

May, 2024

# THE PLANET VISION

## **Underwater Apocalypse: The Looming Crisis of Coral Bleaching**

Imagine arriving at a  
tropical paradise, ready...

**Beyond the Tropics: The Enigmatic  
Cold Water Coral Ecosystems**

**10**

**5 Tech Hacks for  
Coral Reefs Restoration**

**17**



# From the Editor's Desk

For years, scuba diving among vibrant coral reefs topped Rani's bucket list of dreams. But when she finally visited the tropical waters off the Australian coast, she found the reality to be far bleaker. Instead of the teeming underwater treasure she had envisioned, Sarah was met with a ghostly boneyard of bleached white coral skeletons.

Sadly, Sarah's experience is becoming all too common as coral bleaching, driven by rising ocean temperatures, ravages reefs around the globe. This process drains reefs of their brilliant colors and life, turning thriving ecosystems into barren graveyards. The consequences could be catastrophic for marine ecology and human livelihoods.

Coral reefs support over 25% of marine life and provide food and income for hundreds of millions. Their loss would unravel entire ocean ecosystems and coastal economies. Places like the Great Barrier Reef and other iconic reef systems may be gone by the century's end if we don't act.

However, there is a reason for hope. Along with global and local initiatives, this edition highlights pioneering technologies for the conservation of vulnerable reef ecosystems. We will also explore the underwater world and learn more about the enigmatic corals. It is important to know that preserving coral reefs will require consistent efforts and innovative solutions at all levels. Let us take action to protect these underwater rainforests before it's too late. We simply cannot afford to let our reefs bleach away.

**Happy Learning.**

Team **VisionIAS**

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# INDEX



## 5 Cover Stories

- 5 **Underwater Apocalypse:** The Looming Crisis of Coral Bleaching
- 6 **Types of Corals:** Nature's Living Sculptures beneath the Waves
- 10 **Beyond the Tropics:** The Enigmatic Cold Water Coral Ecosystems
- 12 **Marvels of the Deep:** Discovering the Great Barrier Reef
- 15 **Coral reefs:** Attacks by Invasive Alien Species
- 17 5 Tech Hacks for Coral Reefs Restoration

## 22 Briefings

- 22 **India**
- 24 **Global**

## 28 Protect and Preserve

### 30 Green Tech

- 30 Hydrogels Take on Microplastic Pollution
- 32 **E-Soil:** Revolutionizing Agriculture with Sustainable Growth

## 36 Environment and You

- 36 **Saving Coral Reefs:** One Action at a Time

## 41 Developments

- 41 Sustainable Finance for Tiger Landscapes Conference (SFTLC)
- 43 The Environment and Our Fundamental Rights
- 45 The Grand History of Environmental Movements in India
- 47 Dream of a Plastic-Free Planet: The Global Plastic Treaty

### SNAPSHOT:

- 20 **Magnificent Coral Reefs in India**
- 26 **Nature's Electrical Fury: Witnessing Volcanic lightning**
- 38 **Blue Whales: Ocean's Mighty Titan**
- 34 **Global: Quick Hits**
- 40 **Comic Strip**
- 50 **Green Days Diary**
- 51 **The Planet Facts**
- 52 **Quiz Zone**
- 53 **Crossword**



# Underwater Apocalypse: The Looming Crisis of Coral Bleaching

A deep dive into the growing coral bleaching crisis, its impacts, and the urgent efforts to save our underwater ecosystems.



Healthy coral vs bleached coral  
Source: Great Barrier Reef Foundation

Imagine arriving at a tropical paradise, ready to explore the vibrant underwater world. As you descend into the ocean, you're greeted by a breathtaking sight: a kaleidoscope of colourful fish and coral reefs. But as you venture deeper, a stark contrast emerges. A large group of coral, once vibrant and alive, now stands pale and lifeless. This is the harsh reality of the growing coral bleaching crisis. Over the past two decades, a significant 25-40% decline has struck the globe's coral populations. The recent 4th Global Mass Bleaching event of 2023-2024 serves as a stark reminder of the ongoing crisis unfolding beneath the waves.

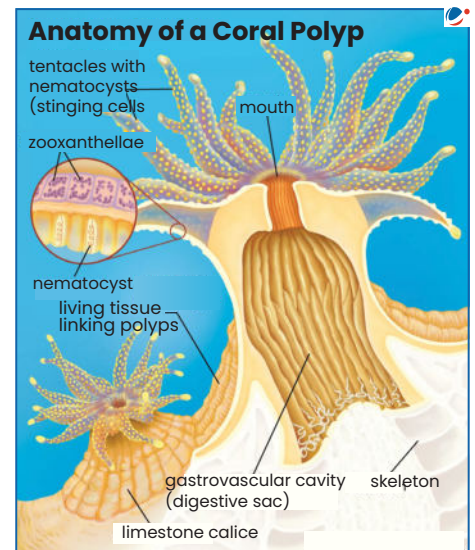
But what are these corals that captivate our attention with their colourful variations? And what exactly happens during 'coral bleaching'?

“Over the past two decades, a significant 25-40% decline has struck the globe's coral populations.”

## Corals and Coral Bleaching

Corals are invertebrate species that are part of the Cnidaria family, which includes many colourful and intriguing creatures like jellyfish and sea anemones. While Corals may appear like plants, they are actually tiny animals called polyps. The majority of these polyps live in groups of hundreds to thousands of genetically identical partners known collectively as a 'colony'. Arguably, the most fascinating aspect of corals is their highly evolved symbiotic relationship with microscopic, single-celled,

algae known as zooxanthellae. The algae live in the coral polyp's tissues in a mutually beneficial relationship, ensuring each other's survival.



# TYPES OF CORALS

*Nature's Living Sculptures beneath the Waves*

## Hard coral species



Often referred to as reef-building corals. They use abundant calcium from surrounding seawater to create hardened reef structures. There are as many as 850 types of hard corals occurring in numerous varieties of shape and size.

## Soft Coral



Unlike stony corals, most soft corals thrive in nutrient rich waters where light intensity is moderate.

## DIFFERENT TYPES OF CORALS FOUND ACROSS THE GLOBE

### Mushroom Corals



Most are solitary forms living unattached to any underlying substrate. Found in Indo-Pacific waters.

### Bubble Coral



Commonly found in shallow waters, bubble coral is often mistaken for fish eggs.

### Carnation Coral



Though a soft coral, colony is well supported and stiffened by numerous hard slivers of calcium carbonate. This feature allows coral to retain its shape in, and orient itself perpendicularly to, swift water current.

### Sun Coral



Found across Red Sea, Indo-Pacific, Western Indian Ocean and Southern Pacific.

### Staghorn Corals



Occurs up to 100 ft. depth. Most important corals in the Caribbean

### Brain Coral



Found in shallow and warm water coral reefs. Life span of the largest of brain corals is about 900 years. Colonies can grow as high as 6 ft., or even more.

### Elkhorn coral

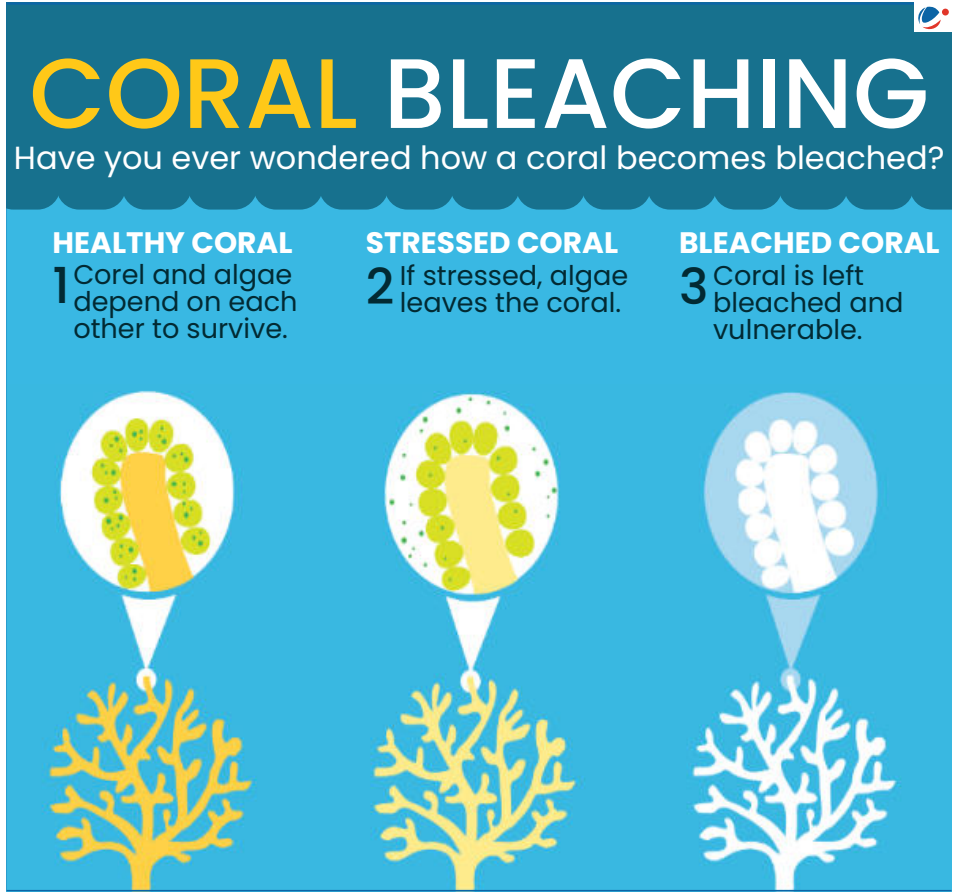


Forms dense groups called "thickets" in very shallow water. They provide important habitat for other reef animals, especially fish.

**The Underwater Alliance: Corals and Their Zooxanthellae**

Zooxanthellae use photosynthesis to convert the energy from sunlight into nutrients that the coral can use. Coral polyps, in return, supply them with a safe haven and the nutrients they require for photosynthesis. Interestingly the algae are also responsible for the corals' unique and stunning colours. So, what happens when this harmonious bond between the two is disrupted for any reason? The answer- coral bleaching!

Coral bleaching usually occurs when corals are under some kind of stress, generally due to a change in their living conditions. When such stress occurs, corals release the symbiotic algae living in their tissues. This causes them to lose their beautiful colours and become white—hence the term bleaching. Without the



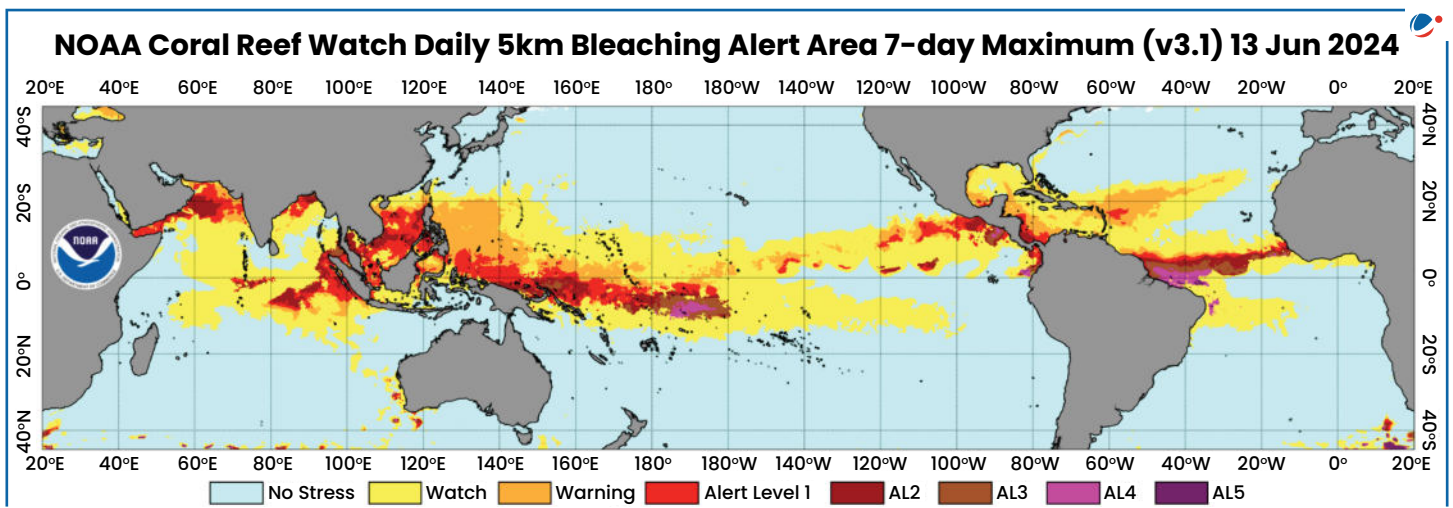
“ Coral bleaching has been causing significant damage to the Great Barrier Reef, affecting 91% of the reef in early 2022, and over 60% of the system is experiencing severe bleaching. ”

algae, the corals become more vulnerable and struggle to survive for long periods.

In recent times, Coral bleaching has been causing significant damage to the Great Barrier Reef, affecting 91% of the reef in early 2022, and over 60% of the system is experiencing severe bleaching. The Mesoamerican Reef,

stretching from Mexico to Guatemala, experienced widespread bleaching, losing up to 40% of its coral cover.

But have you ever wondered why they are turning white? The answer is climate change and increasing human intervention which played in key role in coral bleaching.



Coral reef bleaching alert  
Source: National Oceanic and Atmospheric Administration (NOAA)

## The Bleaching Menace: Why do corals turn White?

### **Rising temperature, Increased radiation and Diseases**

Climate change and increasing greenhouse gas emissions are causing temperature changes across the globe. Oceans absorb most of the excess heat, putting coral reefs at risk. El Niño, a climatic event exacerbated by climate change, brings intense heat into ocean depths, making the water too hot for these marine ecosystems. Additionally, due to rising emissions, oceans are now absorbing more carbon dioxide from the atmosphere, resulting in increased acidic levels. This phenomenon- known as ocean acidification- makes it harder for corals to build their calcium-based skeletons.

Climate change has also led to increased vulnerability of coral reefs to sun and ultraviolet light. This increased radiation is exacerbated by the spread of infectious diseases like *Vibrio shiloi*, which invade corals' defences, inhibiting photosynthetic processes that support their symbiotic algae. Moreover, extreme weather events like marine heatwaves, fueled by climate change, are pushing coral reefs and marine ecosystems towards a critical tipping point.



*Bottom trawling can damage coral reef structures, destroying these fragile ecosystems*

### **Marine Heat Waves: The Silent Killers of Coral Reefs**

Unlike terrestrial heatwaves, which can be quickly alleviated by weather changes, MHWs can persist for weeks or even months. This prolonged

exposure to elevated temperatures can have dire consequences for coral reefs that are highly sensitive to temperature changes. MHWs have surged by more than 50% globally over the past century, and their frequency and intensity are projected to keep increasing due to ongoing global warming. By 2021, nearly 60% of the ocean surface had experienced at least one heatwave episode.

