

GUYANA SECONDARY SCHOOL ENVIRONMENTAL QUIZ 2023

Earth, Climate, and
the Low Carbon Development Strategy



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INTRODUCTION

This Handbook has been prepared by the EMC Foundation as a guide to assist students in preparing for the 2023 Secondary School Environmental Quiz. The objective of the Quiz is to help raise awareness and appreciation of Guyana's environment, its rich culture, heritage, ecosystems, and biodiversity, as well as key topics such as climate change and initiatives being pursued by Guyana.

The Quiz is a collaboration between the EMC Foundation, the Ministry of Education and Iwokrama and it targets grade seven secondary school students from the coast and hinterland of Guyana.

The Handbook has been prepared using information provided by the Department of Environment and Climate Change, Office of the President, including the LCDS 2030. Images were also obtained from the internet and other sources. This information was compiled into two chapters:

- Chapter 1: Earth and Climate
- Chapter 2: Guyana's Low Carbon Development Strategy

There is also a Glossary of Key Terms at the end.

The Quiz will be based on information from the social studies textbooks; *Guyana, Our Country, Our Home - Levels 5 & 6* and *New Horizons in Social Studies - Book 1*, as well as information in this handbook. Kindly familiarise yourself with those documents.



CHAPTER 1 EARTH AND CLIMATE

In this section, you will learn about:

- The atmosphere and how it relates to the Earth
- Weather and climate, and what differentiates them
- Global warming, the greenhouse effect, and climate change

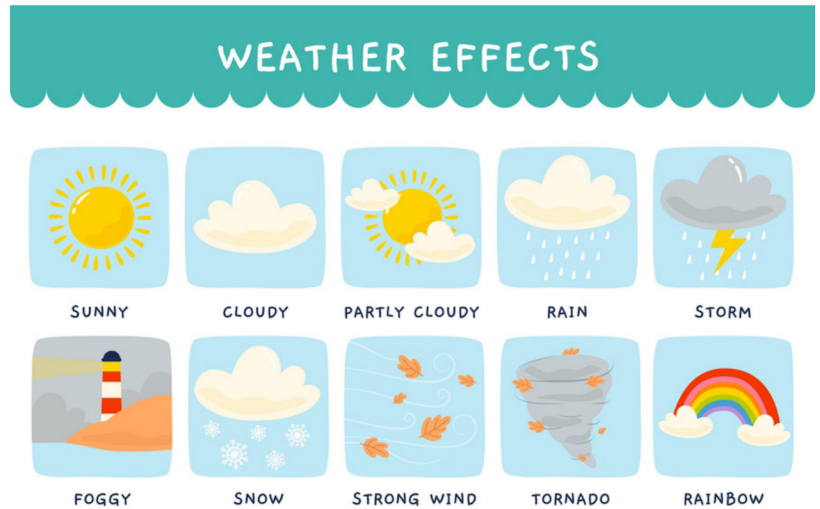
The Atmosphere

The atmosphere is the mixture of gases that surrounds the earth. The atmosphere has many natural and man-made gases in it. In the atmosphere, there is a layer made up of a gas called ozone, also known as the ozone layer. The ozone layer protects us from harmful energy from the sun and helps to maintain life on Earth.



Weather and Climate

Weather is the state of the atmosphere at a given time and place. It can be hot or cold, dry, or wet, clear, or cloudy. It can be sunny in the morning, rainy in the afternoon, and cold in the evening. Weather is made up of temperature, rain, pressure, wind, humidity, and many more.



Climate is the average weather condition in a specific time and place and is usually measured over a 30-year period. The types of climates found on earth are tropical, desert, temperate, polar, and Mediterranean.

Different Climate Types



Desert



Polar



Tropical

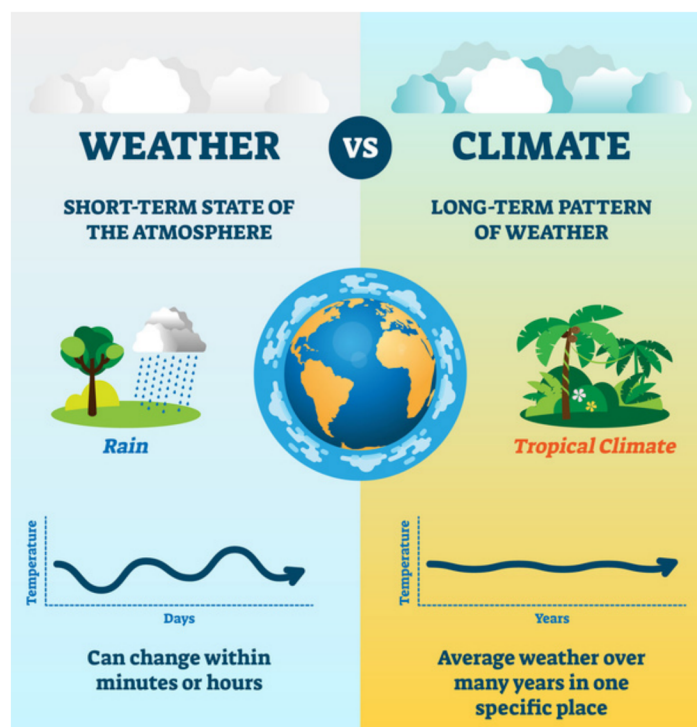


Temperate



Mediterranean

What is the Difference Between Weather and Climate?



Global Warming

Scientists have discovered that changes to our climate are caused by what is known as global warming. Global warming is the average increase in the Earth's temperatures.

