



IITM-EIACP NEWSLETTER

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CLIMATE CHANGE AND CORAL REEFS

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EDITORIAL

Coral reefs occupy less than 0.1% of the ocean floor; they are home to a quarter of all marine life - that's more species than rainforests. Animals use reefs for shelter, food and laying eggs. Reefs are vital for people too they protect coastlines by reducing the impact of storms and waves, which can cause destruction and land erosion. They also provide food and livelihoods to many millions of people.

Over the last three decades, the world has lost half of its reefs. The combination of destructive fishing practices, polluted water entering the ocean, coastal development, shipping, and climate change causing Rapid Ocean warming has led to mass coral death. In addition, our oceans absorb 30% of human-made carbon dioxide from the air (much like our forests do), and this is causing the ocean to become more acidic, which corrodes coral skeletons. In this publication we tried to focus on this issue and mentioned some precautionary measures to protect our valuable coral reefs.

- **Dr. B.S. Murthy**

CLIMATE CHANGE AND CORAL REEFS

INTRODUCTION

Climate change is long-term shifts in temperatures and weather patterns. These shifts may be natural, such as through variations in the solar cycle. But since the 1800s, human activities have been the main driver of climate change, primarily due to burning fossil fuels like coal, oil and gas.

Burning fossil fuels generates greenhouse gas emissions that act like a blanket wrapped around the Earth, trapping the sun's heat and raising temperatures.

CAUSES OF CLIMATE CHANGE

There are lots of factors that contribute to Earth's climate. However, scientists agree that Earth has been getting warmer in the past 50 to 100 years due to human activities. Certain gases in Earth's atmosphere block heat from escaping. This is called the greenhouse effect. These gases keep Earth warm like the glass in a greenhouse keeps plants warm.

Human activities such as burning fuel to power factories, cars and buses are changing the natural greenhouse. These changes cause the atmosphere to trap more heat than it used to, these include warming temperatures and changes in precipitation, as well as the effects of Earth's warming, such as:

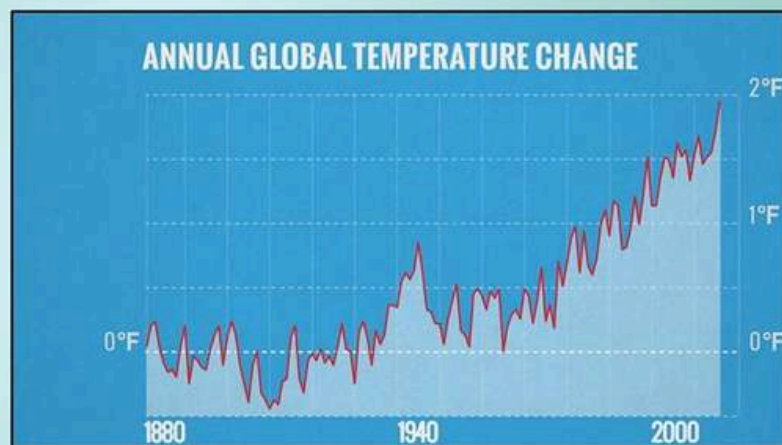
- Rising sea levels
- Shrinking mountain glaciers
- Ice melting at a faster rate than usual in Greenland, Antarctica and the Arctic
- Changes in flower and plant blooming times.

Earth's climate has constantly been changing — even long before humans came into the picture. However, scientists have observed unusual changes recently. For example, Earth's average temperature has been increasing much more quickly than they would expect over the past 150 years.

CURRENT STATUS OF EARTH'S CLIMATE CHANGING

Some parts of Earth are warming faster than others. But on average, global air temperatures near Earth's surface have gone up about 2 degrees Fahrenheit in the past 100 years. In fact, the past five years have been the warmest five years in centuries.

As Earth's climate continues to warm, the intensity and amount of rainfall during storms such as hurricanes is expected to increase. Droughts and heat waves are also expected to become more intense as the climate warms. When the whole Earth's temperature changes by one or two degrees, that change can have big impacts on the health of Earth's plants and animals, too.



Graph of change in annual global temperatures, compared to the average of global annual temperatures from 1880-1899. Source: NASA's Goddard Space Flight Center.

CLIMATE CHANGE IMPACTING THE WORLD'S OCEAN

The ocean has long taken the brunt of the impacts of human-made global warming. As the planet's greatest carbon sink, the ocean absorbs excess heat and energy released from rising greenhouse gas emissions trapped in the Earth's system. Today, the ocean has absorbed about 90 percent of the heat generated by rising emissions. As the excessive heat and energy warms the ocean, the change in temperature leads to unparalleled cascading effects, including ice-melting, sea-level rise, marine heat waves, and ocean acidification.