### **Human activities damaging coral reefs**

Chemical pollution from industrial and agricultural runoff leads to phytoplankton growth, smothering corals and denying them light and nutrients. Coastal development and land clearing cause sedimentation, burying coral colonies in silt and suspended particles. Overfishing, coral mining, and industrial development further threaten coral reefs, forcing them to navigate human-induced dangers.

The failure to address these issues has made coral bleaching a widespread phenomenon, leaving a trail of lifeless reefs in its wake.



**Research conducted by the Global Coral Reef Monitoring Network (GCRMN) in 2021 revealed that around 14% of the coral on reefs worldwide was lost over the period from 2009 to 2018.**



### **Waves of bleached corals Across the Ocean**

Research conducted by the Global Coral Reef Monitoring Network (GCRMN) in 2021 revealed that around 14% of the coral on reefs worldwide was lost from 2009 to 2018. Coral bleaching was the primary cause of this loss. So, what happens when we lose corals?

## Ecological consequences



*Coral reefs attract tourists and safeguard fishing from predators*

Since nearly a quarter of all the fish in the sea rely on healthy coral reefs, loss of corals can have severe ecological consequences, disrupting marine ecosystems and food chains. It also threatens biodiversity, as the diverse marine life it supports is at risk of decline or extinction. For example, the Maldives' 1998 bleaching event destroyed more than 60% of the country's coral species. Similarly, coral reefs are crucial for marine ecosystems and local economies through tourism and fishing industries, and thus, any disturbances can have significant economic consequences.

### **Economic Tides Ebbing**

As per a report by the Intergovernmental Panel on Climate Change Coral bleaching costs the Australian economy over a loss of \$1 billion 10,000 per year.

In regions where local communities rely on fishing, coral bleaching can lead to a decline in fish populations and reduced catches, affecting food security and livelihoods. For example, in Seychelles, a series of bleaching events in the late 1990s and early 2000s resulted in a 50% drop in artisanal fish catches, leaving families financially uncertain while the coasts lost a buffer to themselves from tides and floods.

### **Coastal Guardians Fading**

Coral reefs also shield land and people from storms by acting as a barrier that lessens the force of huge waves striking the coast. These reefs, when degraded or lost due





to bleaching events, become more vulnerable to erosion, storm damage, and inundation. This can have severe consequences, especially in regions already threatened by rising sea levels due to climate change. For example, in the Caribbean, the loss of coral reefs has increased the risk of coastal flooding and erosion, leaving once-thriving communities exposed to the sea's relentless fury. These horrifying impacts highlight the urgent need for action to protect coral ecosystems from climate change and human activities.

### **Gleams of Hope: Strategies for Coral Conservation**

Amidst this crisis, there is a glimmer of hope as efforts are underway globally to mitigate coral bleaching and promote coral recovery. International initiatives like the International Coral Reef Initiative, Global Coral Reef Monitoring Network, and Global Coral Reef Alliance are working to raise awareness, coordinate research, and implement conservation strategies. Platforms like the Global Coral Reef R&D Accelerator aim to accelerate the development and deployment of innovative solutions. Furthermore, Saudi Arabia Scientists at KAUST in Saudi Arabia are constructing the world's largest coral restoration project, a primary nursery and a second facility in the Red Sea, aiming to transform coral restoration efforts.

At the national level, India is taking proactive measures, including coral reef studies under the Coastal Zone

Studies and pioneering techniques like "biorock" or mineral accretion technology. The National Coastal Mission Programme emphasizes India's commitment to protecting and sustaining its coral reef ecosystems. Moreover, Mumbai installed 210 artificial reefs in the Arabian Sea to restore coral reefs.



**In 2022, the Indian government announced a project to restore and conserve coral reefs in the Gulf of Mannar using cutting-edge techniques such as biorock technology.**

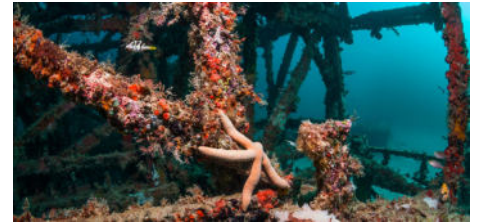


Beyond these initiatives, strategies include establishing marine protected areas, promoting sustainable fishing practices, and researching coral resilience and assisted evolution to develop more resilient coral species capable of withstanding climate change impacts. However, the rapid bleaching of coral reefs is like a ticking time bomb that needs to be diffused as soon as possible.

### **The Race Against Time**

Coral reefs are in a critical crisis due to the increasing frequency and severity of bleaching events. Urgent action is needed to address the underlying causes, including reducing carbon footprints, supporting conservation initiatives, and advocating for stronger

environmental policies. Indigenous communities have been instrumental in coral reef restoration, offering valuable insights and traditional knowledge.



*210 artificial coral reefs installed on Mumbai's coast to restore coral reef*

In Australia, the Giringun Aboriginal Corporation has been working on the Great Barrier Reef through its "Coral Nurture Program." Similarly, the Zoological Survey of India is actively involved in coral reef mapping and monitoring.

Organizations like the Nature Conservation Foundation are raising awareness and implementing conservation measures. The International Coral Reef Initiative (ICRI), founded in 1994, now includes over 90 members, including 45 countries that are custodians of over 75% of the world's coral reefs. Additionally, coastal communities in regions like the Gulf of Mannar and Lakshadweep are engaging in traditional practices to promote reef health. By learning from indigenous knowledge systems globally and fostering collaborative efforts, we can collectively forge a path towards the preservation of these invaluable marine treasures.



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**Coral bleaching, driven by climate change and human activities, is decimating reef ecosystems worldwide, causing ecological and economic devastation. Urgent action through conservation initiatives, sustainable practices, and global collaboration is crucial to safeguard these invaluable marine treasures from further decline.**

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# Beyond the Tropics: The Enigmatic Cold Water Coral Ecosystems



*Cold water corals are found in many shapes and sizes and vibrant colours.*

When most people think about corals, they usually imagine a sunny tropical reef speckled with fishes, crabs, snails, and other creatures on a colourful rocky surface. But do all corals live in warm water or are found on island coasts in shallow seas? Not at all – in fact, over half of all known coral species are found in cold, deep, and dark waters. Deep-sea corals have existed for millions of years and have colonized all seas and oceans of the world. So, what are these mysterious creatures and what makes them distinct from the ordinary corals?

## **Unravelling the mystery of Deep Sea Corals or Cold-Water Corals**

Cold-water corals are related to animals like sea anemones and jellyfish. They can live as individuals or as colonies that form extensive reefs. Cold-water corals differ from tropical corals primarily due to their surrounding environment. They typically thrive at depths ranging from 40 meters to over 1000 meters. Unlike their tropical counterparts, which rely on sunlight and symbiotic algae for food, cold-water



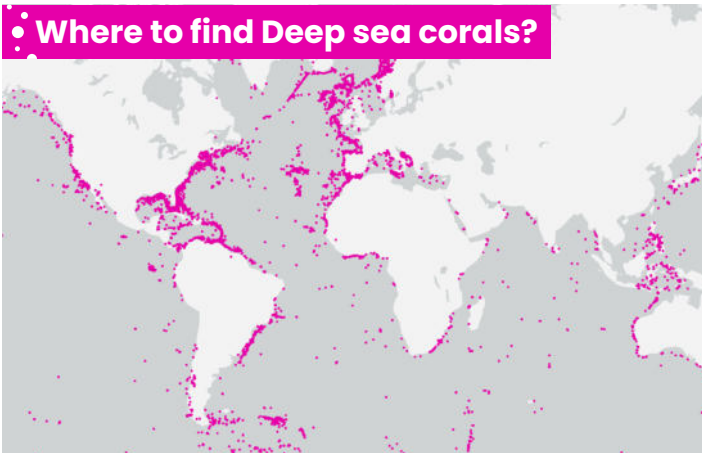
Unlike their tropical counterparts, which rely on sunlight and symbiotic algae for food, cold-water corals inhabit a dark world devoid of these algae.



corals inhabit a dark world devoid of these algae. Hence, their survival depends on water rich in organic matter, especially zooplankton, which serves as their main food source. To effectively capture their food, these cold-water corals usually develop tree-like branching structures that support colonies of polyps.

Furthermore, what is interesting is how they reproduce. These Corals are solidly attached to a hard surface or into sediments. This presents some interesting challenges when it comes to reproduction and dispersal. Like trees scattering their pollen, most corals are broadcast spawners that is male release their sperm into water and





*Global Distribution of Cold Water Corals*  
 Source: UNEP World Conservation Monitoring Centre

females may do same with their eggs or hold eggs until they capture sperm to fertilize them.

Due to their sturdy and resilient nature, these corals are widely distributed around the world. The Norwegian continental shelf has one of the widest habitats for cold-water corals known to man and, therefore, has a high biodiversity. However, as the sea environment changes due to various environmental and human-induced factors, these corals face increased survival-related challenges.



**International trade in most cold-water coral reef species is closely controlled.**



Like tropical coral reefs, these ecosystems are also threatened directly or indirectly by several human activities, including climate change. Trawling, cable placement/repair, pipe placement, deep sea mineral exploration and exploitation amongst others, can cause damage to cold-water coral ecosystems. Other documented and potential sources of impact are waste disposal and dumping, in particular, abandoned fishing gear and coastal debris. The extensive nature of threats warrants collaborative efforts to preserve these unique ecosystems.

**International actions to conserve Coldwater Coral Reefs**

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) lists black

corals (Antipatharia), stony corals (Scleractinia) and lace corals (Stylasteridae) under Appendix II. This means that international trade in most cold-water coral reef species is closely controlled and requires export permits/certificates to be granted by the relevant authorities.

Moreover, World Wide Fund for Nature (WWF) has several international and regional campaigns and initiatives on the urgent need to conserve, protect and manage cold-water coral reefs and other vulnerable marine ecosystems in both national and international waters. But more needs to be done to overcome the increasing impact of human activities on these fragile species.

**Advancing Coral Reef Protection**



*Bottom trawling can damage coral reef structures, destroying these fragile ecosystems*

We need a global internet-based database mapping cold-water coral reef. Collaboration with industries like fishing and oil and gas exploration can also provide valuable data for scientists, managers, and policymakers. It can help enhance research and coordination at global, regional, and national levels.

We also need practical strategies and guidelines for in-situ monitoring of coral habitats, along with awareness about their sustainable management. Strategies can be developed along the lines of IUCN’s Global Marine Program, which has published numerous documents on marine resource conservation and cold-water coral reefs.

**Cold-water corals, vital yet vulnerable components of marine ecosystems, face significant threats from human activities and climate change. Preserving these ecosystems requires global collaboration, enhanced research, and effective management strategies, alongside raising awareness and involving various stakeholders.**

# Marvels of the Deep: Discovering the Great Barrier Reef



*Great Barrier reef as photographed from International space station*  
Source: NASA

Do you know there is a coral reef ecosystem on Earth so large it can be seen from space? The Great Barrier Reef spans over a jaw-dropping 344,400 square kilometres, an area roughly the size of Japan. It is the world's largest coral reef ecosystem (GBR) and consists of more than 2900 individual reefs and 900 islands stretching for over 2300 km along Australia's northeast coastline. But what exactly is a Barrier Reef?



**The Great Barrier Reef spans over a jaw-dropping 344,400 square kilometres, an area roughly the size Of Japan**



A barrier reef is a coral reef that is roughly parallel to a shore and separated from it by a lagoon or other body of water. Barrier reefs are very rare, but they include some of

the world's most famous reefs, e.g., the Australian Great Barrier Reef and Belize's Barrier Reef. Some of these barriers date back millions of years.

## **Timeline of GBR: From Ancient Seas to Indigenous Shores**

GBR that exists today are thought to have evolved in ancient Tethys Sea between Laurasia and Gondwanaland. Due to continental drift, Tethys Sea began to close, and widely dispersed evolving corals were slowly pushed eastward and concentrated in what is now the western Pacific Ocean. It has moved and morphed over the years and was first encountered by humans 40,000 years ago by Aboriginal and Torres Strait Islander peoples. These Indigenous communities have been custodians and traditional owners of these seas.

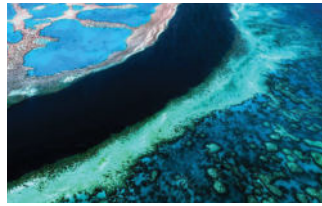
More recently, formation of Great Barrier Reef was driven



## FOUR TYPES OF CORAL REEFS



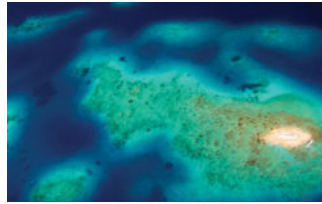
1. Fringing Reef



2. Barrier Reef

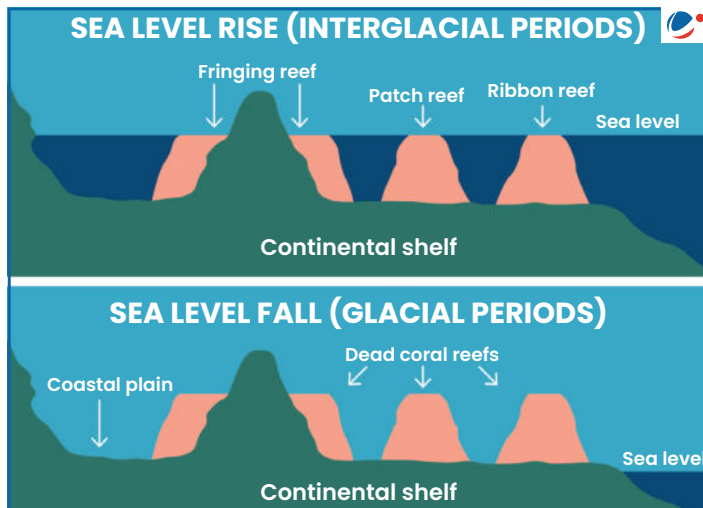


3. Atoll Reef



4. Patch Reef

by Sea Level and Climatic changes. Over last 500,000 years reef has developed as sea level has risen and fallen over multiple glacial (ice ages) and interglacial cycles (warmer periods). During periods of high sea level, corals were able to grow in the warm shallow waters and create reefs.



Growth of Corals during Inter-glacial Periods

Current reef is about 6,000 to 8,000 years old and was formed after the last ice age began to recede and water levels and temperatures rapidly changed. GBR today actually sits on the remains of sediments of Great Dividing mountain Range.