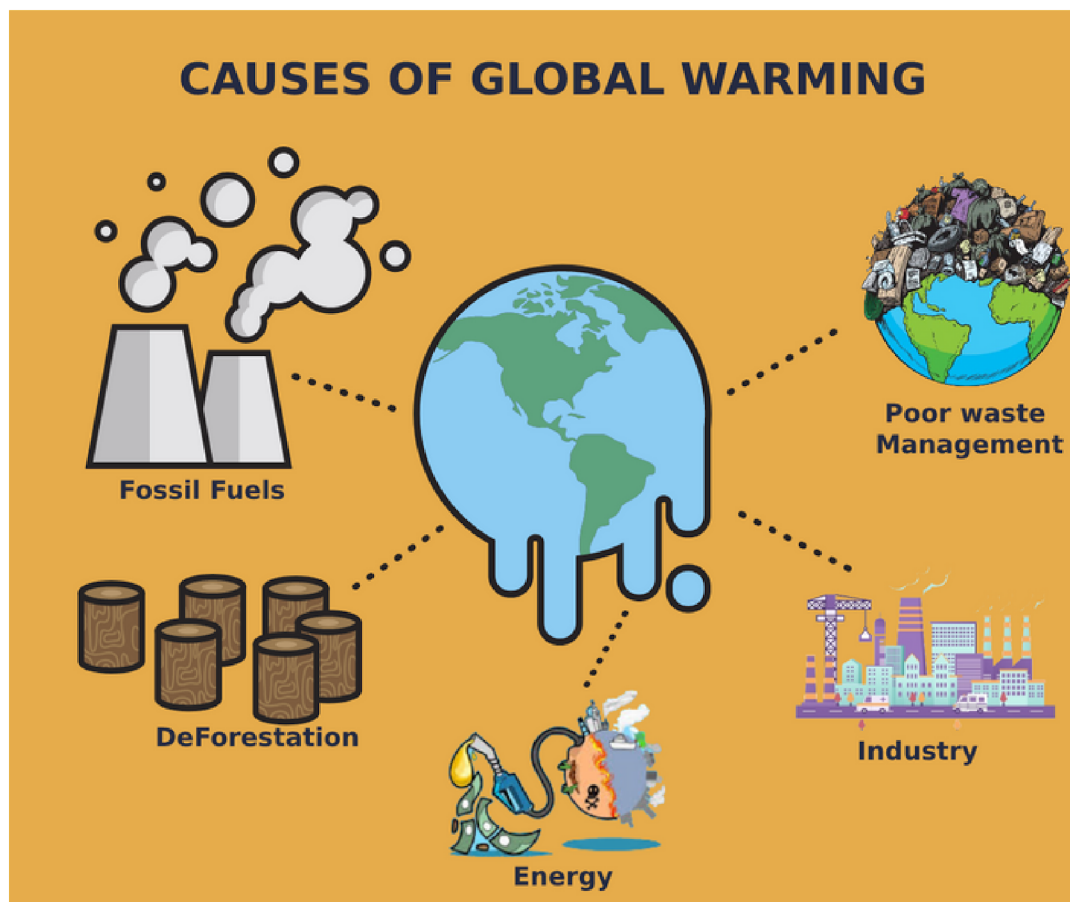
There are two kinds of global warming:

- **Global warming from natural causes:** Volcanic eruptions and natural fires are natural events which have always happened. They helped to keep the Earth warm.



- **Global warming from human activities:** Human activities are the main cause of the increase in global warming. The industrial revolution which began in the 18th century resulted in the use of a lot of fossil fuels. Use of fossil fuels released large amounts of gases into the atmosphere. As a result, this has led to the Earth getting warmer.

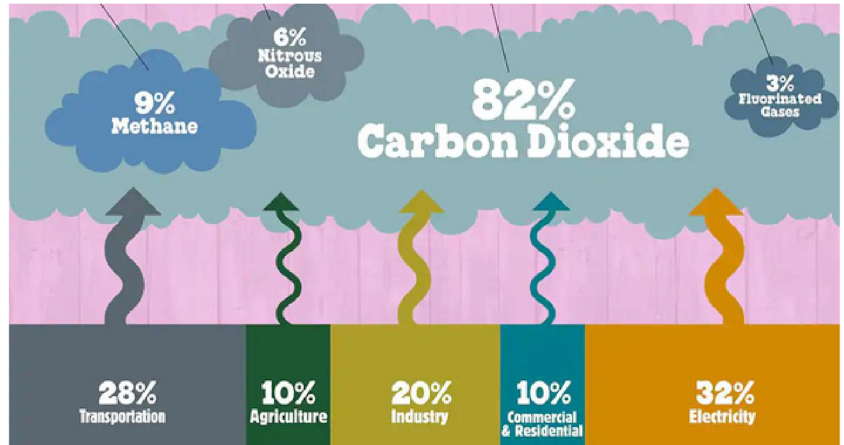
What Human Activities Cause Global Warming?



How does adding gases into the atmosphere result in global warming? For us to understand global warming, we need to understand the effect and what greenhouse gases are.

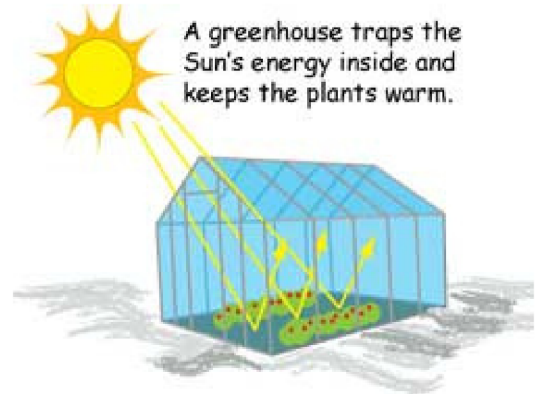
Greenhouse Gases

Greenhouse gases are found in the ozone layer. They are natural or man-made gases in the atmosphere and are sometimes known as heat trapping gases. Examples of greenhouse gases are, water vapour, carbon dioxide, methane, nitrous oxide, and fluorinated gases. They act like a protective blanket around the Earth. They trap heat to keep the Earth warm and this process is known as the greenhouse effect.



The Greenhouse Effect

In some areas farmers build a house made of glass or plastic to plant crops in. It is built to allow the sun's rays to enter and prevent the heat inside from going back into the atmosphere. The glass on the greenhouse traps heat causing the temperature inside the greenhouse to increase. In the same way, the greenhouse gases trap heat in the Earth's atmosphere causing its temperature to increase.