CLIMATE CHANGE & CORAL REEFS

Coral reefs are unique and the most diverse marine ecosystems on Earth. They are believed to have existed for about 200 million years. They are home to 25% of all marine life.

Corals are composed of hundreds of thousands of individual animals known as polyps. Every polyp has a stomach that opens at only one end. This opening, which is essentially the mouth, is surrounded by tentacles. These tentacles are used for defence and capturing small animals for food. Food is taken through the mouth and the waste products cleared through the same opening. Most corals feed on microscopic animals during the night time.



They play a crucial role in supporting the flora and fauna in the marine ecosystem. They have, since time immemorial, provided us with food, pleasure and protection from storm and other natural calamities. They are also described as 'underwater tropical rainforest, fairy land under water, biologist's paradise, magnificent repository of resources, genetic garden, submerged meadows and treasure house of wealth'. They act as barrier against waves and thus prevent coastal erosion. Mangroves and the sea grass beds, which act as breeding ground of various marine faunal species, are protected by coral reefs.

Coral reefs act as breeding, spawning, nesting and feeding areas for many fishes and other marine organisms. Indonesia has the largest coral reef area in the world. India, Maldives, Sri Lanka

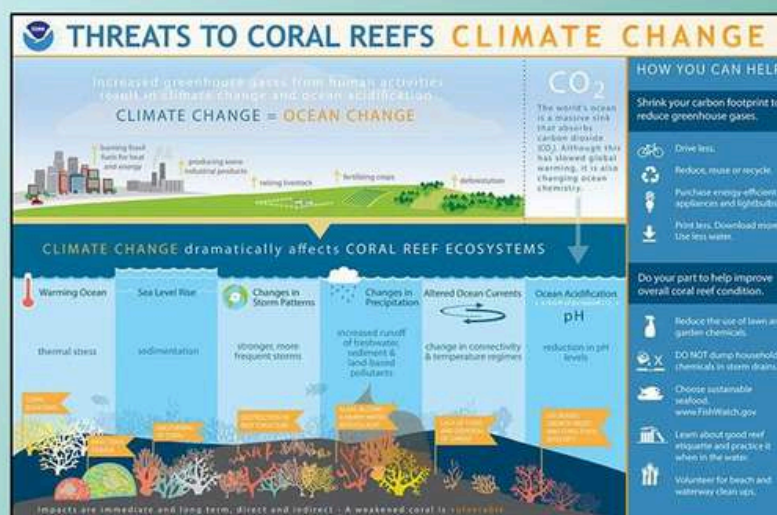
and Chagos have the maximum coral reefs in South Asia. The Great Barrier Reef of the Queensland coast of Australia is the largest aggregation of coral reefs extending to a length of 1,931 kilometres and a width that varies from 16-322 kilometres. India has four coral reef areas: Gulf of Manner, Andaman and Nicobar Islands, Lakshadweep islands and the Gulf of Kutch.

Benefits of Coral reefs:

Coral reefs protect the humanity from natural calamities. They provide revenue and employment through tourism and recreation. They provide habitats for fishes, starfish and sea anemones. It has been assessed that one square kilometre of coral reef produces 20-35 mega tonnes of fishes sufficient to feed about 600 people annually.

They are used in jewellery and as curios. The internal skeleton polished with colours is used in jewellery. Sea grasses that provide food for dugongs and dolphins are harboured by coral reefs. Coral blocks are used for buildings and road construction. The lime supplied by corals is used in cement industries.