### Great Barrier Reef: Guardians of a Global Treasure

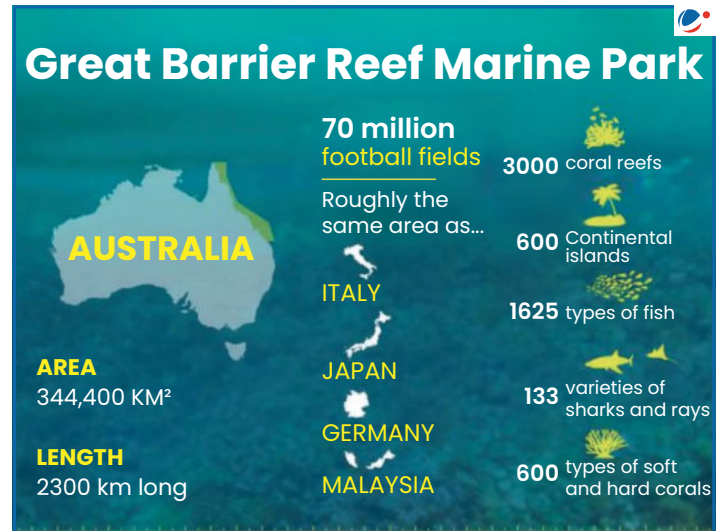
GBR is a globally significant natural asset that is home to thousands of species and a vast network of environments. It also holds great scientific interest as the habitat of species such as dugong ('sea cow') and large green turtles, which are threatened with extinction. The reef is also a major contributor to the Australian economy, supporting jobs and businesses.



GBR is a globally significant natural asset that is home to thousands of species and a vast network of environments.



Not surprisingly, the Great Barrier Reef was listed as a World Heritage Site in 1981 when UNESCO recognized its cultural, environmental wonder and scientific importance. It has been on the UNESCO heritage list for over 40 years, but the organization says the icon is under "serious threat" from warming seas and pollution.



Key Facts about Great Barrier reef

Source: Great Barrier Reef Marine Park Authority (GBRMPA)

### A Heritage at Risk: Dire State of the Great Barrier Reef

Climate change has turned out to be the biggest threat to GBR. The Southern Hemisphere summer that concluded last February (2024) was likely the deadliest in the reef's history. This was due to the unprecedented thermal stress the reef experienced. In the reef's southern part, where stress was worst, sea-surface temperatures peaked at 2.5°C above average. This prolonged heat exposure has caused mass bleaching of coral reef communities observed within all three regions of the Great Barrier Reef. This is the fifth mass bleaching event to occur since 2016 and the seventh mass bleaching event on the GBR since 1998.

Other more local challenges include poor water quality due to land-based pollution, pests such as the coral-eating crown-of-thorns starfish, fishing and coastal development. In response to these threats, several protective measures have been implemented.





*Coral bleaching event on the Great Barrier Reef*  
Source: Great Barrier Reef Foundation

### **Safeguarding a Natural Wonder: Collaborative Efforts for the Great Barrier Reef's Future**

Great Barrier Reef Marine Park Authority (GBRMPA) is responsible for the care and protection of the Great Barrier Reef Marine Park. Since 1975, this Australian government Authority has provided world-leading management of GBR Marine Park. The Reef 2050 Long-Term Sustainability Plan, the Australian and Queensland Governments' overarching framework, emphasizes building partnerships and fostering cooperation across various groups.



Great Barrier Reef Marine park Authority (GBRMPA) is responsible for the care and protection of the Great Barrier Reef Marine Park.



At the global level, United Nations Environment Programme (UNEP) also supports Global Coral Reef Monitoring Network (GCRMN), which monitors the health of coral reefs worldwide, including the Great Barrier Reef. The data collected helps inform conservation strategies and policy decisions. Building on current conservation efforts.

However, preserving GBR necessitates a deepened commitment to innovative strategies and international collaboration to address both existing and emerging threats. Great Barrier Reef's survival hinges on our collective actions to mitigate climate change, improve water quality, enforce sustainable practices, and foster international collaboration.



**The Great Barrier Reef, one Of the most magnificent natural wonders Of the world, faces unprecedented threats from coral bleaching. Only by embracing innovative solutions and steadfast stewardship, we can ensure this vibrant underwater wonder continues to flourish for generations to come. Let's protect our planet's most stunning masterpiece, one coral at a time.**



# Coral reefs: Attacks by Invasive Alien Species



*Lionfish have an enormous appetite, so they feed constantly on small fish that graze the corals.*

While most of us have probably heard or sung “Ek dal par tota bole, ek dal par myna” song, only a select few may be familiar with the story of the Myna invasions. In 2000, the World Conservation Union (IUCN) placed mynas on its list of 100 most harmful invasive species, making it one of just three birds on that list.

## **What are Invasive Alien Species?**

Invasive Alien Species are species that pose a threat to biological diversity due to their introduction and/or spread outside of their natural distribution. For an alien species to become invasive, it must arrive, survive and thrive. One in ten species in IUCN red list is threatened by Invasive Alien Species.

Common characteristics of Invasive Alien Species include rapid reproduction and growth, high dispersal ability, and

ability to survive on various food types and in a wide range of environmental conditions. These species have effected each and every biodiversity from terrestrial to wetland to Coral reefs.

## **How do Invasive Alien Species impact coral reefs?**

Coral reefs are in grave danger of extinction, experts predict that 90% of them will disappear by 2050. While climate change is the most immediate concern, new research has identified numerous additional threats, including overfishing, trawling, and invasive species. Invasive species are second only to habitat modification in causing the extinction of native coral species and change due to them is less reversible than other dangers like climate change.

## **What are the common Invasive Alien Species for coral reefs?**

Invasive Alien Species are introduced through two methods. One is biological method of transferring species such as an organism carrying a disease and transferring it directly to another. Second is the non-biological methods

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One in ten species in IUCN red list is  
threatened by Invasive Alien Species



of movement. This includes winds, hurricanes, and ocean currents, and even transportation via cargo ships.



*Invasive species that attacks corals*

One invasive species that has made its way to coral reefs in the Western Atlantic and Caribbean is the Indo-Pacific lionfish. The native fish populations in these areas have declined significantly as lionfish numbers have grown due to the lack of natural predators. They change the dynamics of the entire food chain with their fast reproductive rates and huge appetites.

Another invasive species of concern is the Northern Pacific Seastar. They have highly regenerative reproductive rates.

In fact, 12 million Seastars were reported in the space of two-years in Australia's Port Phillip Bay. They damage the reefs by feeding and depleting shellfish populations, thereby disrupting the natural ecosystem.



**Invasive Alien Species are through biological and introduced non-biological methods.**



### **What can be done to save corals from Invasive Alien Species?**

Florida has just implemented the 'Lionfish Challenge', a programme that rewards divers and fishermen for capturing lionfish invading coastal waters. Prizes are given based on the quantity of fish gathered. Although this may only have a limited impact on the extensive population until alternative approaches are created, it is a beginning.

Global cooperation is needed to protect the rainforest of the ocean, coral reefs. It is imperative to implement comprehensive management strategies, including early detection and rapid response systems and stricter regulations on species importation. We can also ensure their protection by choosing sustainable sea food. These small steps can bring a positive change in coral reef protection.



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**The invasion of non-native species poses a significant and growing threat to coral reef ecosystems worldwide. By addressing the issue of invasive species with urgency and dedication, we can help preserve the biodiversity and ecological integrity of coral reefs for future generations.**

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# 5 Tech Hacks for Coral Reefs Restoration

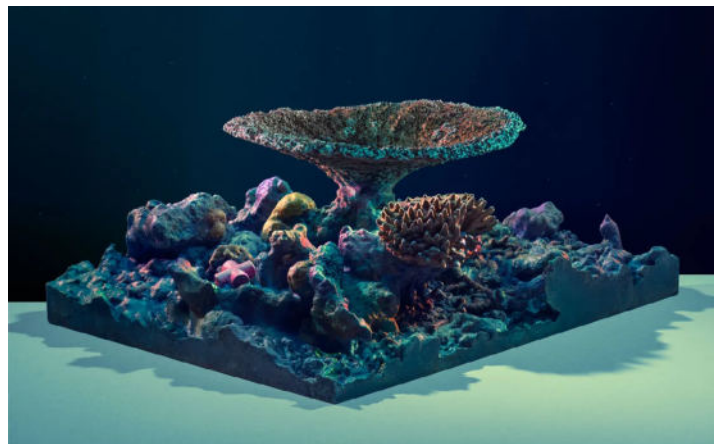


*Technological innovations can play a key role in conserving coral reefs*

From high-tech monitoring to cutting-edge restoration techniques, the latest technological revolution offers a glimmer of hope for the future of coral reefs. Let's explore the 5 technologies that have been used by researchers and scientists to revive the coral reef.

## 1. 3D Mapping: Unveiling the Reef in Three Dimensions

3D mapping technology uses underwater cameras to capture high-resolution images of coral reefs using Structure from Motion (SfM). The software analyzes overlapping features within each image, determining the camera's position and orientation. It generates point clouds, creating millions of data points for each captured feature. This model offers a detailed representation of the reef's topography, including crevices, ledges, and overhangs that provide habitat for marine life. It allows scientists to track changes in reef structure over time, identifying areas of coral bleaching or damage, enabling early intervention and targeted conservation efforts.



*Source: The Hydrous*



## 2. Biorock Technology

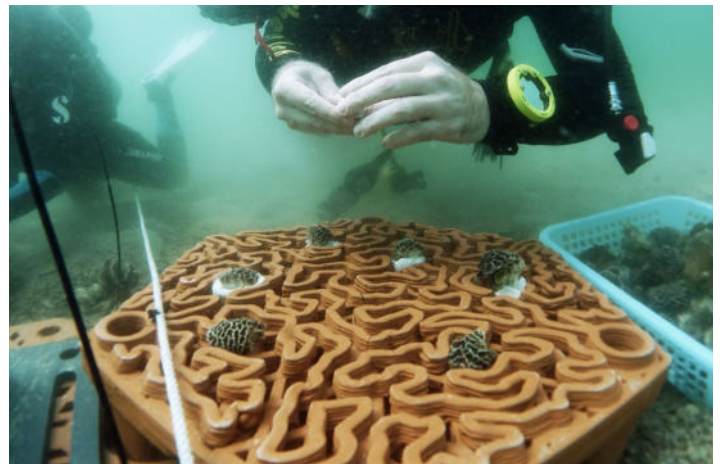
Biorock utilises a low-voltage direct current passed through a submerged steel structure. This electrical current interacts with the minerals within the seawater, facilitating the formation of a solid limestone base. This limestone bears a close resemblance to the natural building blocks that constitute coral reefs. Biorock technology offers a promising solution for the restoration of coral reefs. The low-voltage current serves to accelerate the natural processes of coral growth, significantly improving the coral's chance of survival. Studies have demonstrated that coral transplanted to biorock structures exhibits a 50% increase in survival rates.



Source: *KntaArchitects*

## 3. 3D Printing of Corals

3D printing technology allows for the creation of intricate structures that mimic the natural composition of coral reefs. These “artificial reefs” can replenish depleted coral populations and potentially exhibit enhanced resilience against climate change and environmental stressors. They also serve as self-sustaining ecosystems, providing habitats for marine life. Traditional methods often lack resemblance to natural reefs, but 3D printing technology can replicate the intricate features of natural coral, including tiny crevices and openings that provide shelter for fish and other inhabitants. Additionally, 3D-printed structures can be designed to optimize light and shadow patterns, enhancing predator evasion.



Source: *Reefcause Conservation*

## 4. Underwater robots: Robotic Plankton

Researchers at Scripps Institution of Oceanography at the University of California San Diego have developed underwater robots to study ocean currents and creatures. The robots, equipped with temperature and other sensors, can measure ocean conditions by swimming up and down or maintaining a constant depth. The robots were used to test theories behind how plankton form dense patches under the ocean surface, leading them to rise to the surface as red tides. The robots are made inexpensively and can be tracked continuously underwater, allowing them to be used as a small army and deployed in a swarm. The low-cost robots with cameras could allow for photographic mapping of corals, identifying problems and seeing the effects of coral bleaching in almost real-time.



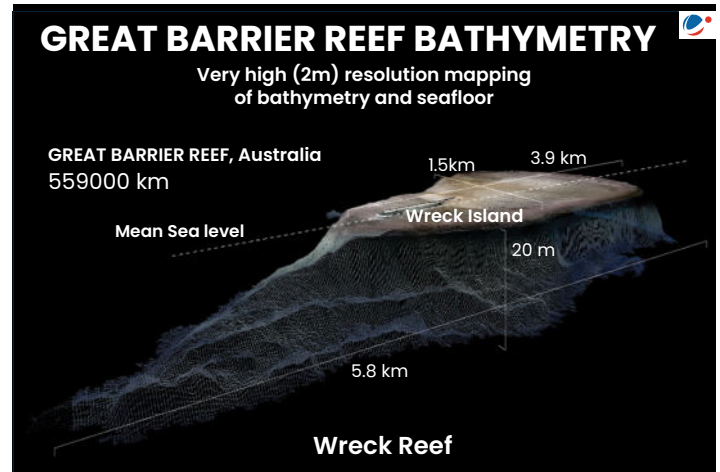
Source: *Australia Institute of Marine Science*



## 5. Bathymetry: Delving into the Depths

Bathymetry focuses on measuring the underwater topography, essentially mapping the variations in depth across the reef system. This information is analogous to charting the underwater hills and valleys, providing a crucial understanding of the overall structure of the reef environment. The resulting data can reveal crucial details about the reef's foundation. For instance, bathymetric maps can identify underwater ridges, canyons, and slopes that contribute to the overall structure and complexity of the reef system. These variations in depth can influence factors like water flow, nutrient availability, and light penetration, all of which play a vital role in the health and distribution of coral life.

This range of technological approaches shows great promise. By using the power of advanced robotics, imaging, mapping, and manufacturing capabilities, scientists and conservationists can gain new insights and develop targeted interventions to revitalize coral reefs globally. Though immense work remains, the coral revival effort is being recharged by rapidly evolving technologies deployed in imaginative new ways. With perseverance and innovation, we may yet save these underwater rainforests for future generations.



Source: EOMAP

**A wide range of modern tools, ranging from underwater robotic monitoring equipment to 3D printing capabilities for reef restoration, equips scientists and conservation specialists with a formidable solution.**



# Snapshot

To a layman, coral reefs may look like a bunch of rocks, but they are actually extremely complex ecosystems of plants and animals. In fact, Corals support 25% of all marine life. Do you know? With just 1% of the world's coral reef area (5790 km<sup>2</sup>) in its territory, all major reef types can be found in Indian waters.



## Magnificent Coral Reefs in India

### Geographical Distribution of coral Reefs

Coral reefs are primarily found in **Gulf of Kutch** in North-West and Gulf of Mannar in the South-East. West coast of India between Bombay and Goa is reported to have submerged banks with isolated coral formations.



#### Gulf of Kutch

- ▶ Situated on northwestern coast of India in the Arabian sea. Reefs here are primarily fringing reefs
- ▶ Notable sites: Narara Island, Pirotan Island, and Positra



#### Gulf of Mannar

- ▶ Located between southeastern tip of India and west coast of Sri Lanka.
- ▶ This region is known for its fringing reefs and patch reefs, particularly around 21 islands forming Gulf of Mannar Marine National Park.
- ▶ Notable sites: Pamban Island, Kurusadai Island, and Shingle Island.