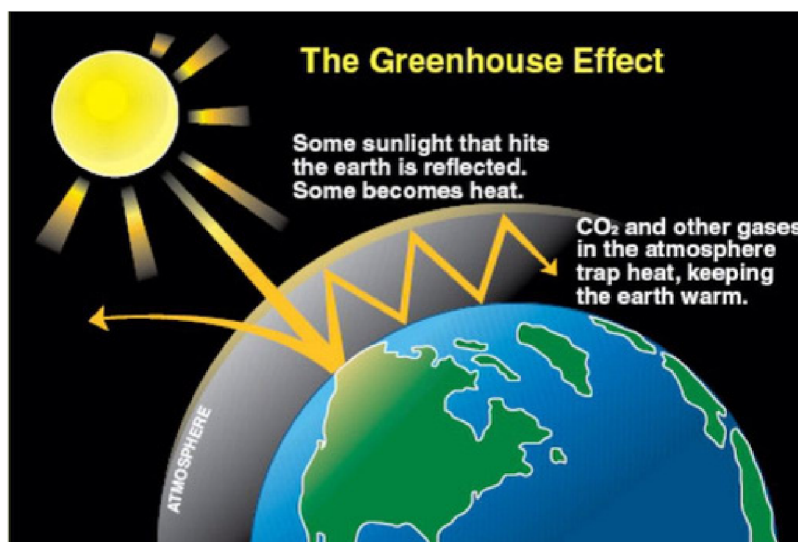


Now pretend that the Earth is inside a giant greenhouse.

Light from the sun warms the land, water, and air. The warmed-up Earth gives off heat, which rises into the sky. Greenhouse gases in the Earth's atmosphere, such as carbon dioxide and methane, act like the glass walls and roof of a greenhouse. This is known as the greenhouse effect.

The gases act like a blanket on Earth and prevent some of the heat from escaping into space, which keeps the Earth warm enough for plants, animals, and humans to survive. Without these gases, all the heat would escape back into space, and the Earth would become too cold to support life.

However human activities are adding too much greenhouse gases to the atmosphere making the blanket thicker. As a result, the Earth is becoming warmer and warmer. This increase in temperature is called global warming.



Climate Change

Climate change describes a change in the average weather in a region over a long period of time. Climate change includes major changes in temperature, rainfall, and wind patterns, among other effects.

Climate change is nothing new. Earth's climate has been changing regularly for hundreds of millions of years, sometimes getting colder and sometimes warmer over long periods of time. Some human activities such as driving cars, generating electricity, and cutting down forests, are speeding things up by releasing gases into the atmosphere called greenhouse gases, which slowly warm the planet, creating climate change.

Scientists believe that with global warming, we can expect more severe weather patterns. This could mean heavier rainfall on occasions and more floods, more snow in some places, longer periods of drought, more storms and hurricanes, and more frequent heat-waves – in general, major problems for human, animal and plant life and our various ecosystems.

