, bike, or walk.
- We can install solar panels on your roof or purchase green power from your utility company.
- We should plant trees and support reforestation projects. Trees absorb carbon dioxide from the atmosphere, so planting them can help reduce the amount of greenhouse gases in the atmosphere.
- By supporting politicians and policies that address climate change, we can help bring about the necessary change on a much larger scale.
- We must try to eat less meat and dairy products. Because the production of these foods is a significant source of greenhouse gas emissions, reducing consumption can have a significant impact.

- We should use energy-efficient light bulbs and appliances and reduce overall energy consumption by unplugging devices when they are not in use.
- We should be climate change advocates, educating ourselves and others about the issue and encouraging others to take action.



## REDUCE, REUSE, RECYCLE

- “Reduce, reuse, recycle” is a popular phrase encouraging people to live more sustainably and environmentally friendly lives. The three Rs are actions that individuals and groups can take to reduce waste and pollution, protect the environment, and conserve natural resources.
- Reduce means to reduce the amount of trash we produce by using less and being more selective about what we buy. This can be accomplished by purchasing products with less packaging, products made from sustainable materials, and not purchasing disposable products.
- When you reuse something, you put it to use more than once before discarding it. This can be accomplished by using cloth bags instead of plastic bags, reusing water bottles, and finding new uses for old clothes and other household items
- Recycling is the process of converting old items into new ones. This can be accomplished by separating recyclables



such as paper, plastic, and metal from non-recyclable trash and transporting the recyclables to a recycling center. We can help protect the environment and conserve natural resources by following the three R's. It's a simple but effective way to improve the world.

# FIGHTING CLIMATE CHANGE

## 1. INTERNATIONAL LEVEL

### A) PARIS AGREEMENT

The Paris Agreement is an international agreement signed by 195 countries in 2016 to combat climate change and accelerate and scale up the actions and investments required for a low-carbon, sustainable future. The Paris Agreement's main goal is to keep the average global temperature rise this century below 2 degrees Celsius above pre-industrial levels and ideally below 1.5 degrees Celsius. This treaty's goal is to make it easier for countries to deal with climate change's effects and find funding to assist them in doing so.

To try to avert the worst effects of global warming, 195 countries signed the Paris Climate Agreement in December 2015. Long-term goals include keeping global warming well below 2°C by the end of the century and attempting to keep it below 1.5°C.

Countries that attended COP-3 in Kyoto, Japan, signed a protocol in 1997 that required them to reduce their emissions by 6-9% (below 1990 levels) by 2012.



## 2. NATIONAL LEVEL

The Third Conference of the Parties to the United Nations Framework Convention on Climate Change (COP-3) was held in Kyoto, Japan, in 1997. At this conference, the countries in attendance signed the Kyoto Protocol, which established and legally bound industrialized countries to reduce emissions. This was done in an attempt to halt global warming. The protocol was implemented in 2005.

In 2009, a meeting was held in Kalapathar, a small village in the Himalayas, to discuss climate change and its effects on the region. The meeting was attended by representatives from local governments, environmental organizations, and scientists from around the world. The majority of the discussions focused on how climate change will affect the region's glaciers, forests, and wildlife, as well as the people who live there and rely on them. Participants also discussed ways to mitigate the effects of climate change, such as adopting more environmentally friendly practices and developing more renewable energy sources. The meeting was deemed a success because many concrete suggestions were made to address the region's urgent problem of climate change.





In 2022, Egypt hosted the 27th Conference of the Parties (COP 27) of the United Nations Framework Convention on Climate Change (UNFCCC). The Paris Agreement was created to limit global warming to well below 2 degrees Celsius, and this summit will bring together leaders from all over the world to negotiate and agree on policies to address climate change and implement the agreement. The emphasis at COP 27 will be on stepping up our efforts and raising our sights to meet the Paris Agreement's lofty targets.

# WHERE TO GET INFORMATION

More information about climate change can be obtained from the following sources:

- Ministry of Environment
- The United Nations Framework Convention on Climate Change (UNFCCC)
- The United Nations Development Program (UNDP)
- The United Nations Children's Fund (UNICEF)
- Meteorological Department
- Intergovernmental Panel on Climate Change (IPCC)





# KEY TERMS

## ADAPTATION

Adapting to new conditions as a result of global warming. It's a way to deal with the effects of climate change now while solutions to the root causes are discovered and implemented. Individuals can maintain their standard of living despite disruptions by adapting to new circumstances.

## ATMOSPHERE

The air surrounding us and extending hundreds of kilometers comprised various gases. It is essential to all life forms and serves various functions, including keeping the planet comfortable.

## AIR POLLUTION

Poisonous gases and small dust particles are released into the atmosphere. The use of fossil fuels contributes significantly to air pollution.

## BIOGAS

A gas mixture is formed by the breakdown of organic matter without oxygen. Biogas can be made from various raw materials, including agricultural waste, municipal waste, plant materials, sewage, green waste, and food waste. Biogas is a renewable energy source that has little impact on the environment.