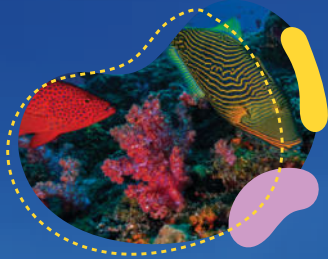


### Andaman and Nicobar Islands

Located in the Bay of Bengal, these islands host the most extensive and diverse coral reefs in India.

The reefs here include fringing reefs, barrier reefs, and atolls, supporting a wide variety of marine life.

Notable sites: Ritchie's Archipelago, North Reef Island, and South Button Island.

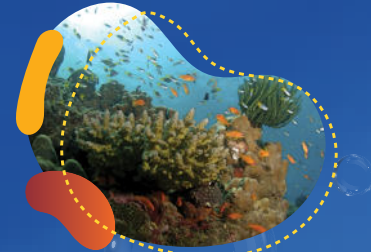


### Other Regions:

- Malvan (Maharashtra): Known for the small but ecologically significant reefs in the Malvan Marine Sanctuary.
- Netrani Island (Karnataka): Features fringing reefs around the island, known for its diverse marine life.

### Lakshadweep Islands:

- Situated in the Arabian Sea, this group of 36 atolls and coral islands is known for its well-developed atoll formations.
- The coral reefs here are characterized by clear waters and high biodiversity.
- Notable sites: Agatti Island, Bangaram Island, and Kadmat Island.



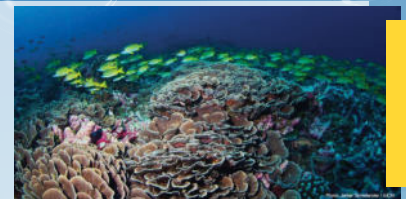
However, these precious corals have been facing threats increasingly with the advent of extreme impacts of climate change.

The Central Marine Fisheries Research Institute recently recorded a widespread bleaching event impacting the coral reefs in the Lakshadweep Sea.



### Conservation in India

For conservation of Corals, regulatory measures have been implemented through Coastal Regulation Zone (CRZ) Notification 2019 under Environment (Protection) Act, 1986. Also, several of the coral species, including Fire Coral, Organ Pipe Coral, Soft Corals, Stony Coral, Soft Corals, etc. are accorded highest protection under the Schedule I of the Wildlife (Protection) Act, 1972.



## India

### Ministry established an Eco-Sensitive Zone (ESZ) around Sukhna Wildlife Sanctuary

The Union Ministry of Environment, Forest and Climate Change (MoEFCC) has proposed an eco-sensitive zone (ESZ) around Sukhna Wildlife Sanctuary in Haryana, extending from 1 km to 2.035 km. The sanctuary, which spans 25.98 square km and is managed by Chandigarh, is located in the Shivalik foothills and hosts endangered species like leopards and Indian pangolins. This decision rejects the Haryana government's proposal for a 1,000-meter ESZ. The proposed ESZ would affect 10 Haryana villages, including Prempura and Sukhomajri.

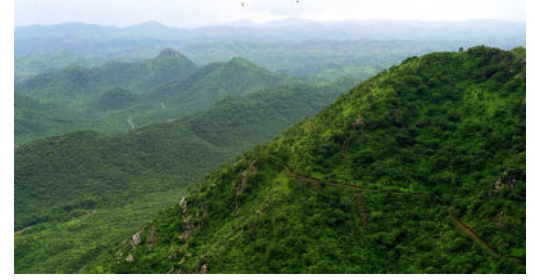


Sukhna Wildlife Sanctuary  
Source: Chandigarh Tourism

ESZs are ecologically important and fragile areas around protected areas designated under the Environment Protection Act (EPA), 1986. These areas act as transition zones and create a kind of shock absorber around protected areas. Activities in the ESZ are generally regulated and not prohibitory in nature, barring a few such as commercial mining, stone quarrying and crushing units, major hydroelectric projects, handling of hazardous substances, and discharge of untreated effluents.

### Supreme Court Declares Forests a National Asset, Advocates Ecocentric Approach

The Indian Supreme Court has declared forests as a national asset and a major contributor to the nation's financial wealth, emphasizing an ecocentric approach over an anthropocentric one. The shift focuses on nature's needs rather than human demands, recognizing humans as part of the broader ecological system.



*The nation behaves well if it treats the natural resources as assets which it must turn over to the next generation increased; and not impaired in value.*

- Theodore Roosevelt

Additionally, the court stated that a nation's wealth, including its environmental assets, might be evaluated using the notion of "Green Accounting," which would bring about significant tangible and intangible benefits. Forests can contribute significantly to financial wealth through carbon credits, with a potential worth of \$120 billion for 24,000 mt of carbon dioxide (CO<sub>2</sub>). They play a crucial role in climate change mitigation, with rising temperatures and changing monsoon patterns potentially costing India 2.8% of its GDP. The judgment references key cases underscoring environmental protection, such as M.C. Mehta v. Kamal Nath (2000) and Municipal Corporation of Greater Mumbai v. Ankita Sinha (2022).

### 1st First Synchronised Census launched by Tamil Nadu and Kerala

The Tamil Nadu Forest Department, in collaboration with the Kerala Forest Department, Wildlife Institute of India, WWF-India, and IUCN, has launched the first synchronised estimation of the endangered Nilgiri Tahr. The three-day survey, which began on April 29, 2024, will cover tahr habitats in Tamil Nadu and



Nilgiri Tahr resting atop a mountain  
Source: WWF India



Kerala, including the Eravikulam and Silent Valley National Parks. The survey will cover 13 forest divisions, 100 forest beats, and 140 blocks in Tamil Nadu, aiming to gather baseline data for the conservation and management of the Nilgiri Tahr population in the Western Ghats.

Nilgiri Tahr is a flagship species and finds protection under the Species Recovery Programme of the Government of India. Once common across the whole Western Ghats, the Nilgiri tahr is now restricted to a few isolated areas. The Eravikulam National Park in Anamalai hills, Kerala, is home to the largest population of the Nilgiri tahr.

### Updated guidelines for the Green Credit Programme (GCP)



New guidelines highlight the need for efforts in the direction of eco-restoration of degraded forests

The Ministry of Environment, Forests and Climate Change has released new guidelines for the Green Credit Programme (GCP), focusing on the eco-restoration of degraded forests. The guidelines have been released in addition to the rules for calculating green credit for tree plantations notified in February 2024.

The guidelines clarified that activities for eco-restoration will not be limited to the plantation of trees but also include other activities like shrub planting, herb planting, grass planting, soil and moisture conservation, terracing, and rainwater harvesting. The guidelines also emphasize the importance of planting indigenous species and high-quality seedlings for healthy growth.

### Invasive Chital Deer Create Ecological and Financial Strain on Andaman Island

The chital, introduced by the British in the early 1900s for hunting, has become an invasive species in the Andaman

and Nicobar Islands, causing significant ecological and financial challenges. The population surges, causing depleted ground vegetation and a monthly expenditure of Rs 15-20 lakh to feed around 500 chital.



Chital Deer in Andaman Island  
Source: Biodiversity India

The Andaman and Nicobar Forest Department has consulted the Wildlife Institute of India (WII) for safe translocation strategies, including a “passive Boma capture technique” using funnel-like fencing. Studies show that chital’s presence reduces understory vegetation density and diversity, negatively impacting native species like forest floor and semi-arboreal lizards. Effective management and rehabilitation efforts are crucial for restoring the island’s ecological balance.

### New “Butterfly Cicada” Species found in Meghalaya



*Becquartina bicolor*  
Source: The Shillong Times

A new species of cicada, named “Butterfly Cicada” due to its vibrant wings, has been discovered in Meghalaya, India. The species, *Becquartina bicolor*, has two distinct colour forms and seven species. It was first discovered in Balpakram National Park in 2017 and Nongkhrah community forest in 2020. This discovery underscores the importance of preserving cicada habitats in protected areas and community forests as these unique insects add to the biodiversity and ecological value of their environments.



# Global

## CTCN's 10th Anniversary of Climate Technology and Innovation

The Climate Technology Centre and Network (CTCN) celebrated its 10th anniversary in Copenhagen, marking a decade of significant work in climate technology and innovation. With over 300 technical assistance projects funded across 112 developing countries, the CTCN has helped them meet sustainable development goals under the Paris Agreement. A report detailing CTCN's efforts, including green building standards in Zimbabwe, drought risk modelling in Saint Kitts and Nevis, and flood management designs in Burundi, was released to commemorate the anniversary.



### CTCN celebrated 10th Anniversary of Climate Tech Innovation

As the implementation arm of the United Nations Framework Convention on Climate Change's Climate Change Technology Mechanism, the CTCN aims to accelerate the development and transfer of environmentally sound technologies for low-carbon and climate-resilient development.

### Tundra's Carbon Shift from Carbon Sink to Source

A study titled 'Environmental drivers of increased ecosystem respiration in a warming tundra' was conducted by 70 scientists who used open-top chambers (OTCs) at 28 global tundra sites, arctic and alpine tundra sites, for 25 years to simulate increased temperatures. In field trials, open-top chambers passively raise air temperatures to mimic global warming. The study found that rising global temperatures can cause the tundra to release carbon, potentially worsening climate change. The increase in air temperature and soil temperature, along with a decrease in soil moisture, leads to a 30% increase in ecosystem



*With increasing temperatures, Tundra regions may lose their ability to act as Carbon sinks*

respiration during the growing season. This is linked to increased metabolic activity in soil organisms and plants. The tundra's response to warming varies across regions, with areas like Siberia and Canada showing greater sensitivity.

A key carbon sink, the tundra is experiencing dramatic transformations as a result of global warming. Despite their long-standing reputation as carbon sinks, these expansive, icy landscapes are now leaking carbon into the atmosphere, which could hasten global warming. Understanding these dynamics can be crucial for effectively managing climate change.

### WMO Labels Asia as 'Global Disaster Capital'

Two recent reports by the World Meteorological Organization (WMO) have highlighted the G7 countries' failure to meet emission reduction goals and Asia's designation as the "Global Disaster Capital." The report also highlighted that the G7 countries are only halfway to achieving the 1.5°C target set by the 2015 Paris Agreement for greenhouse gas reductions by 2030.



*Asia was the world's most disaster-prone region*

The report urges G7 countries to phase out coal and fossil fuels, triple renewable energy, and improve climate finance for vulnerable nations. Asia is also deemed a

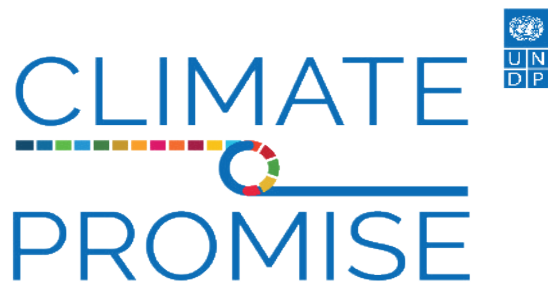




disaster capital due to increased disaster incidence due to climate change. Experts call for stronger ministerial collaboration and localized climate adaptation strategies.

## UNDP Launches Climate Promise 2025 to Bolster Developing Countries' Climate Action

The UN Development Programme (UNDP) has launched Climate Promise 2025, a new phase of its flagship initiative to support developing countries' climate action. Launched by UN Secretary-General António Guterres and UNDP Administrator Achim Steiner, the initiative aims to help these nations enhance their Nationally Determined Contributions (NDCs) under the Paris Agreement, aiming to limit global temperature rise to 1.5 degrees Celsius.



Climate Promise 2023 by UNDP  
Source: UNDP

The initiative leverages UNDP's Climate Hub, which integrates expertise in gender equality, energy, poverty, health, climate security, and biodiversity. The initiative continues UNDP's support for over 125 developing countries as they prepare for the 2025 cycle of NDCs, crucial for achieving climate goals by the COP30 negotiations in Brazil.

## Saudi Arabia and UNEP Launch Campaigns Ahead of World Environment Day

Saudi Arabia and the United Nations Environment Programme (UNEP) have launched campaigns to combat desertification, restore degraded lands, and build drought resilience ahead of World Environment Day (WED) 2024. The campaigns will highlight Saudi Arabia's regional and global leadership in land restoration and climate change mitigation. The UNEP Deputy Executive Director, Elizabeth Mrema, emphasized the urgency of preventing, halting, and reversing ecosystem degradation.

Saudi Arabia's commitments include leading the G20 Global Land Initiative and hosting the largest UN conference on land and drought, COP16, in December 2024. World Environment Day 2024 aligns with the UN Decade on Ecosystem Restoration, aiming to restore one billion hectares of land and protect 30% of land and sea by 2030.

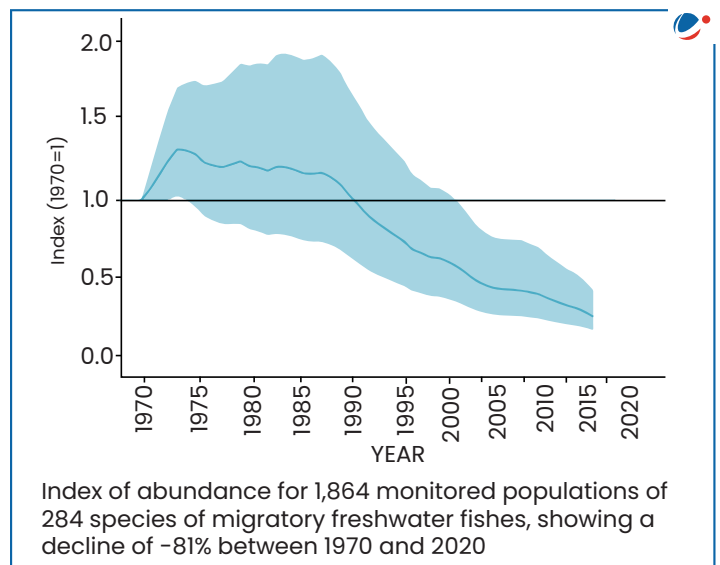


World Environment Day 2024 campaign and Saudi Environment Week launched  
Source: UNEP

## Migration Fish Populations Collapse Threatens Freshwater Ecosystems

The 2024 Living Planet Index (LPI) update for Migratory Freshwater Fishes reported an 81% decline in migratory freshwater fish populations since 1970, with the most severe declines in Latin America, the Caribbean, and Europe. The report was funded by The Nature Conservancy, WWF, World Fish Migration Foundation and Wetlands International.

The decline is attributed to habitat loss, dam fragmentation, agricultural conversion, over-exploitation, pollution, and climate change. Migratory fish species are crucial for food security and livelihoods, especially in Asia, Africa, and Latin America. However, nearly one-third of monitored species have seen population increases due to improved management and conservation efforts. The report calls for urgent action to protect free-flowing rivers and scale up efforts like the Freshwater Challenge.