SIGNS OF CLIMATE CHANGE



Rising Temperatures



Decreasing Snow Cover



Change in Rainfall Patterns



Rising Sea Levels



Gradual Shifting Seasons

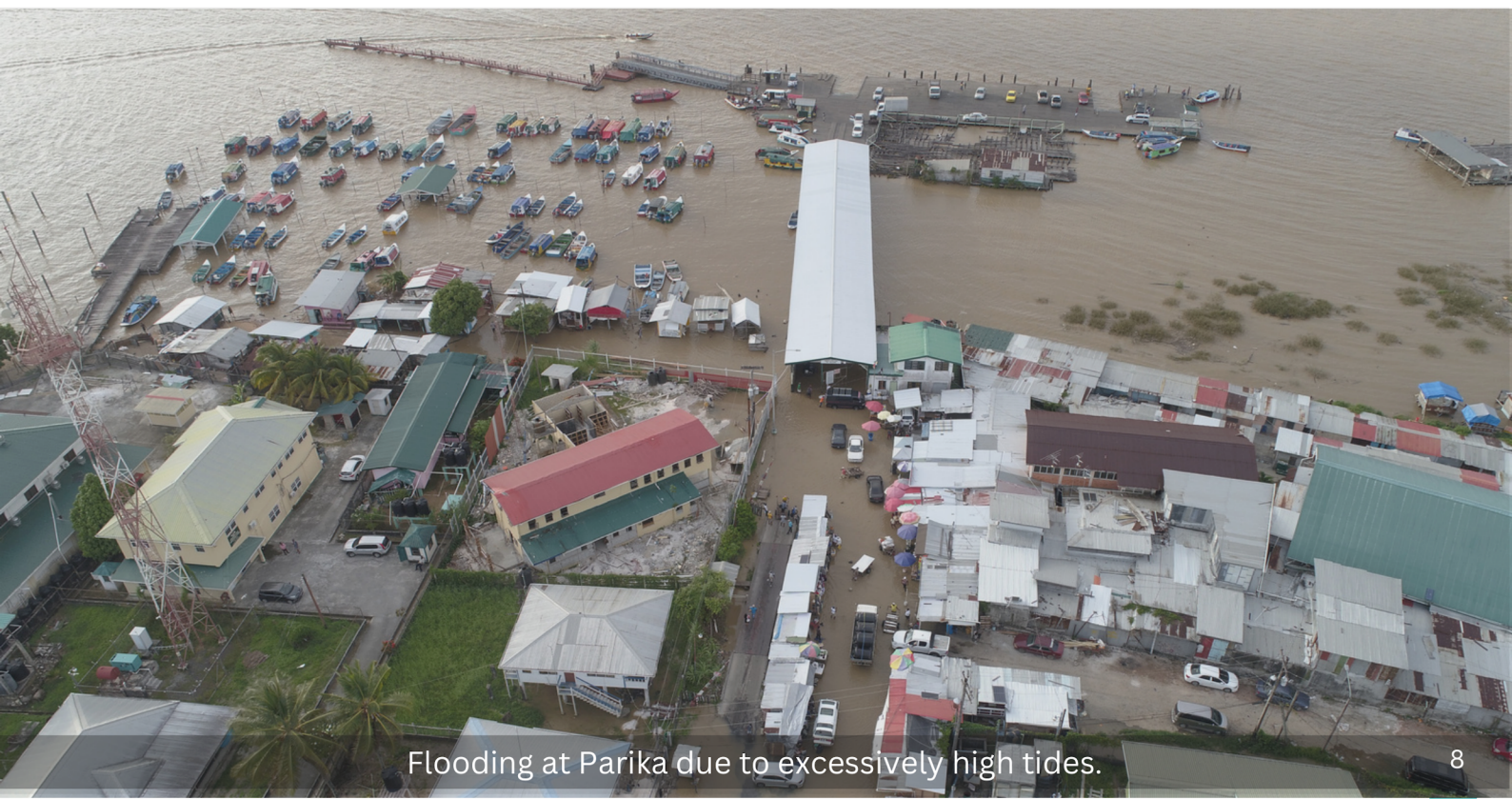
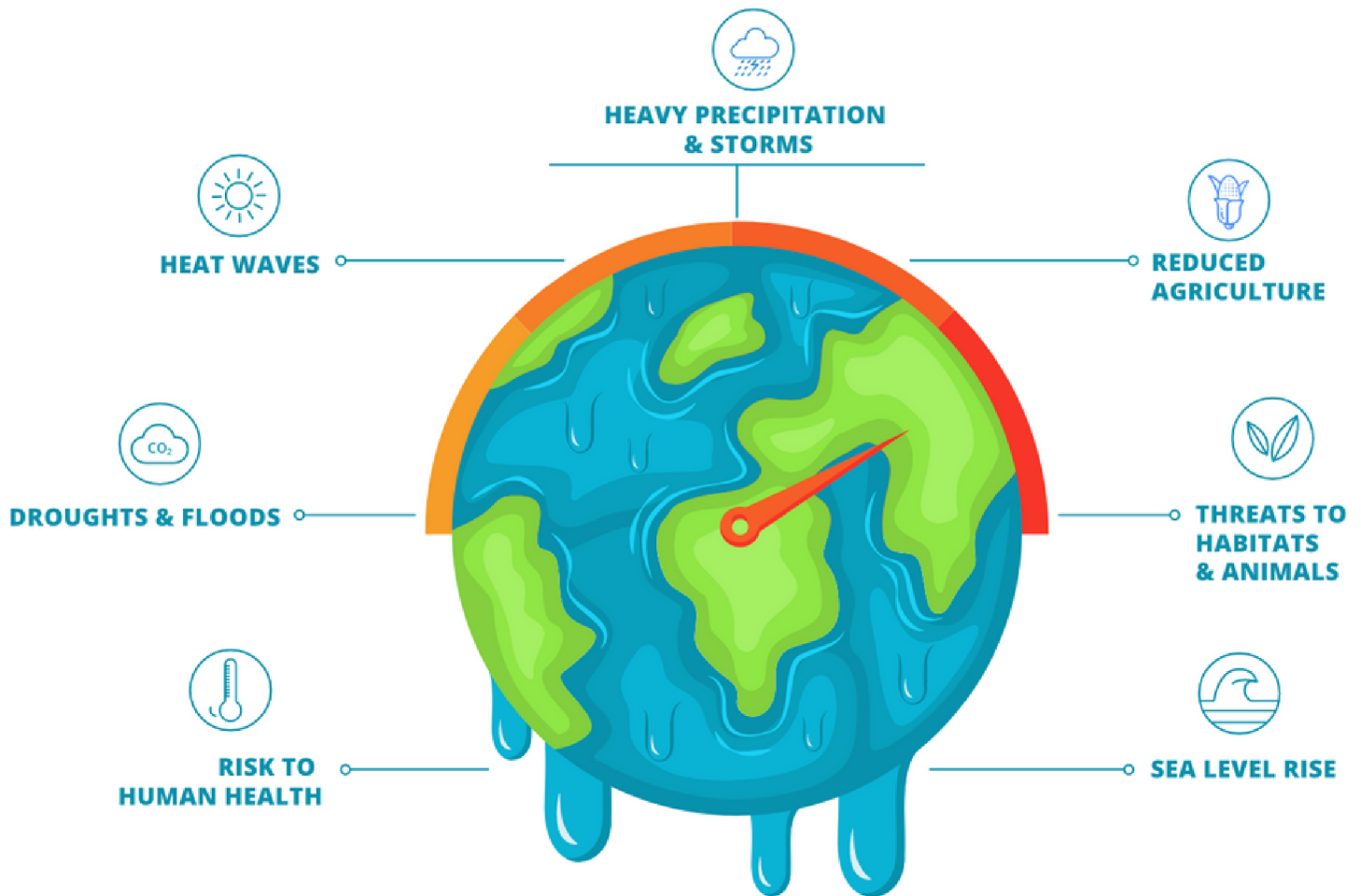


Extreme Weather Events



Impacts of Climate Change

Rising global temperatures affect many things, such as extreme weather, human health, food supply, and ecosystems. These impacts are already being felt today, and groups such as the poor, elderly, and others are especially vulnerable. Impacts of climate change include:



Flooding at Parika due to excessively high tides.

Impacts of Climate Change in Guyana

Guyana is highly exposed to the effects of climate change for a number of reasons:

Sea Level Rise



Over 90% of the people in Guyana live on the Low Coastal Plain, which is around 1 metre below sea level. It has sea defences to protect from the sea water, but if it rises by even a small amount, they will not work.

Drainage



The coast is also quite flat which allows rainfall to collect on the land quickly and makes natural drainage into the ocean very difficult. This has badly affected Guyana's drainage and irrigation system.

Floods



High levels of flooding have happened in the country, especially along the coast and in some inland areas. Climate change is likely to increase the frequency and intensity of flooding events.

Economy



Approximately 75% of Guyana's economic activities are located on the coastal area. These sectors are very sensitive to extreme weather events and sea-level rise and at high risk because of climate change.

How is the World Fighting Climate Change?

In addressing climate change, actions generally fall under mitigation and adaptation.

Mitigation

Mitigation – reducing or slowing down climate change – involves reducing the flow of heat-trapping greenhouse gases into the atmosphere, either by reducing sources of these gases or enabling their removal from the atmosphere through carbon sinks. The goal of mitigation is to avoid significant human interference with Earth’s climate and stabilize greenhouse gas levels to allow ecosystems to adapt naturally to climate change.

Adaptation

Adaptation – adapting to life in a changing climate – involves adjusting to actual or expected future climate. The goal of adaptation is to reduce our risks from the harmful effects of climate change and making the most of any opportunities associated with climate change, for example, longer growing seasons or increased harvests in some regions.