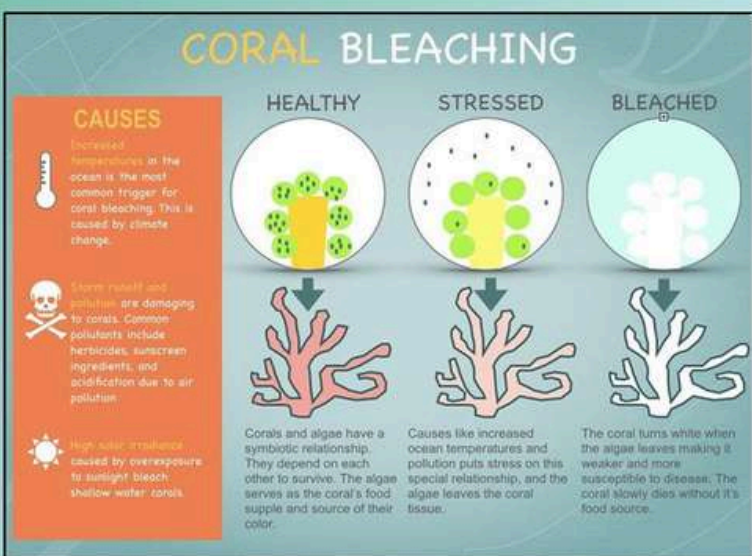
EFFECT OF CLIMATE CHANGE ON CORAL REEF



Climate change is the greatest global threat to coral reef ecosystems. Scientific evidence now clearly indicates that the Earth's atmosphere and ocean are warming, and that these changes are primarily due to greenhouse gases derived from human activities.

Coral Bleaching

Global ocean temperature has risen by 1.3°F since the late 19th century and is continuing to climb. Coral reefs are very sensitive to light and temperature. If the water they live in gets too hot, they might not survive. They also don't survive when the ocean has too much pollution. Sometimes, storms can even upset coral depending on how often they happen and how severe they are. If coral reefs are under too much stress, like in these conditions, they can eject the algae living on them and turn completely white. This is known as coral bleaching. This does not necessarily mean the coral is dead - corals can survive bleaching. They do become more vulnerable to death however, especially if the stress continues for a long period of time.



Increased carbon dioxide in the atmosphere is one of the recognized causes of our changing climate and it is also problematic for coral reefs. The ocean absorbs approximately one-third of the atmosphere's excess carbon dioxide, resulting in a more acidic ocean. In order for a coral reef to grow, it must produce limestone (or calcium carbonate) at a rate that is faster than the reef is being eroded. Ocean acidification slows the rate at which coral reefs generate calcium carbonate, thus slowing the growth of coral skeletons. Climate change can cause sea level rise; changes in the frequency, intensity, and distribution of tropical storms; and altered ocean circulation. All of these impacts can have negative consequences for the health and diversity of reefs around the world.

PROTECTION OF CORAL REEFS

No matter where you live, near the coast or hundreds of miles away, there are several things that we can do to keep coral reefs healthy. Many dangers to coral reefs occur directly on the water but many also come from activities that occur on land, even those far from the coast. Below are lifestyle changes that anyone can adopt that can make a difference for the health of our coral reefs.

When Visiting Coral Reefs

Practice safe and responsible diving and snorkelling. Avoid touching reefs or anchoring your boat on the reef. Contact with the reef will damage the delicate coral animals, and anchoring on the reef can kill corals, so look for sandy bottom or use moorings, if available.

Every Day

Recycle and dispose of trash properly. Marine debris can be harmful to coral reefs. Recycle your trash at home and on the go (especially plastic), and remember the three R's (reduce, reuse, and recycle). When disposing of trash, do it properly in bins, to avoid trash being blown or washed away into waterways and oceans. On beaches, make sure you leave no trash behind, and never throw or leave any cigarette butts in the sand. You can help keep your rivers and streams clean by volunteering to pick up trash in your community. Check with your local environmental organizations for annual trash clean ups and make sure to check the annual International Coastal Clean-up.

Minimize use of fertilizers

The overuse of fertilizers on lawns harm water quality because nutrients (nitrogen and phosphorus) from the fertilizer are washed into waterways and eventually end up in oceans. These nutrients pollute the water and can harm coral reefs.

Use environmentally-friendly modes of transportation. Instead of driving a car, try to walk, bike, or use public transport (like buses and trains) more often. If you are planning to buy a car, choose a fuel-efficient vehicle like a hybrid or electric car. Using these cleaner transportation methods can help reduce the amount of greenhouse gasses that are emitted into the atmosphere. These emissions contribute to ocean acidification and increased ocean temperature. More acidic ocean waters impede coral growth and warmer waters cause coral bleaching.

Save energy at home and at work. You can save energy at home by turning off lights and electronic devices when not using them and opting to buy energy-efficient appliances such as Energy Star-certified appliances. At work, try to turn the lights and your computer off when you leave. Be conscious when buying aquarium fish. Avoid purchasing living coral and if you buy a marine aquarium fish, make sure that it has been collected in a sustainable manner.



Brief details about Natural Energy Sources based Models was given to students of class 7th to 9th. Student had actively participated in demonstration of Models. About 400+ students and teachers taken pledge and became "Climate Change Warriors". Certificates & badges were circulated to students. This pledge helps students to curb air pollution and live a sustainable lifestyle at individual level.