Index of abundance for 1,864 monitored populations of 284 species of migratory freshwater fishes, showing a decline of -81% between 1970 and 2020

# Snapshot

## Nature's Electrical Fury:

### Witnessing Volcanic lightning

Indonesia's Mount Ruang recently erupted, creating a spectacle both awe-inspiring and terrifying. The eruption triggered volcanic lightning, causing the sky to take on an almost otherworldly, even Mordor-like, appearance.



#### Science behind volcanic lightning

Like ordinary lightning, volcanic lightning is an electric burst. But, unlike normal lightning, it's not produced by storm clouds. Rather, it results from the friction between ash particles and volcanic gases erupting from a volcano during an eruption. A bolt of lightning discharges within the ash cloud when the accumulation is powerful enough to give it a flickering glow. This is why volcanic lightning is sometimes called "dirty thunderstorm" lightning.

Inductive Charging  
(requires pre-existing electric field)

Fragmentation level

Fractoelectrification



radon decay

emission of electrons, ions, and photons

Plume Lightning

Fragmentation level

# When Mountains Light Up

## Example of lightning volcanoes lighting



**Hunga  
Tonga-Hunga  
Ha'apai  
volcano in  
Tonga in 2022**



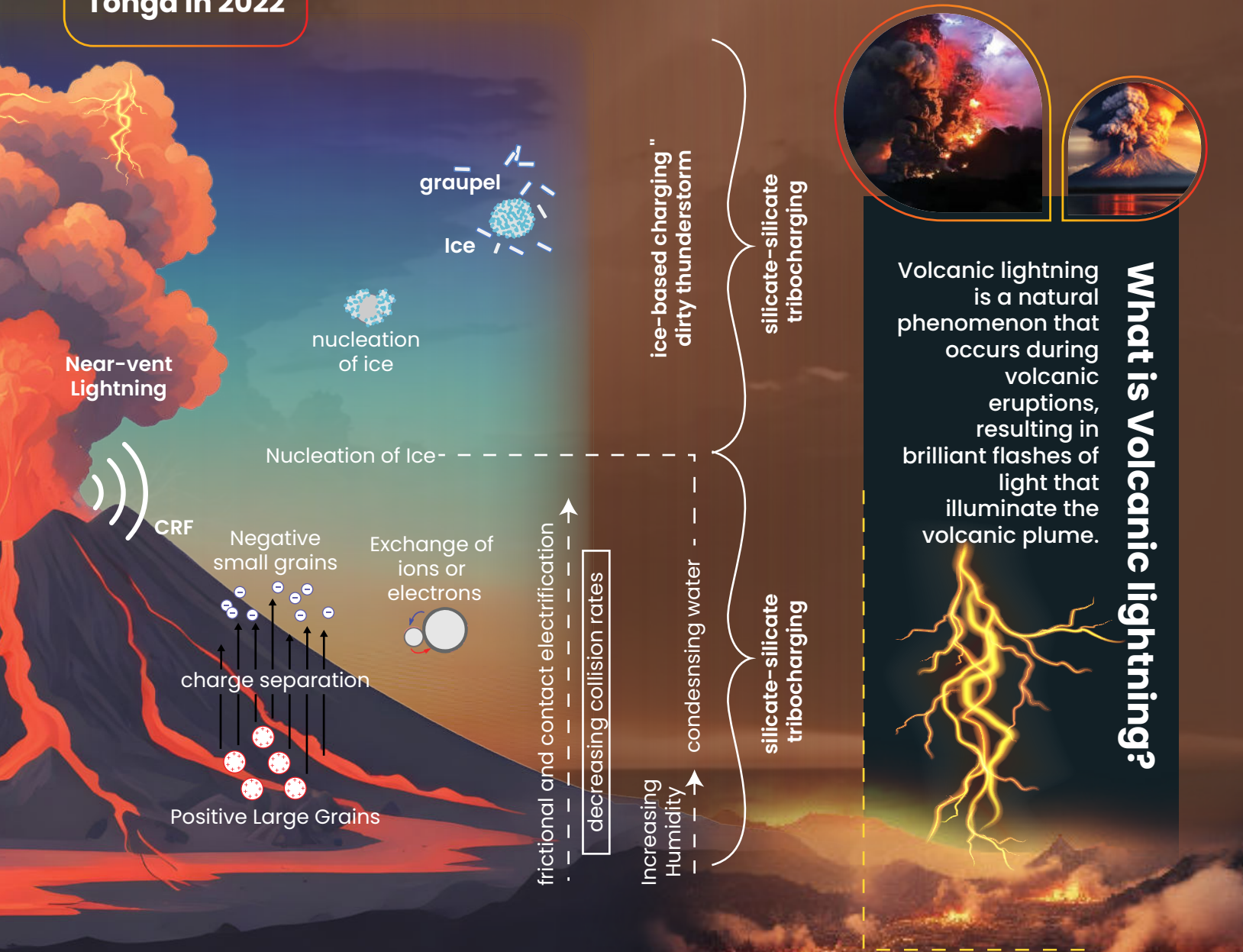
**Japan's  
Sakurajima  
volcano in 2016**



**Volcàn de Fuego,  
Guatemala in  
2024**



**Calbuco  
volcano in  
Chile in 2020**



### Chenchu Tribe: Children of the Forest

The Chenchu tribe, one of the aboriginal tribes of India, is mainly concentrated in the Nallamala Hills in the Eastern Ghats. Their habitat is a part of Nagarajunasagar Srisailem Tiger Reserve (NSTR). Today, this region is renowned for its diverse flora and fauna, however, the scenario was not the same many years ago. During the time of Naxalism, the forest ecosystem suffered major losses as the forest department had faced difficulties in maintaining the region as most of the areas were under the control of Maoists. Also, large-scale illegal smuggling of forest products including bamboo, timber, and hunting for bushmeat has affected the pristine ecosystem of the region.

The Chenchu Tribe has played an incredible role in reviving the ecosystem in the region by providing their support to the forest department. The Chenchu have developed a symbiotic relationship with forests over the period, which has helped them coexist with wildlife. Their sustainable lifestyle has ensured that habitat is not destroyed beyond a point and also the major carnivores have never been the target of hunting.

The forest department has employed them as protection watchers in the base camps. Their knowledge of forests and wildlife is key for managing the unusually large tiger reserve. They also keep an eye on the outsiders' movement in the tiger reserve. Collaboration has proved to be fruitful for both conservation and the Chenchu.

With their knowledge of every naturally occurring landmark in the forest (like water bodies), the forest department has developed GIS-based maps of the forest's wildlife corridors and conservation hotspots. They are also involved as Swatch Sevaks, also referred to as Green Warriors. They pick up the plastic or other non-biodegradable material discarded by the tourists on the State and National Highways that crisscross the Nallamala Reserve Forest, thus limiting the spread of plastic in forests.



Members of Chenchu Tribe Keeping eye on the forest

### Project Cheer – Urja- Fostering Green Energy

An environmental sustainability initiative “Project Cheer – Urja” has been launched in a village of Mandi district (Himachal Pradesh) by Canara HSBC Life Insurance, in collaboration with Ashray Foundation. Being an insurance company it provides insurance services to the people. However, this initiative will provide long term insurance against the climate change without paying hefty premium.

Under this project, the foundation has initiated production of green energy from pine needles in the form of briquettes – a biofuel. The technical support to the project will be provided by IIT Mandi. It is one of the major efforts in the region toward green energy solutions. In the long run, it will address multiple socio-environmental challenges simultaneously by harnessing the potential of pine needles.

The key stakeholders in the implementation projects include local community women and self-help groups. Their true potential can be provided through decision-making and eco-friendly product training,



Launch of the Project Cheer – Urja  
Source: The CSR Journal



# Nagar Van Yojana- Afforesting Concrete Forest

The green space in the city has been engulfed by reckless urbanisation, a key driver of our modern civilisation. To turn our cities again into paradise where we can live, an ambitious initiative “Nagar Van Yojana” was launched in the year 2020. It has been initiated by the Ministry of Environment, Forest and Climate Change. It envisages creating 1000 Nagar Van / Nagar Vatika in Cities having Municipal Corporations/ Municipal council/Municipality/Urban Local Bodies (ULB). It will contribute to the environmental improvement of cities by pollution mitigation, providing cleaner air, noise reduction, water harvesting, and reduction of heat islands effect.



*Urban Forest in state of Maharashtra*

The scheme is designed to actively engage residents and different agencies in developing bio-diverse forests for social and environmental benefits in an urban landscape. It will supplement other initiatives of the government such as the National Mission for a Green India (GIM). It will create awareness about plants and biodiversity and develop environmental stewardship. In-situ conservation of important flora of the region will be facilitated by it.



## Hydrogels Take on Microplastic Pollution



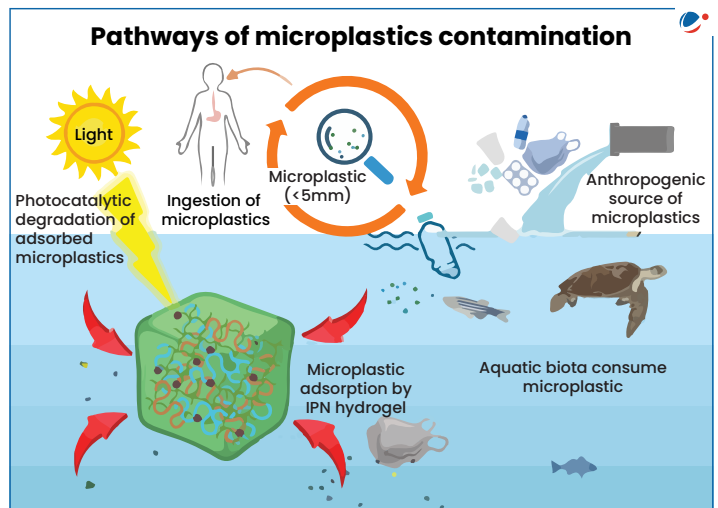
*These Tiny Particles of Plastic pose a major threat to humans and marine organisms.*

Microplastics are small pieces of plastics, usually smaller than a grain of rice, spreading everywhere! They have been found everywhere from the deepest oceans to the highest mountains in the world. They have infiltrated the bloodstreams and organs of humans, causing heart issues and hormonal imbalances. When ingested by birds, fish etc., microplastics lead to suffocation and genetic alteration. Thus, microplastic poses an existential threat to life on the earth. But no worries, researchers at the Indian Institute of Science (IISc) have created a surprising weapon against tiny plastic invaders in our water: a super sponge they call a hydrogel! This eco-friendly material can trap microplastics and even break them down, offering a ray of hope for cleaner oceans and rivers.

### How does the Hydrogel remove Microplastics from Water?

The sustainable hydrogel designed by the researchers has a unique intertwined polymer network that can bind contaminants and degrade them using UV light irradiation. The novel hydrogel developed by the team comprises three different polymer layers intertwined together. This

combination is mixed with a nanomaterial called copper substitute polyoxometalate (Cu-POM), which acts as a catalyst that can use UV light to degrade microplastics. This resulted in a robust hydrogel capable of adsorbing



*Addressing microplastic contamination in water with engineered 3D Hydrogel*

Source: Indian Institute of Science

and degrading large quantities of microplastics.

### How efficient is it?

The hydrogel performed a great job of filtering out microplastics from water. It could remove around 95% and 93% of two different kinds of microplastics when the water had a pH close to neutral (around 6.5). The researchers did many experiments to check how strong and long-lasting the material was. They found that combining the three polymers made the hydrogel work well at different temperatures.

### What lies ahead?

The hydrogel can effectively remove microplastics for up to five cycles without significantly losing its ability to work. After its lifecycle hydrogel can be repurposed into carbon nanomaterials that can remove heavy metals like hexavalent chromium from polluted water. In the future, the researchers plan to work with partners to develop a device that can be used on a large scale to help clean up microplastics from different water sources. ■■



# E-Soil: Revolutionizing Agriculture with Sustainable Growth



*E-Soil is a biomimetic approach to provide soilless farming productions of nutrients in mineral forms.  
Source: The Farmer's Journal Africa*

With billions of people depending on agriculture for fuel, food, fibre, and other necessities, it is one of the most significant economic sectors in the world. Despite its importance, the sector faces significant challenges such as land degradation, water scarcity, climate change, and a growing population. To address these issues, it is vital to find ways to increase food production using optimum utilization of resources while protecting the environment and improving overall human well-being.

One such innovative solution is E-Soil, a cutting-edge technology that integrates hydroponics and bioelectronics to boost plant growth and crop yields. Hydroponics involves growing plants without soil, using water and nutrients instead. Bioelectronics, on the other hand, involves using electrical signals to interact with biological systems.

## What is E-Soil?

Developed by researchers at Linköping University in Sweden, E-Soil (short for electronic Soil) is an engineered material designed to mimic the functional properties of traditional soil. It utilizes a polymer electrical conductor

called PEDOT mixed with cellulose biopolymer to enhance plant growth in a soilless environment. This combination results in a porous, flexible material that can retain water and nutrients while conducting electricity. When connected to a low-power source such as a battery or solar panel, E-Soil delivers electrical stimulation to plant roots, enhancing growth and metabolic activity.

## E-Soil's Transformative Benefits

E-soil represents a significant advancement in hydroponics, potentially revolutionizing food production in areas with limited arable land. In experimental trials, barley seedlings grown in e-soil showed a 50% increase in growth rate within 15 days as compared to those grown in mineral wool, a standard hydroponic substrate. This faster seedling development could address food security challenges by enabling quicker and more efficient crop production. Additionally, E-Soil was also found to have improved the plants' nitrogen uptake, which is crucial for protein synthesis and photosynthesis.

Further, E-Soil stands out as a biodegradable and renewable alternative to traditional hydroponic substrates





like mineral wool, which is non-biodegradable and energy-intensive to produce. Also, its efficient design requires less water and nutrients than conventional soil, effectively preventing soil-borne diseases and pests. Moreover, E-Soil's adaptability allows it to be tailored to various crops and conditions, making it ideal for innovative agricultural methods such as vertical farming and urban agriculture, where space is limited but the demand for fresh produce is high.

While E-Soil's potential to revolutionise sustainable agriculture is immense, it is still in the early stages of development and requires further research to fully understand its mechanisms and impacts on various crops and environments. Additionally, E-Soil is not yet widely known or recognized, potentially facing barriers in market access, consumer demand, and certification.

As the world grapples with the dual challenges of food security and environmental sustainability, e-soil offers a beacon of hope. Embracing E-soil could transform our agricultural practices, ensuring a resilient food supply for



*Vertical farming is the practice of growing crops on top of each other, rather than in traditional, horizontal rows.*

future generations. The potential benefits of this innovation are vast, and as research continues, e-soil might just be the key to unlocking a greener, more sustainable future for global agriculture. ■■



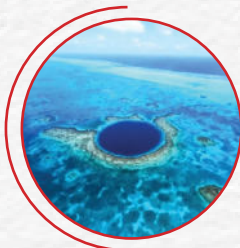
# Global: Quick Hits



## United Kingdom

Scientists found 81 species living under the ocean off the Sussex coast, including an eel and a shark dubbed as tope shark.