Examples of Mitigation and Adaptation

Mitigation

Adaptation



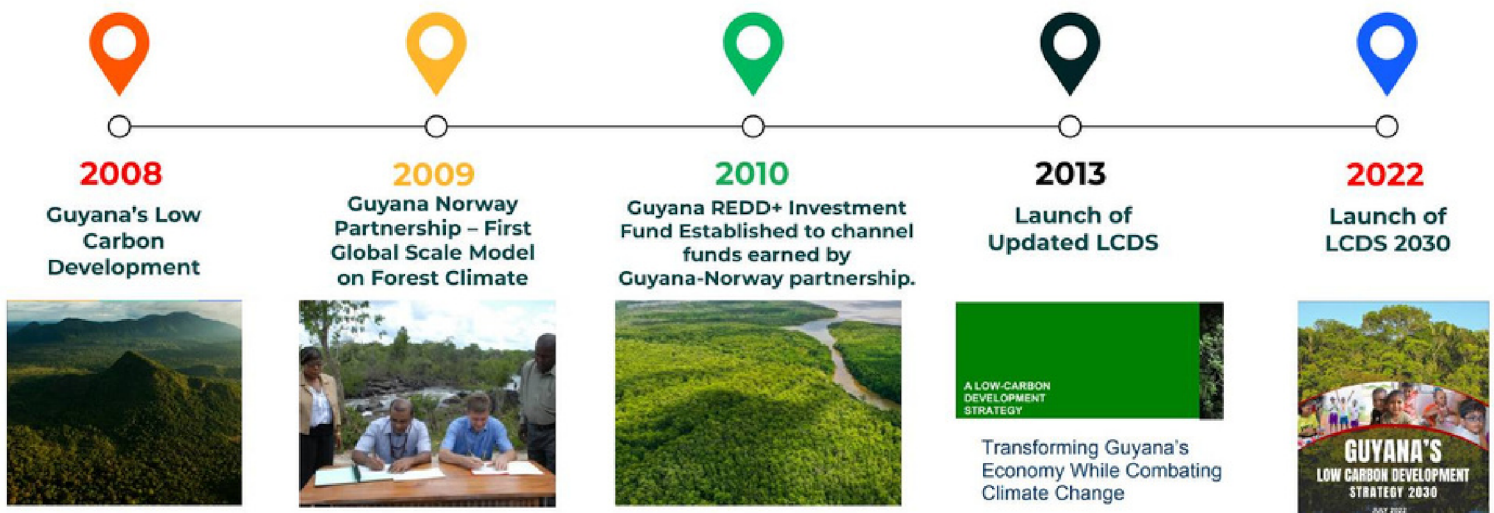
In this section, you will learn:

- How Guyana is fighting climate change
- About the Guyana Low Carbon Development Strategy

What is the Low Carbon Development Strategy?

The Low Carbon Development Strategy (LCDS) is a strategy document that outlines the approach and actions that Guyana, as a nation, can take to develop and grow for the inclusive benefit of all in a non-polluting, low carbon way.

The first draft of LCDS was published in June 2009 with the aim of taking Guyana’s economy onto a low carbon, sustainable development trajectory, while also assisting in fighting climate change. Its goal was to deliver greater economic and social development by following a low carbon development path and obtaining revenue from forest and ecosystem services.



Guyana's Early Success in Low Carbon Development

2nd highest forest cover in the World (85% forest cover)

99% of forest cover maintained

Guyana continues to maintain one of the lowest deforestation rates in the world (0.02 – 0.079%)

Internationally recognised as one of the best Monitoring Reporting and Verification Systems

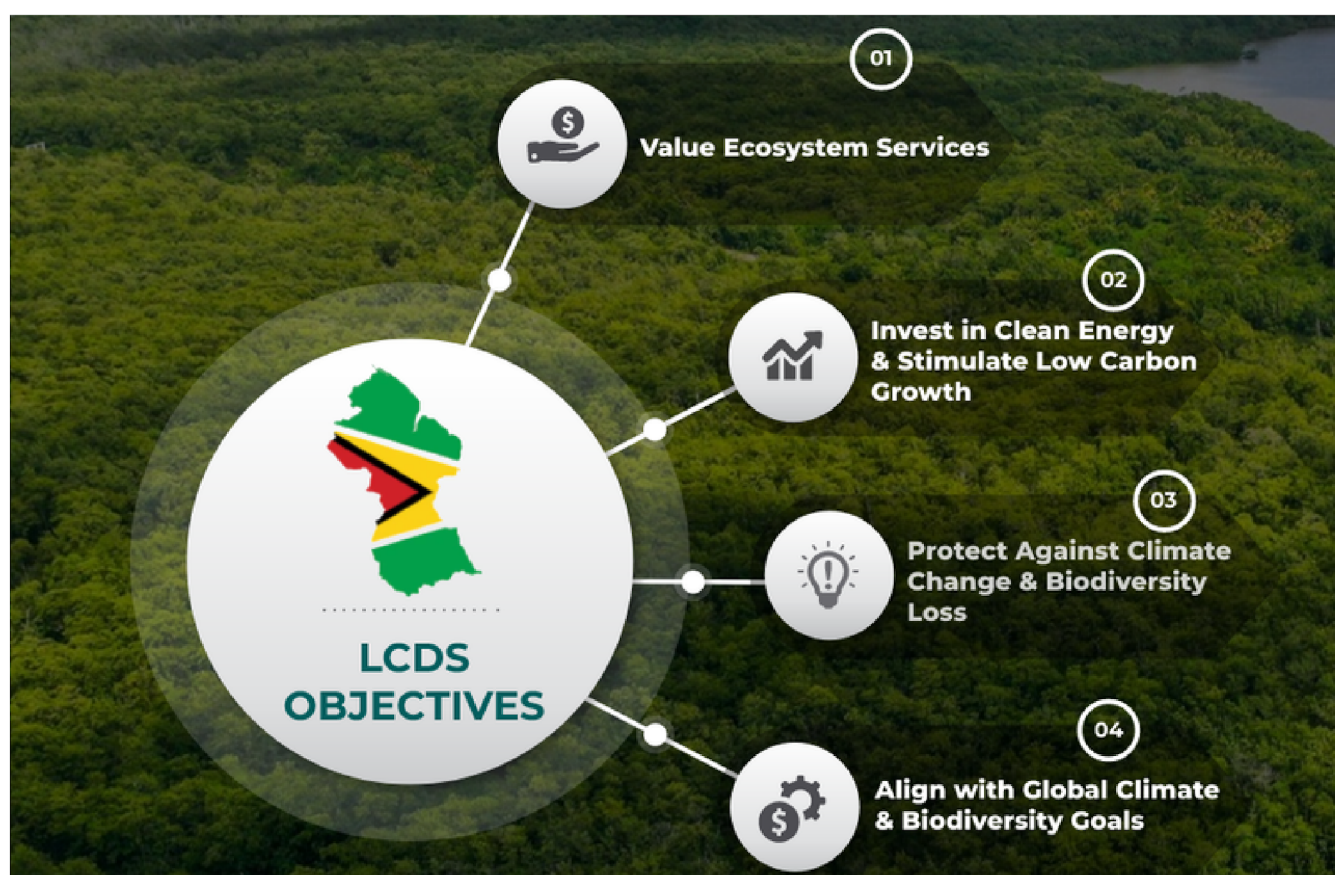
World's 2nd largest interim REDD+ Agreement signed with Norway

US\$ 212.52 million earned under agreement with Norway

LCDS Objectives

In July 2022, the LCDS was updated to reflect Guyana's ever-changing context. Titled "LCDS 2030", it provides a roadmap or sustainable management of forests, earning revenue from forest and ecosystem services, protecting against climate change, and moving the country onto a low carbon economy.