## BIOMAS

Organic matter derived from living or recently living organisms is called biomass. Biomass can be used as an energy source, and it typically refers to plant or plant-based materials that are not used for food or feed. The most common biomass form is still *the primary fuel source for 60% of Nepal's population.*

## CARBON DIOXIDE

Gas is produced when humans and animals breathe out or when certain fuels are burned and used for energy by plants. It is a heavy, colorless gas that cannot be burned and is used in beverage carbonation.

## CLIMATE

The weather that a location experiences over time.

## CLIMATE CHANGE

Many places now have different weather than they did previously. Climate change is linked to global warming and caused by fossil fuel use.

## DEFORESTATION

Removing trees and converting land to other uses, such as agriculture.

## DROUGHT

A drought is a lack of rainfall that causes the land to dry out. *A drought occurs when a region receives significantly less rain than usual.*

## ENERGY EFFICIENCY

This application of technology requires less energy to perform the same function or work. LED lights, for example, are more *energy efficient than traditional light bulbs, as a 3-watt light bulb can provide the same amount of light as a 50-watt conventional light bulb. Energy efficiency also attempts to minimize the amount of energy lost when doing work or performing a function, such as improved wood cook-stoves that use less wood to quickly cook the same amount of food.*

## FLOOD

*A flood occurs when water overflows and normally covers dry land. Rivers overflowing their banks after heavy rain can cause flooding. Floods frequently cause water scarcity.*

## FOREST

A large area of land densely forested with trees and other plants. A forest contains not only trees and plants but also animals, insects, birds, and people who live in and rely on it.

## FOSSIL FUEL

A fuel derived from the skeletal remains of plants and animals that died millions of years ago. Oil, coal, and natural gas are examples of fossil fuels. Fossil fuels are nonrenewable resources that emit carbon dioxide when burned, contributing to global warming.

## GLACIERS

Large ice masses flow downhill under their mass. Glaciers flow like slow rivers, providing water to many downhill communities in warmer climates. They have long kept water out of the seas, and oceans froze.

## GLOBAL WARMING

The average rise in the temperature of the Earth's surface. It is commonly used to refer to an increase in the Earth's surface temperature caused by human activities that emit greenhouse gases into the atmosphere.

## GREENHOUSE GASES

Greenhouse gases are gases that trap heat in the atmosphere. Water vapor, carbon dioxide, methane, nitrous oxide, and ozone are the primary greenhouse gases in the Earth's atmosphere.

## GREENHOUSE EFFECT

This describes how greenhouse gases in the atmosphere act like the glass in a greenhouse, trapping heat and keeping the earth warm. The greenhouse gases allow most of the earth's heat waves to escape into space. As a result, the earth maintains a warm temperature suitable for life. However, as the number of heat-trapping gages increases, more heat is trapped, contributing to global warming.

## METHANE

Methane is a greenhouse gas that is produced and distributed with natural gas.

NITROUS OXIDE

A nitrogen oxide gas is found in the atmosphere.

MITIGATION

Climate change prevention or removal of climate change causes. Mitigation focuses on reducing greenhouse gas emissions and removing greenhouse gases from the atmosphere, as these are the primary causes of climate change.

SUSTAINABLE

Capable of being sustained at a constant rate without harming the environment or depleting resources.

UNFCC

The United Nations Framework Convention on Climate Change.

## ACKNOWLEDGMENT

We published the Handbook on Climate Change and Global Warming for primary and secondary students in Solukhumbu District to help them understand and manage the impact of climate change in mountainous areas. This book gives an overview of the challenges of global warming and climate change and is a follow-up to our previous book, "Climate Change in the Himalayas." The Partners Nepal will publish this book in 2020, **thanks to the community's contributions of time and resources.**

Ms. Ang Chhoden Sherpa provided a **significant contribution by editing, clarifying, and organizing the content.** Mr. Hari Marasini from Spandan Design played a crucial role in

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## ABOUT THE AUTHORS

### ANG RITA SHERPA Chairman

ANG RITA SHERPA, a native of Khunde village in Khumbu Pasanglhamu Rural Municipality-4, has served as Chairman of The Partners Nepal Executive Committee since its inception in 2012. Mr. Sherpa worked as a Senior Program Manager at The Mountain Institute (TMI) for over 35 years, specializing in Protected Area Management, Eco-Tourism and Community-based Tourism, Protected Landscape Management, Natural and Cultural Conservation Project Planning and Implementation, and Sustainable Development Programs.

Mr. Ang Rita Sherpa holds an M.Sc. in Protected Area Landscape Management from the University of Wales in the United Kingdom in 2000 and a Bachelor's in Parks, Recreation, and Tourism from Lincoln University in New Zealand. In 1987, he spent nine months as a Volunteer in Park Service

(VIP) in the United States, working in Yellowstone and Grand Teton National Parks. Similarly, he worked as a VIP in Shenandoah and Smoky Mountain National Parks in 2002, before and after joining TMI in 1988.