PACIFIC OCEAN



## Mexico

Scientists have discovered the world's deepest blue hole, Taam Ja' Blue Hole, in Mexico's Chetumal Bay, 1,380 feet below sea level, potentially containing undiscovered marine life.



## Southern Ocean

The Southern Ocean is renowned for having Earth's purest air, due to its natural sources of fine particles, and fewer industrial chemicals and fossil fuels.



## Peru

Changes in Peruvian forestry laws have allegedly led to accelerated deforestation in the Amazon rainforest, by facilitating the growth of illicit enterprises like mining and logging.

SOUTH ATLANTIC OCEAN



## Lake Kariba, (Cross border lake between Zambia and Zimbabwe)

Lake Kariba's water levels have dropped to 13% due to El Nino-induced drought, a climate pattern characterized by unusual warming of eastern tropical Pacific Ocean surface waters.

SOUTHERN OCEAN



### Mount Etna, Italy

Mount Etna, Europe's largest volcano, is emitting perfect volcanic vortex rings, similar to smoke rings from cigarette smoke.

ARCTIC OCEAN



### Russia

Climate change has led to an increase in the Ural River's water level, affecting over 11,700 Russian residences.



### China

A new species of catfish, named *Liobagrus chenhaojuni* or Chen's catfish, was recently identified in the Tiaoxi River by scientists.



### Cambodia

A recent survey in Cambodia revealed that the mangroves are home to around 700 species of wildlife, providing a unique discovery for biologists.



### Kenya

Intense Tropical storms due to accelerated global warming have led to over 200 deaths with hundreds being relocated, and over 2,000 schools being devastated.



### Zimbabwe

Zimbabwean scientist develops porous materials to capture and convert waste carbon dioxide from factories, aiming to produce energy materials like formic acid and methanol for emerging economies.

# Saving Coral Reefs: One Action at a Time



*Humans trying to revive coral reef*

Did you know that sunscreen, while protecting you from the sun's UV rays, also contributes to coral bleaching? Studies have found that certain chemicals used in sunscreen, such as oxybenzone and octinoxate, can cause coral bleaching.

The impact of sunscreen chemicals is concerning because these products wash off of our bodies when we enter the water. This constant influx, even in small amounts, can accumulate in coral reefs, leading to widespread damage. This situation highlights the interconnectedness of our actions and the environment. Even the products we use for personal care can have unintended consequences for ecosystems far away. This emphasizes the need for us to be more conscious consumers and take responsibility for the impact of our choices.

### How our individual actions can save corals?

While the challenges facing coral reefs are vast, underestimating the power of individual actions would

be a mistake. The collective impact of individuals making conscious choices can ripple outwards, influencing industries and environmental policies that can force the government to make more conscious decisions.



Certain chemical used in sunscreen such as oxybenzone and octinoxate disrupts the vital relationship between corals and algae living within them



### Do you want to assist?

Here are a few easy yet impactful steps you can take to support the preservation of coral reefs and the fish, wildlife, and plants that they support.


It is also important to promote awareness about coral reefs' importance and threats is crucial, including social media sharing, community education, and engaging with friends and family. By adopting practices like using reef-safe sunscreen, reducing our carbon footprint, and supporting sustainable seafood, we can collectively lessen the burden on these fragile ecosystems.

Remember, our individual actions, when combined, have the power to tip the scales in favour of coral reef survival.



# BE A REEF HERO

## Simple Actions to Protect Coral Ecosystems




Look for sunscreens with zinc oxide or titanium dioxide instead of oxybenzone and octinoxate. Many brands today offer reef-safe options!




Plastic pollution poses a significant threat to coral reefs, so it's crucial to recycle, participate in beach clean-ups, and dispose of trash properly to prevent it from reaching the ocean.



Excess fertilizer from lawns can harm coral reefs, so consider alternatives like composting or using less fertilizers.



Walking, biking, or using public transport reduces carbon footprint, reducing ocean acidification and harmful coral damage.



Avoid using products that damage the environment, such as explosives, and bottom trawling methods, which can destroy coral reefs.



When visiting a coral reef, practice safe and responsible diving or snorkelling by avoiding touching the coral and avoiding stirring up sediment.

# Snapshot

## Blue Whales: Ocean's Mighty Titan

Marine researchers have recently discovered over a dozen blue whales in the territorial waters of Seychelles. It is a remarkable milestone as these majestic creatures have been spotted in these warm seas for the first time since 1966.



### True Giants

- ↳ The blue whale, or *Balaenoptera musculus*, is the largest animal that has ever existed on Earth. Even larger than all known dinosaurs!
- ↳ Even the size of a newborn blue whale surpasses that of most adult animals!
- ↳ They can weigh as much as 200 tons (approximately 33 elephants) and grow up to 100 feet!



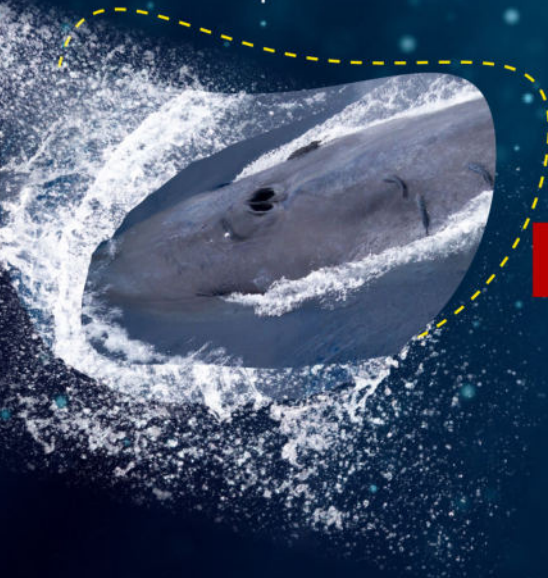
### Singing Giants

- ↳ Blue whales are the loudest animals on the planet, even louder than a jet engine!
- ↳ Their calls can travel for hundreds of miles underwater, a symphony echoing through the ocean depths.
- ↳ Scientists believe these vocalizations might be used for communication and navigation.

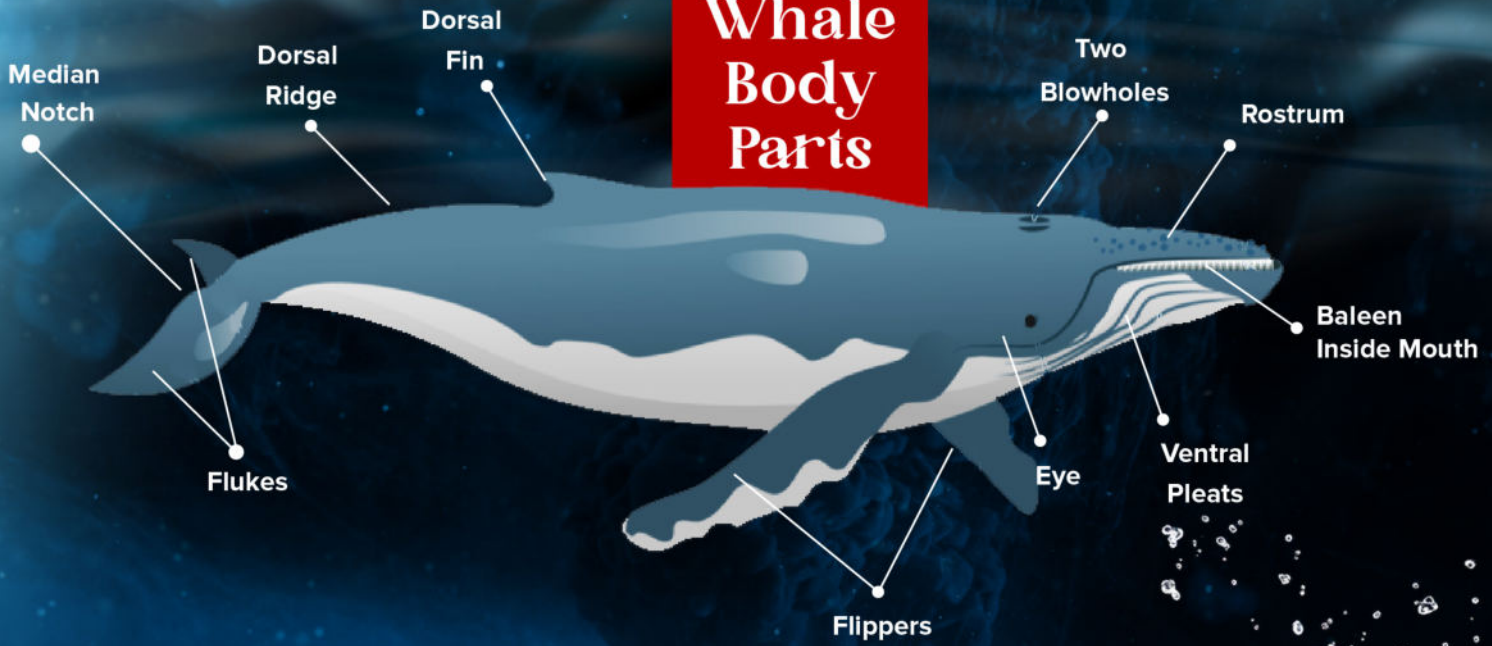


### Amazing Eaters

- ↳ Despite their enormous size, blue whales are filter feeders.
- ↳ Their main course? Tiny shrimp-like creatures called krill. They take massive gulps of water, filtering out the krill with special plates called baleen. The biggest blue whales can consume up to 6 tons of krill in a single day!



# Whale Body Parts



## Global Travelers

- Blue whales are found in all the world's oceans except the Arctic. They are constantly on the move and follow a seasonal migration pattern.
- During the feeding season, they fill up on krill in cold polar waters. They then travel to warmer, tropical waters to mate and give birth.



## Blue Behemoths in Jeopardy

- According to some estimates, there were over 225,000 Antarctic blue whales before their exploitation in the 1900s. They were hunted to almost extinction for their blubber and oil.
- The International Whaling Convention then put a ban on the commercial hunting of whales in 1986.
- Today, they are classified as endangered and face threats from entanglement in fishing gear and alteration in habitats due to climate change and pollution.

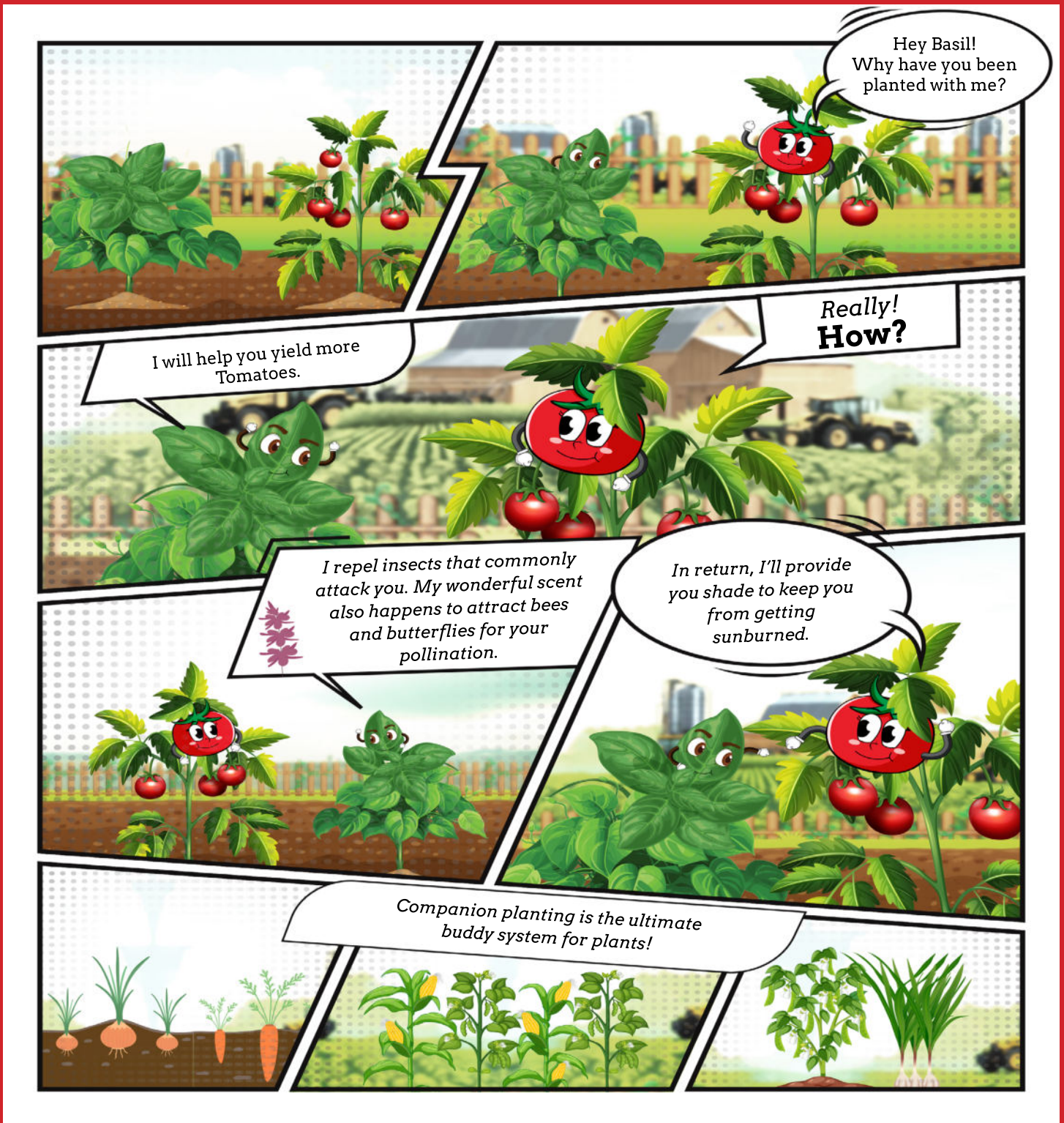


### Do you know?

Whales have recently been legally acknowledged as "legal persons" in a new treaty signed by Pacific Indigenous leaders from the Cook Islands, French Polynesia, Aotearoa (New Zealand), and Tonga. This will give whales the same rights as humans.

# Comic Strip

## Companion Planting Adventures: Growing Together for a Better Harvest!



In recent times, gardeners and farmers have been adopting the companion planting method. This innovative method involves growing different plant species together to create a mutually beneficial relationship. Companion planting not only boosts growth and deters pests, but can also improve soil fertility and enhance flavor through plant partnerships.



# Sustainable Finance for Tiger Landscapes Conference (SFTLC)



Representatives from countries and organisations at SFTLC  
Source: IUCN

In recent times, tiger populations have been stable or increasing in key tiger landscape countries like India, Nepal, Bhutan, Russia and China. However, in some areas, including much of Southeast Asia, tigers are still in crisis and declining in number. Global Tiger Forum data shows that about 5,574 tigers remain in the wild which presents a grim picture of the status of tigers. To supplement the existing efforts, the Sustainable Finance for Tiger Landscapes Conference (SFTLC) was organized to ensure sustainable finance for Tiger Landscape conservation.