The LCDS sets out four objectives to reach this goal:



Objective 1: Value Ecosystem Services

Ecosystem services are the many contributions of the natural environment and healthy ecosystems to human wellbeing. For example, plants clean air and filter water, bacteria decompose wastes, bees pollinate flowers, and tree roots hold soil in place to prevent erosion. All these processes work together to make ecosystems clean, sustainable, functional, and resilient to change.

The Government has set out to ensure that natural resources are valued, conserved, managed, and appropriately used for social, economic, and environmental benefits at the national level whilst meeting international obligations. This will be done by:



Protecting Guyana's forests



Conserving and protecting
Guyana's biodiversity



Using water wisely



Exploring the ocean

Protecting Guyana's Forests

Guyana's forests are important in the global fight against climate change and Guyana has one of the lowest deforestation rates in the world. As well as carbon storage and sequestration, Guyana's forests provide many other benefits, including biodiversity and water protection. To strengthen efforts to balance between economic growth and protecting Guyana's ecosystems, Guyana plans to:



Keep Improving Sustainable Forest Management



Protect Guyana's Coast with Mangroves



Expand and Restore of Guyana's Mangrove Forests and Ecosystems



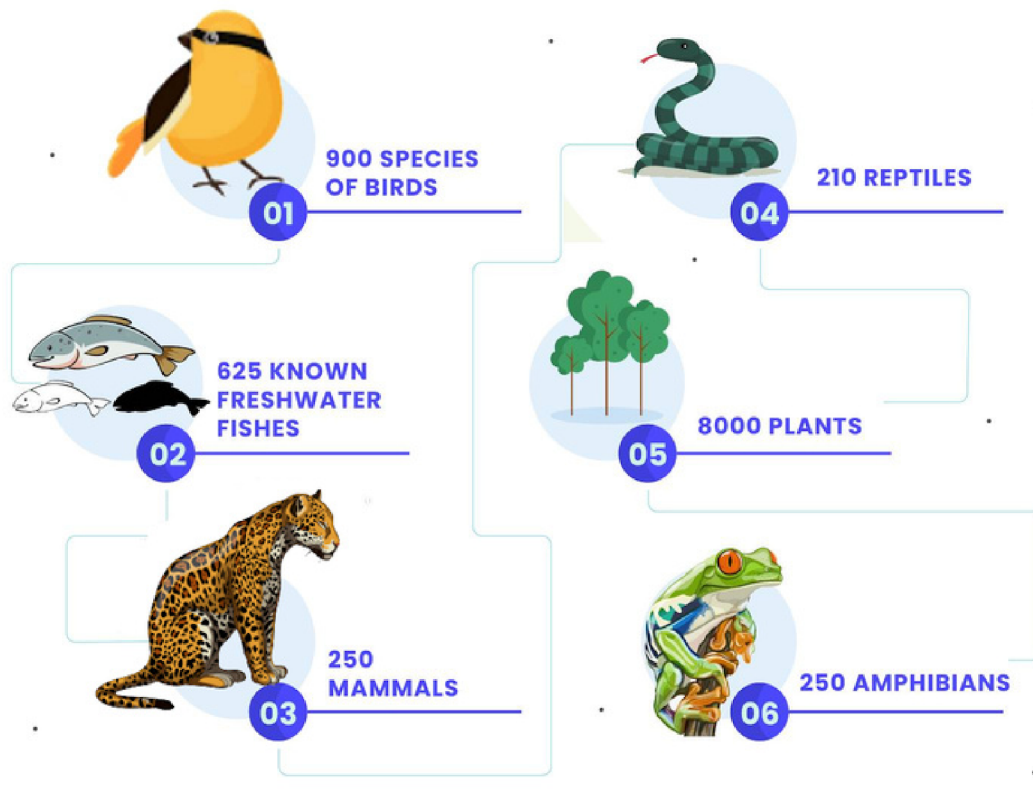
Maintain Intact Forest Landscapes and Protect Biodiversity Corridors



Protect Watersheds and Ecosystems

Conserving and Protecting Guyana's Biodiversity

Guyana's ecosystems are largely intact and have one of the highest levels of biodiversity in the world.