Mr. Ang Rita Sherpa managed the project, which was funded by the Ambassador Fund for Cultural Preservation (AFCP) at Pangboche Monastery, a 600-year-old Buddhist monastery in the Limi Valley of Humla district in mid-western Nepal. He was an executive member and former Chairman of *Sir Edmund Hillary's Himalayan Trust*, which he founded in 1964. Mr. Sherpa serves as an advisor to the Climate Alliance of Himalayan Communities, the Hill Development Conservation Group (HDCG), and Mountain Spirit. Mr. Sherpa received the Sir Edmund Hillary Mountain Legacy Medal in 2011.



## BHEEM RAJ RAI Secretary



BHEEM RAJ RAI has been a member of *The Partners Nepal's executive committee* since its inception in 2012. Before joining *The Partners Nepal*, Mr. Rai worked as a *Conservation and Livelihood Program Officer* at *The Mountain Institute*. Mr. Rai is a *Tribhuvan University* forest ranger with a *master's degree in rural development (RD)* and a graduate degree in health education. *Mr. Rai's work has included protected area conservation, Community Forest Users Group, community-based ecotourism, alpine ecosystems in Sagarmatha and Makalu-Barun National Parks, community forest management training to partners Non-*

*Governmental Organizations (NGOs)/ Government Organizations (GOs), and line agencies, and experience in community-based project planning and livelihood program in far west Nepal with UN World Food Programme (WFP). Mr. Rai has more than 25 years of experience in appreciative participatory planning, Natural Resource Management Action, and Climate Change Adaptation and Community Development program implementation.*



## True/False Answer

### Page 6

1. Climate and weather are the same thing. **False**
2. Climate refers to the average weather conditions for a given time and location. **True**
3. The climate is determined over the course of 30 years. **True**
4. Climate is what you expect, while weather is what you get. **True**
5. Both natural and human activities contribute to climate change. **True**
6. The atmosphere includes the air we breathe. **True**
7. Weather is the state of the atmosphere over a specific time period. **True**
8. The climate has four seasons. **True**
9. Wind, rain, and temperature are weather elements. **True**
10. The Earth is the only known planet with life. **True**
11. The term "weather" refers to short-term conditions. **True**
12. This morning's temperature is an example of weather. **True**

## Page 34

1. The use of fossil fuels does not cause global warming. **FALSE**
2. Climate change is caused by global warming. **TRUE**
3. The *greenhouse effect* is beneficial to our climate. **FALSE**
4. Global warming is the average increase in the temperature of the Earth. **TRUE**
5. Climate and weather are synonymous. **FALSE**
6. An open fire has no negative impact on the environment. **FALSE**
7. Human activity does not contribute to global warming. **FALSE**
8. People used to harvest more food than they do now. **TRUE**
9. Energy-saving activities contribute to global warming. **FALSE**
10. Waste burning emits greenhouse gases. **TRUE**
11. Global warming is beneficial to the environment. **FALSE**

## Fill in the Blanks Answer

### Page 56

1. Climate change is not a serious issue. **FALSE**
2. Rising temperatures have no effect on natural disasters such as drought and wildfires. **TRUE**
3. Climate change has no effect on agricultural production. **FALSE**
4. The current effects of climate change include more severe droughts, storms, heat waves, rising sea levels, melting glaciers, and warming oceans. **TRUE**
5. Drought, as a result of climate change, can harm food production and human health. **TRUE**
6. Melting glaciers, rising CO2 levels in the atmosphere, dwindling forests, and declining wildlife have nothing to do with the effects of climate change. **FALSE**
7. Climate change will have an impact on biodiversity. **TRUE**
8. There is no link between tourism and climate change. **FALSE**
9. Glacier retreat and melting diminish water sources. **TRUE**
10. Extreme heat has nothing to do with climate change. **TRUE**

## Page 57

1. Only Nepal is experiencing climate change. **FALSE**
2. Mitigation prevents future climate change. **TRUE**
3. Children can help to combat climate change. **TRUE**
4. Youth groups, mothers' groups, and communities can work together to combat climate change. **TRUE**
5. Climate change education makes communities vulnerable to climate change. **TRUE**
6. Tree planting helps to prevent further climate change. **TRUE**
7. Climate change does not affect resilient communities. **FALSE**
8. Adaptation does not assist people in coping with the effects of climate change. **FALSE**
9. Turning off lights in a room aids in the fight against climate change. **TRUE**
10. Climate change does not cause disease outbreaks. **FALSE**
11. Renewable energy emits greenhouse gases. **FALSE**

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## ABOUT THE PARTNERS NEPAL

The Partners Nepal is a new organization in Nepal that helps mountain communities facing financial and other resource limitations to overcome natural, cultural, social, and environmental issues. It was established in 2012 with a mission to “assist underprivileged communities in developing a reliable source of income and establishing practices that will regenerate the local environment for current and future generations.”

The founders of The Partners Nepal have a long history of serving mountain communities in various important areas, such as managing protected areas, managing community forests, conserving natural and cultural heritage, restoring communities, developing community-based ecotourism, and improving livelihoods. What makes TPN special is that it is made up of members and staff who previously worked to help impoverished mountain communities.



THE PARTNERS NEPAL

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