### **Sustainable Finance for Tiger Landscapes Conference (SFTLC): Bridging Gap in Finance**

SFTLC was hosted by the Bhutan government and supported by the Tiger Conservation Coalition, an independent group of organisations that have worked extensively together under a common vision for tiger



**Sustainable Finance for Tiger Landscapes Conference (SFTLC) was organized to ensure sustainable finance for Tiger Landscape conservation**



conservation. It is also supported by the World Bank, Green Environment Fund and Global Wildlife Program. It was attended by Bangladesh, Bhutan, Cambodia, China, India, Kazakhstan, Malaysia, Nepal, Thailand and Vietnam.

The SFTLC seeks to increase support for tiger protection and tiger landscape by using new financial strategies and promoting global partnerships as stated in the Paro statement for Tigers that seeks to mobilize US\$1 billion in



additional funding for tiger conservation by 2034. Also, it aims to recognize Tigers as an indicator species and their potential to contribute to national and global biodiversity, climate, human well-being, sustainable development agendas and within global funding mechanisms.


### Sustainable Financing Initiatives in the Conference

Tiger Landscapes Investment Fund was presented by the UNDP. It is a new blended financial mechanism under development that would catalyze nature-positive businesses with positive impacts on tigers, biodiversity, and people.

The Asian Development Bank intends to explore innovative financing instruments, such as a tiger bond, to engage private sector investors and promote nature-based solutions.

### Do you know these things about Tiger?

<p><b>EN</b> IUCN STATUS Endangered</p>	<p><b>HEIGHT</b> 6-10 feet</p>
<p><b>NAME</b> SCIENTIFIC NAME Panthera tigris</p>	<p><b>HABITATS</b> Tropical rainforests, evergreen forests, Temperate forests mangrove swamps, grasslands, and savannas</p>
<p><b>KG</b> WEIGHT 220-660 Pounds</p>	



### How Sustainable Financing will help Tigers?

Sustainable financing for conservation areas means investment decisions are made with environmental and social impacts in mind and the awareness that successful conservation initiatives take time and investment. For tiger habitats, this comprises adequate, long-term investments in tiger conservation by public and private sectors that support clearly defined tiger conservation goals. It ensures that tiger landscapes are climate-resilient and that there are environmental, social and economic benefits for the region and its communities.

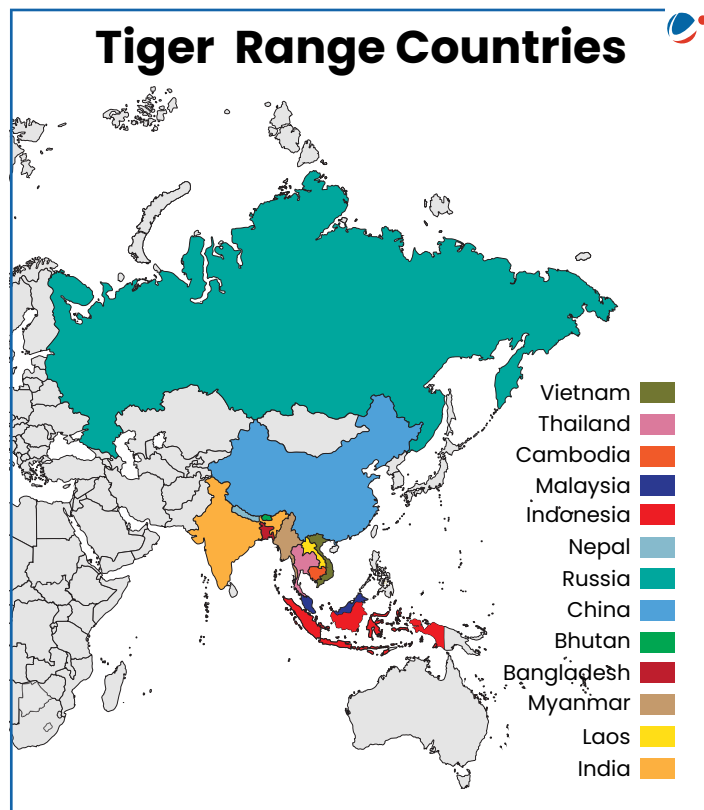
### Why Tiger Landscapes matter?

Tiger Landscape includes large blocks of ecologically connected areas of suitable tiger habitat. The status of their population provides a measurable indicator of the health of the biodiversity dependent on them. As apex predators, tigers regulate prey populations and influence the behavior of other species in the food chain. Protecting large intact forests can help in mitigating the effects of climate change and control the spillover of zoonotic diseases like Ebola. Today, tigers' landscapes comprise less than 8% of the area they originally occupied in Asia.

### Paving Path for the Future

Initiatives like SFTLC will play a key role in facilitating sustainable finances for the Tiger Landscape conservation. All the stakeholders such as states, International organizations, Private players, etc. need to coordinate with each other for the mobilization of funds. Conservation of Tiger Landscapes will not only help in increasing the Tigers population but it will also transform the overall ecosystem.

“ Today, tigers' landscapes comprise less than 8% of the area they originally occupied in Asia. ”



# The Environment and Our Fundamental Rights



People protesting to protect the planet

Source: UN human rights Council

Recently, four women filed a case against Swiss government's inadequate measures to combat climate change, particularly it failed to protect its citizens' health from risks associated with excessive heat.

The Court ruled that Switzerland had failed to comply with its duties concerning climate change and that it had violated the right to respect for private and family life. It is the first time the powerful court has ruled on global warming. In India, the Supreme Court has also been active at this front.

## Supreme court on environment and rights

Recently, Supreme Court (SC) recognised that right to be free from the adverse effects of climate change, should be recognised by Articles 14 and 21 of the Constitution. Articles 14 and 21 of the Constitution guarantee the fundamental rights to equality and life respectively. In the judgement, Supreme Court modified its earlier ruling to place a blanket

direction for undergrounding high voltage and low voltage power lines in Great Indian Bustard habitat.

In other judgements as well, the SC has strengthened the rights regarding environment. In Rural Litigation and Entitlement Kendra vs. State, it recognised the right to



Articles 14 and 21 of the Constitution guarantee the fundamental rights to equality and life respectively.



live in a healthy environment as part of Article 21 of the Constitution. Similarly, In M.C. Mehta vs. Union of India case, the SC treated the right to live in pollution free environment as a part of fundamental right to life under Article 21 of the Constitution. However, enforcing these rights has been challenging.





*Great Indian Bustard*

### Roadblocks in implementation

Firstly, it is difficult to determine the exact source of pollution as the actions that cause pollution are interrelated, making it difficult to determine the particular origins. Furthermore, there is also a contradiction between development and environmental conservation, as infrastructure projects clash with the environment and environmental regulations.

Overburdened courts take too long to resolve environmental disputes and lawsuits, which in turn slows down enforcement and compliance. Lastly, the State

Pollution Control Boards and other regulatory bodies face significant challenges in ensuring compliance monitoring owing to insufficient funding, antiquated machinery, and poor infrastructure. These issues call for proactive efforts from the governmental agencies.



State Pollution Control Boards and other regulatory bodies face significant challenges in ensuring compliance monitoring.



### Path to Improvement

The government can reduce the delays preventing effective implementation by setting up more distinct mechanisms, such as the National Green Tribunal. As environmental issues do not respect national borders, focus should be on international cooperation with the Paris Agreement and other international commitments being upheld in letter and spirit.

There should be overarching legislation concerning climate change and related issues as suggested by SC. Lastly, Government can focus on strengthening institutional capacity by allocating adequate financial resources and investing in capacity building of environmental agencies.



*Air pollution from industries*

# The Grand History of Environmental Movements in India



*Women hugging trees to protect them from cutting.*

In 1730, the Maharaja of Jodhpur planned to build a new palace and needed wood for it. To obtain this, his troops proceeded to the area surrounding the town of Jalnadi for trees. When Amrita Devi saw this, she raced out to stop them and hugged the first tree, but the axe fell on her and killed her on the spot. Before dying, she stated the couplet, 'A cut head is cheaper than a felled tree'.

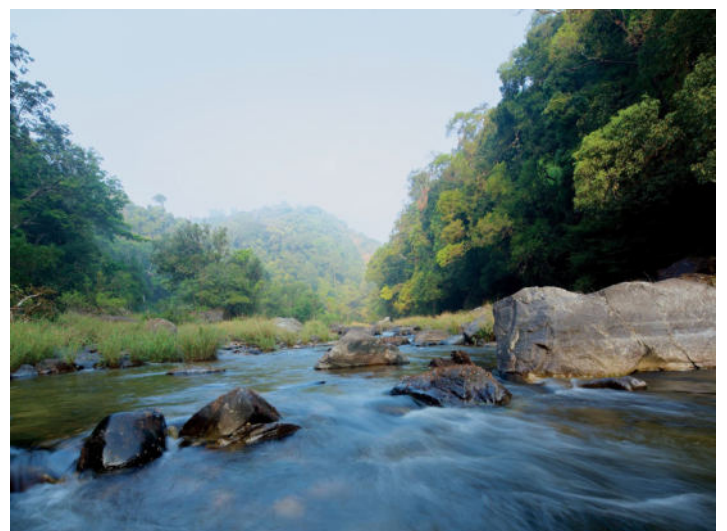
environment. Such movements have deep roots in Indian tradition. In Indian cultural ethos, the ethnic practices of worshipping plants, trees, forests, and rivers, express the wisdom of seeing unity in the living and non-living worlds.

## What is the history of environment movement in India?

“ An environmental movement can be defined as a social or political movement for the conservation of the environment. ”

This is an occurrence in which people sacrificed their lives to defend natural resources. The king personally came to the village to apologize to the people and passed an order that no khejri tree would be cut, and hunting would be banned near the Bishnoi villages. This is a prominent example of a successful environmental movement in India. So what exactly makes up an environmental movement?

An environmental movement can be defined as a social or political movement, for the conservation of the environment or for the improvement of the state of the



*Silent valley  
Source: Kerala government*



Recently, the Chipko movement in 1973 near the village of Mandal in the upper Alaknanda valley completed fifty years. It was a peaceful and silent protest led by rural women in Uttarakhand. It was mainly led by Sundarlal Bahuguna and Gaura Devi. Their objective was to fight against the cruel felling of trees for commercial reasons. To protect the trees the locals went into the woodlands and clutched the trees, preventing the contractors from chopping them down.

The Chipko movement served as a catalyst for numerous environmental movements in India. In Kerala's Palakkad district, an environmental movement known as the Save Silent Valley Movement emerged after the Planning Commission approved the construction of a dam over the Kunthipuzha river. The movement questioned the benefits of environmental degradation-related development.

Narmada Bachao Aandolan was followed by the silent valley movement started in 1985. This protest was against a number of large dams being built across the Narmada river.



*Narmada bachao andolan activists standing in water*



Women leader like Gaura Devi demonstrate the movement's empowerment of women.



### **What has been the impact of these environmental movements?**

These movements have affected several domains. Women leader like Gaura Devi demonstrate the movement's empowerment of women. These movements have promoted peaceful protest based on Gandhian non-violence and Satyagraha principles. They have united people from different castes, and economic backgrounds.

These movements also impacted the policy formulation such as the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, that recognizes the rights of the forest dwelling tribal communities and other traditional forest dwellers to forest resources.

### **How the environmental Movement can be energized?**

Environmental movements have the capacity to advocate for people-friendly development strategies that will guide the society towards sustainability and equality. By providing alternative methods of development, these groups can ensure that expansion does not harm the environment or marginalised communities. They can advocate for policies that enable local populations to manage their own ecosystems.

Incorporating technical and data-related information into the movement's strategies can improve their effectiveness and benefit to the affected communities. Furthermore, they can serve as a bridge between local and global issues, connecting community-level resource conservation and environmental protection to larger global concerns such as sustainability.



# Dream of a Plastic-Free Planet: The Global Plastic Treaty



*About 400 million tonnes of plastic waste is produced every year in the world.*

Imagine a world where all the plastic we have generated over decades has accumulated. It clogs our rivers, turning our oceans into a soup of plastic bits. Even the sandy beaches we love get buried under plastic trash. These plastic mountains don't just look bad, they're dangerous! They break down into tiny pieces smaller than a grain of rice, called microplastics, that sneak into the food fish eat and even end up in our own bodies. These microplastics can mess with how our bodies work, causing problems like hormone trouble and even heart disease. In this horrifying scenario, the Global Plastic Treaty is our chance to forge a cleaner, healthier future for ourselves and the planet.

## **Plastic Pollution: Global Crisis**

Since the 1950s, plastic production across the world has skyrocketed. It increased from just 2 million tonnes in 1950 to more than 450 million tonnes in 2019. If left unchecked, the production is slated to double by 2050, and triple by 2060. Every year, millions of tons of this plastic end up in the ocean, harming sea creatures and killing over 100,000 marine life. Plastic takes anywhere from 20 to 500 years to decompose, and globally, only 9% of plastics are recycled.



**If left unchecked, the production is slated to double by 2050, and triple by 2060.**



## **What is the Plastic Treaty?**

UN Member States endorsed a historic resolution at the UN Environment Assembly (UNEA-5) in Nairobi, 2022 to End Plastic Pollution and forge an international legally binding agreement/treaty by 2024. It means the treaty would be like a law and would be mandatory followed, and the violating country would be penalized. The treaty is set to address plastics through their entire lifecycle - from when they are produced, to how they are used and disposed of.

To finalize the content of the treaty, The UNEA-5 established an Intergovernmental Negotiating Committee (INC) in 2022. As of now total 4 rounds of INC have been completed. However, Countries are divided over ambitious measures like production limits and phase-outs for plastic waste and recycling. The INC-5 scheduled in





175 nations agree to develop a legally binding agreement on plastic pollution by 2024

Source: UN Website

Busan, Korea in November, 2024 is supposed to resolve the differences and adoption of treaty.

### What are the Roadblocks to the Treaty?

Countries are divided over ambitious measures like production limits and phase-outs for plastic waste and recycling. Oil/gas producers and industry groups want the treaty's scope narrowed to plastic waste and recycling. Countries like Saudi Arabia and China opposed mentioning production limits in the draft treaty. Meanwhile, the 60-nation "High-Ambition Coalition" aims to legally reduce

primary plastic polymer production and consumption and phase out problematic single-use plastics.

### India's Role in Negotiations

India has emphasized promoting sustainable and efficient plastic usage and advocates for prioritizing plastic waste management as the primary area of intervention. They advocated for an approach that enhances the longevity of plastic products through improved design, including provisions for repair, reuse, refill, and recyclability. However, India stressed the importance of these measures being nationally determined, without the imposition of international design standards. India is actively advocating for financial assistance and technology transfer across various areas.