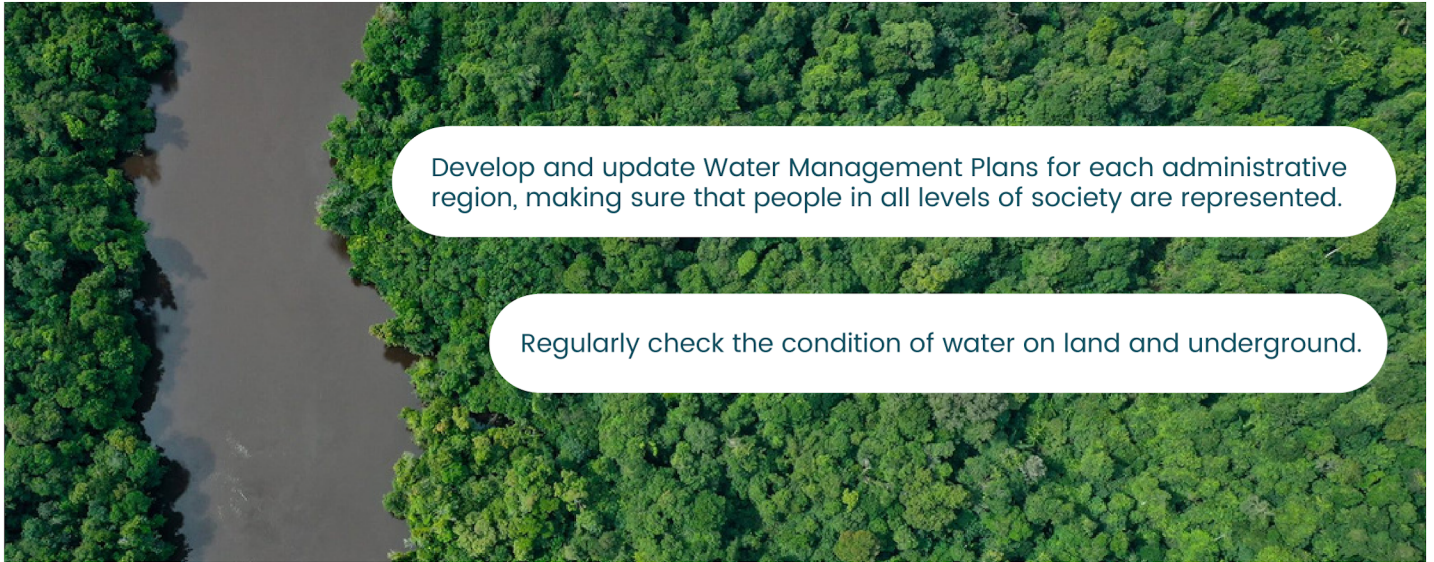


Biodiversity has contributed significantly to Guyana's economy, particularly forestry, fisheries, and wildlife. Guyana can grow more by supporting more biodiversity related products and services, including:



Using Water Wisely

Guyana is known as ‘the land of many waters’ because of the many rivers, creeks, and streams. Planning and water use management are important and require research and understanding. The Government intends to:



The Government will put measures in place for the wise use of water by:

- Making sure everyone has access to water clean and safe water;
- Protecting water in the environment;
- Ensuring there is enough water for agriculture;
- Using water to create electricity;
- Planning for disasters such as floods;
- Managing wastewater; and
- Making sure that water is not wasted or contaminated.



Exploring the Ocean

Guyana has a large ocean area that is mostly used for fishing and transport, and activities related to oil and gas. There is an opportunity to sustainably explore other resources in the ocean that can help with economic growth. These include tourism and mangrove restoration. The LCDS aims to support efforts that protect and restore marine life and coastal ecosystems in partnership with coastal communities.



An overhead view of Guyana's Coast



The Government will explore opportunities to benefit from the ocean by pursuing the following:

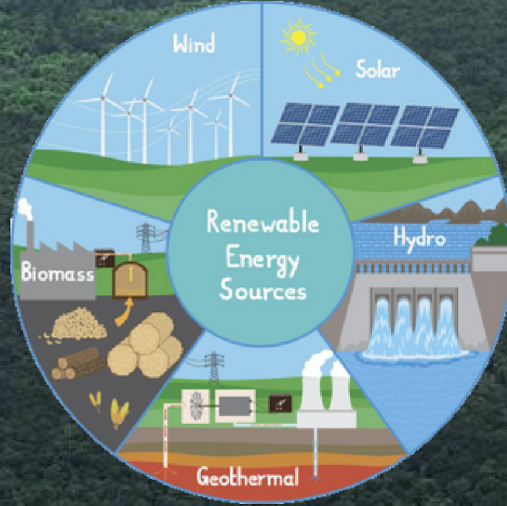
- Biotechnology;
- Fisheries and marine farming;
- Tourism;
- Shipping and trade; and
- Marine and coastal ecosystems protection.



Objective 2: Invest in Green Energy and Stimulate Low Carbon Growth

The Government plans to develop clean energy sources such as hydropower, solar, wind, and biomass to supply Guyana's energy grid and keep greenhouse gas emissions low. This is being done by:

Clean & Renewable Energy



Digital Infrastructure

- Access & connectivity
- Satellite Network
 - 4G and 5G
 - Fibre Optic Cables



Low Carbon Transportation

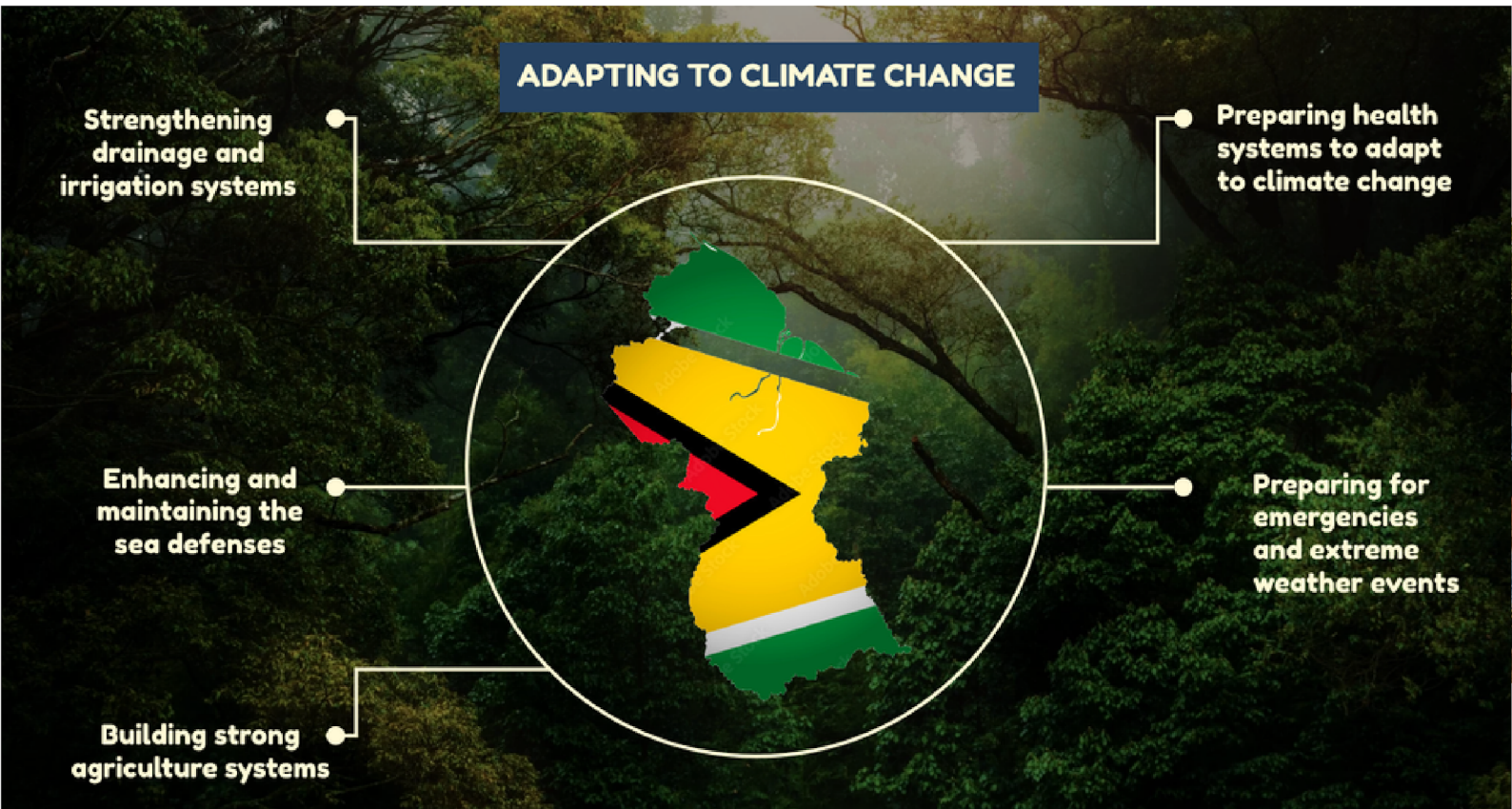
- Electric cars
- Bicycles
- Mass transit
- Better roads