IITM-EIACP MISSION LiFE ACTIVITIES

1. Mission LiFE - Natural Source based energy working model Demonstration at the NCL Modern English Medium High school

As a part of Mission LiFE movement, IITM-EIACP had organized several activities at NCL Modern English Medium High School, Pune on second week of January 2023.



2. Lecture on Mission LiFE at Loyola School, Pashan

For promoting Mission LiFE creatives and detail information in schools and colleges IITM-EIACP has organized informative lecture of Miss. Bhagyashri Katre IT Officer – EIACP on Mission LiFE at Loyola School for 5th to 8th Standard students.



Also he mentioned benefits and what we can do stop climate change through our individual actions to achieve this goal. More than 270 students were participated.



3. Public talk on Mission LiFE at Shri Shivaji Vidyamandir and Kanishtha Mahavidyalaya Aundh, Pune

IITM-EIACP has organized Public talk of Dr. Nihal Gujare Scientist from IITM Pune at Shri Shivaji Vidyamandir and Kanishtha Mahavidyalaya Aundh, Pune for 5th to 8th standard Students. The topic of the talk was 'Lifestyle for In his talk he explained the action points and the concept of 'Lifestyle for the Environment (LiFE) to students.



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THREATS TO CORAL REEFS CLIMATE CHANGE

Increased greenhouse gases from human activities result in climate change and ocean acidification.

CLIMATE CHANGE = OCEAN CHANGE

CO₂

The world's ocean is a massive sink that absorbs carbon dioxide (CO₂). Although this has slowed global warming, it is also changing ocean chemistry.

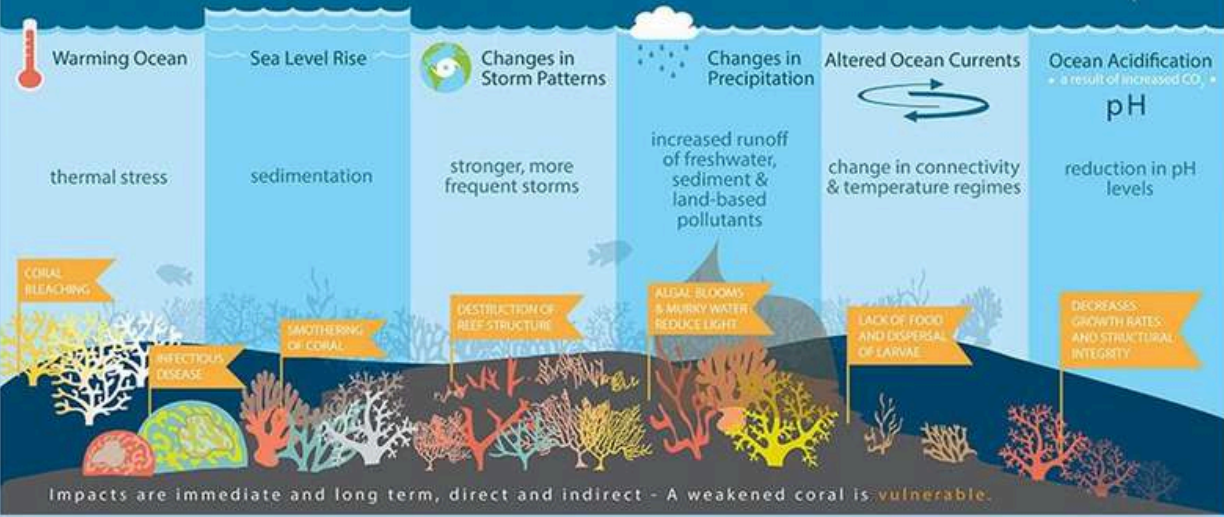
HOW YOU CAN HELP

Shrink your carbon footprint to reduce greenhouse gases.

- Drive less.
- Reduce, reuse or recycle.
- Purchase energy-efficient appliances and lightbulbs.
- Print less. Download more. Use less water.



CLIMATE CHANGE dramatically affects CORAL REEF ECOSYSTEMS



Do your part to help improve overall coral reef condition.

- Reduce the use of lawn and garden chemicals.
- DO NOT dump household chemicals in storm drains.
- Choose sustainable seafood. www.FishWatch.gov
- Learn about good reef etiquette and practice it when in the water.
- Volunteer for beach and waterway clean ups.

All queries and feedback addressed to:

**Environmental Information Awareness,
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