Objective 3: Protect Against Climate Change and Biodiversity Loss

The negative impacts of climate change are already being experienced in Guyana. Since the 1960s, there have been increases in temperature, sea level, and the frequency and intensity of dry spells, drought conditions, and changing rainfall patterns. The impacts on Guyanese people, the economy, and the environment during flooding and droughts are examples of the devastation climate change may cause.

Money from the Guyana-Norway partnership and the low carbon economy is invested in activities that help Guyana adapt to the effects of climate change, such as:



Objective 4: Protect Against Climate Change and Biodiversity Loss

Oil and gas have been discovered off Guyana's coast, creating new opportunities for Guyana's growth and development. As stated in the LCDS, Guyana will develop its oil and gas industry while continuing its low carbon development by using the money earned from oil and gas to:



GLOSSARY OF TERMS

Biodiversity

The variety of organisms found within a specified geographic region.

Carbon Dioxide (CO₂)

CO₂ is a colourless, odourless, non-poisonous gas.

Carbon Sink

Processes that remove more carbon dioxide from the atmosphere than they release.

Climate

The long-term average weather of a region including typical weather patterns, frequency, and intensity of storms, cold spells, and heat waves.

Climate Change

Any change in climate over time, whether due to natural variability or because of human activity.

Context

The situation within which something exists or happens, and that can help explain it.

Deforestation

Processes that result in the conversion of forested lands for non-forest uses through burning, decomposition, or removal of trees.

Ecosystem

A community of organisms and its physical environment.

Emissions

The release of substances into the atmosphere.

Fossil Fuels

Fossil fuels are fuels that form when organic material (the remains of once-living things) is buried under great pressure and temperature over millions of years. They take ages to form but only a little time to burn.

Global Warming

The progressive gradual rise of the Earth's average surface temperature thought to be caused in part by increased concentrations of greenhouse gases in the atmosphere.

Greenhouse Effect

The insulating effect of atmospheric greenhouse gases that keeps the Earth's temperature about 60°F warmer than it would be otherwise.

Greenhouse Gas

Any gas that contributes to the "greenhouse effect."

Infrastructure

The basic physical system of a country and its economy. The fixed installations that it needs in order to function. These include roads, bridges, dams, the water and sewer systems, railways and subways, airports, and harbours.

Livelihoods

A person's livelihood is their means of getting the basic necessities, such as food, water, shelter, and clothing, of life.

Low-carbon Development

Low-carbon development is a new pattern of development that aims to reduce carbon dioxide emissions as much as possible while not affecting the increase of economic development at the same time.

Mangrove Restoration

The replanting and regeneration of mangrove forest ecosystems in areas where they have previously existed.

Paris Agreement

An international treaty on climate change, adopted in 2015. It covers climate change mitigation, adaptation, and finance.

Renewable Energy

Energy obtained from sources such as water, wind, sun, and biomass.

Resilient Ecosystem

The capacity of an ecosystem to respond to a disturbance by resisting damage and recovering quickly.

Sequestration

Opportunities to remove atmospheric CO₂, either through biological processes using plants and trees, or geological processes through storage of CO₂ in underground reservoirs.

Sustainable/ Sustainability

Sustainability consists of fulfilling the needs of current generations without compromising the needs of future generations, while ensuring a balance between economic growth, environmental care, and social well-being.

Sustainable Development

Sustainable development is development that meets the needs of the present, without compromising the ability of future generations to meet their own needs.

Watershed

A watershed is the land through which all water flows as it enters a body of water. Watersheds drain rainfall into streams and rivers.

Weather

Describes the short-term, hourly, and daily, state of the atmosphere.



2023



The EMC Foundation was established in 2022 to support environmental awareness and education in Guyana. The drive for this initiative is influenced by the evolution of environmental issues over the last three decades and their importance in today's national and global context.

The Foundation supports and facilitates activities that encourage a better understanding of the environment, create a network to connect people on environmental issues, and provide opportunities to experience Guyana's natural environment.



The Ministry of Education is dedicated to ensuring that all citizens of Guyana, regardless of age, race, gender, creed, physical or mental disability, and socio-economic status, are given the best possible opportunity to achieve their full potential.

This is being achieved through equal access to quality education as defined by the standards and norms outlined by the Ministry. The commitment to quality and equity in education with no barriers in access to anyone is clear in this declaration.



The Iwokrama International Centre (IIC) was established in 1996 under a joint mandate from the Government of Guyana and the Commonwealth Secretariat to manage the Iwokrama forest, a unique reserve of 371,000 hectares of rainforest, "in a manner that will lead to lasting ecological, economic, and social benefits to the people of Guyana and to the world in general".

The Iwokrama forest and its research centre are unique, providing a dedicated site in which to test the concept of a truly sustainable forest.