UN Member States endorsed a historic resolution at the UN Environment Assembly (UNEA-5) in Nairobi, 2022 to End Plastic Pollution



### What lies ahead?

There are still six months to go before the upcoming negotiations in Busan, Korea. In the meantime, all the countries need to play a constructive role, engaging on the basis of mutual trust, in our collective effort to decide

History of Intergovernmental Negotiating Committee (INC) Negotiations		
	<b>INC-1 Uruguay, 2022</b>	Considered the potential scope, objectives and broad options for the structure of the treaty. Emphasized the need for a bottom-up approach to addressing plastic pollution.
	<b>INC-2 France 2023</b>	Witnessed the convergence on legally binding National action plan at national level, sharing best practices and knowledge financial assistance, technology transfer etc.
	<b>INC-3 Nairobi (Kenya) in November 2023</b>	During the Session different views were expressed on whether to put the primary focus on ending plastic pollution or on protecting human health and the environment.
	<b>INC-4 Ottawa (Canada) in April 2024</b>	Completion of some work, including developing a list of products and chemicals of concern, and standard design requirements to improve recycling capabilities.





on ambitious measures to end plastic pollution and save our health and our planet. If the world agrees on the treaty, it could be the most significant deal on climate-warming emissions and environmental protection since the 2015 Paris Agreement. The treaty can be an insurance policy for this generation and future ones, so they may live with plastic and not be doomed by it.



*Preserving future generations requires immediate action to end plastic pollution.*



# Green Days Diary

MARCH						
SUN	MON	TUE	WED	THU	FRI	SAT
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						



## 3<sup>rd</sup> April World Aquatic Animal Day

Every year, this day is celebrated to raise awareness about the significance of aquatic animals and their role in protecting their ecosystems.

Annual event celebrated to show support for environmental protection. This year theme 'Planet vs. Plastics' is to motivate for building plastic-free future for upcoming generation.

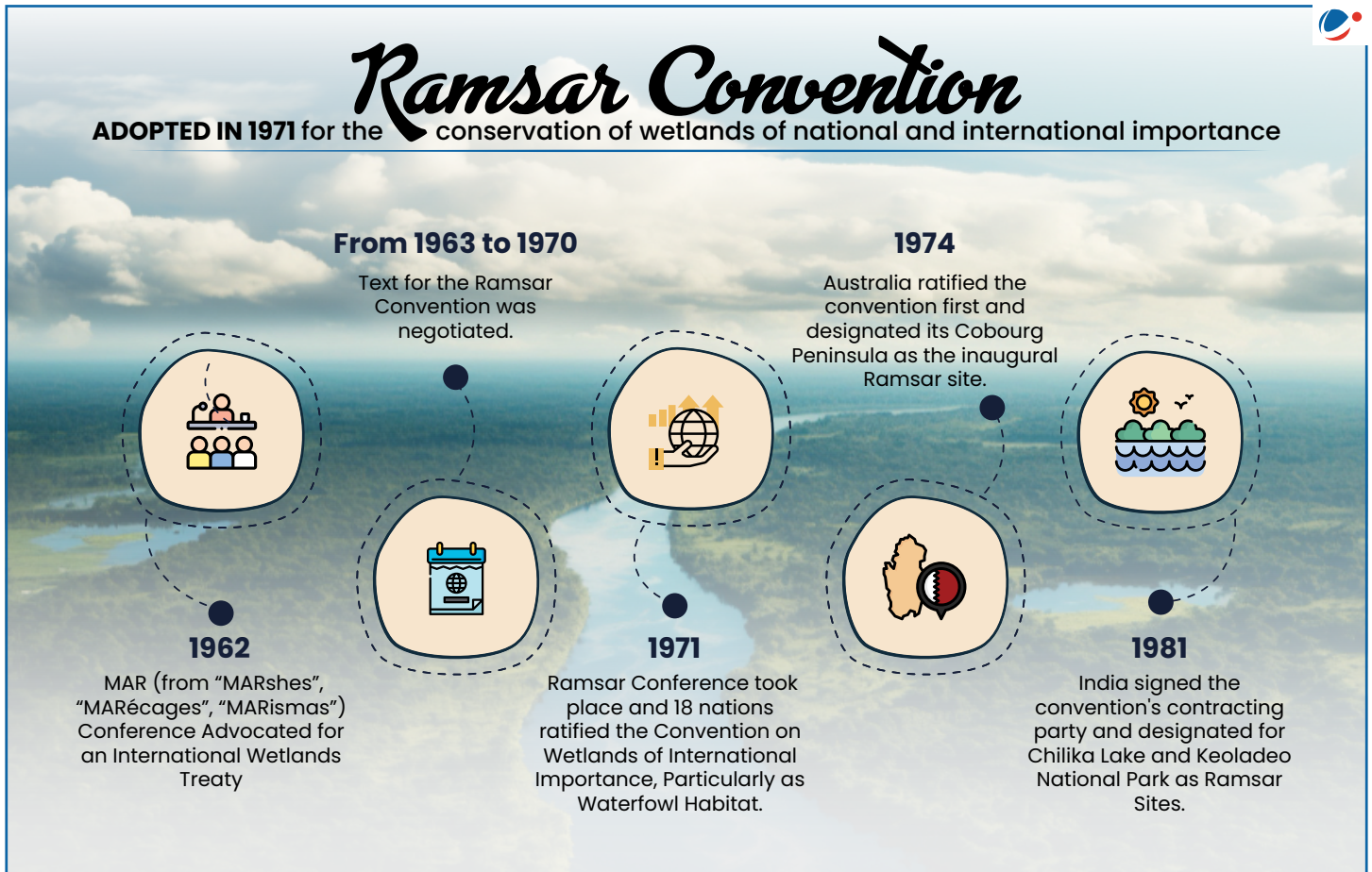
## 22<sup>nd</sup> April Earth Day





## Ramsar Convention on Wetlands

The Ramsar Convention, also known as the Convention on Wetlands, is an international treaty signed in 1971 in Ramsar, Iran. It is the only international agreement that focuses specifically on a single ecosystem: wetlands. Wetlands are crucial for human survival, providing water and productivity for numerous plant and animal species, making them among the world's most productive environments.



In line with this, the Convention provides a framework for countries to work together to conserve and wisely use wetlands and their resources. The Convention is based on three main pillars:

- Wise use of all wetlands
- Designation of suitable wetlands as Ramsar Sites and ensuring their effective management
- International cooperation on wetlands that cross borders or support shared species

India is one of the Contracting Parties to Ramsar Convention and had ratified this Convention in February 1982. India has also served on the Standing Committee of the Convention from 1999 to 2002. Remarkably the number of Ramsar sites in India, has increased from 26 to 80 in the last ten years.

**INDIA** **SINCE 1982**

Ramsar sites: **82**

Surface area of: **1.332.739 ha**

# Quiz Zone

1. Identify the type of reef



- (a) Fringing Reef
- (b) Barrier Reef
- (c) Atoll Reef
- (d) Patch Reef

2. Eco-sensitive zone (ESZ) are established under which of the following Legislation?

- (a) Wildlife (Protection) Act, 1972
- (b) Environment Protection Act (EPA), 1986
- (c) Forest (Conservation) Act, 1980
- (d) None of the above

3. The main concentration of Nilgiri Tahr is found in the high peaks of the Himalayas.

True or False?

4. A new species of cicada, named "Butterfly Cicada" due to its vibrant wings, has been discovered in

- (a) Karnataka
- (b) Tamil Nadu
- (c) Kerala
- (d) Meghalaya

5. Which of the following organisations has launched an initiative named Climate Promise 2025?

- (a) Meteorological Organization (WMO)
- (b) International Union for Conservation of Nature (IUCN)
- (c) UN Environment Programme (UNEP)
- (d) UN Development Programme (UNDP)

6. World Earth Day is observed on

- (a) 22nd April
- (b) 25th April
- (c) 27th April
- (d) 29th April

7. Match the following

Environmental movement	State
(i) Chipko	(i) Kerala
(ii) Silent Valley Movement	(ii) Madhya Pradesh
(iii) Narmada Bachao Andolan	(iii) Uttarakhand
(a) (i) - (iii), (ii)- (i), (iii)-(ii)	
(b) (i) - (iii), (ii)- (ii), (iii)-(i)	
(c) (i) - (i), (ii)- (iii), (iii)-(ii)	
(d) (i) - (ii), (ii)- (i), (iii)-(iii)	

8. Which of the following is not part of Tiger Landscape country?

- (a) China
- (b) Nepal
- (c) India
- (d) Sri Lanka

9. The largest animal on the earth is

- (a) Elephant
- (b) Blue Whale
- (c) Giraffe
- (d) None of the above

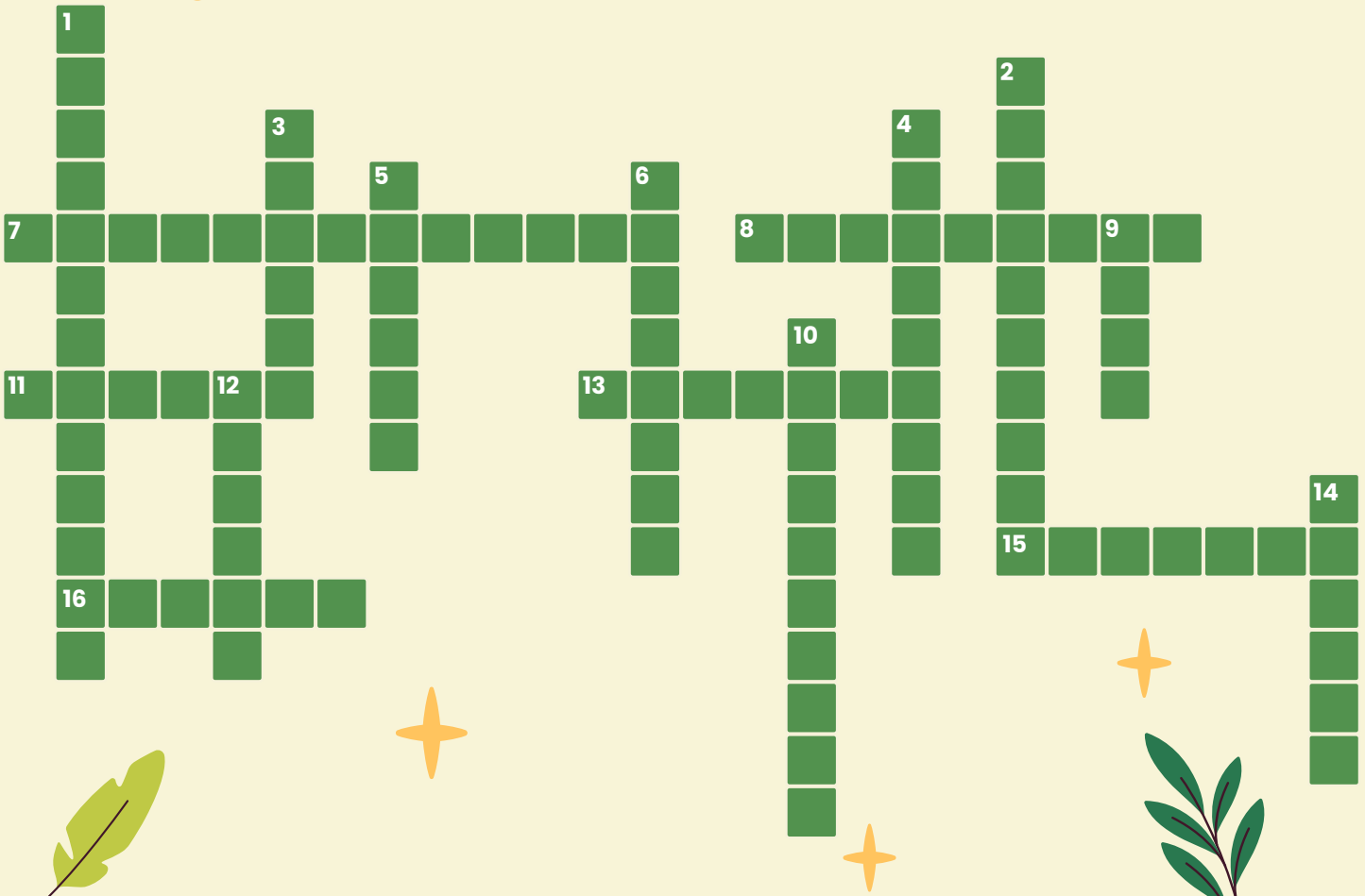
10. Biorock technology is mainly utilised for

- (a) preventing coasts from cyclones
- (b) building green and energy-efficient buildings
- (c) restoration of coral reefs
- (d) collecting microplastics from oceans

Answers  
1-A, 2-B, 3 -False, 4 -D, 5-D, 6-A, 7 -A, 8-D, 9-B, 10-C



# Crossword



## Down

## Across

1. Small pieces of plastics, usually smaller than a grain of rice
2. Growing plants without soil, using water and nutrients instead
3. Treeless regions found in the Arctic and on the tops of mountains
4. World's largest coral reef ecosystem is located off the coast of this country
5. Renowned women led Environment Movement in India
6. Ecosystem protected under the Ramsar Convention
9. Europe's largest volcano
10. Focuses on measuring the underwater topography, mapping the variations in depth across the reef system
12. Country hosted the Sustainable Finance for Tiger Landscapes Conference (SFTLC)
14. A marine creature, popularly known as the Sea Cow

7. Tiny single-celled organisms that live within most types of coral polyps
8. Chemicals used in some of the cosmetic products can harm corals
11. Cross border lake between Zambia and Zimbabwe
13. State in which Sukhna Wildlife Sanctuary is located
15. Tribe concentrated in the Nallamala Hills in the Eastern Ghats
16. An invertebrate species that are part of the Cnidaria family

**ANSWERS**  
 Across: 7- Zooxanthellae, 8- Sunscreen, 11- Kariba, 13- Haryana, 15- Chenchu, 16- Corals  
 Down: 1- Microplastics, 2- Hydroponic, 3- Tundra, 4- Australia, 5- Chipko, 6- Wetlands, 9- Etna, 10- Bathymetry, 12- Bhutan, 14- Dugong





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### OPTIONAL SUBJECTS

**ANTHROPOLOGY | GEOGRAPHY | HINDI | HISTORY | MATHS | PHILOSOPHY**  
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RANCHI | ROHTAK | SHIMLA | THIRUVANANTHAPURAM | VARANASI | VIJAYAWADA VISAKHAPATNAM

## ABOUT 'THE PLANET VISION'

'The Planet Vision' aims to educate and inspire individuals about the importance of individual actions for a sustainable future. It presents uplifting narratives, highlighting local conservation efforts and community initiatives.

We also provide regular updates on the latest environmental technology and groundbreaking projects, aiming to raise awareness of the environment, nature, and the planet. The goal is to encourage eco-friendly behaviours and promote sustainable practices.

## ABOUT AJAYVISION EDUCATION PRIVATE LIMITED

Ajayvision Education Private Limited, popular under the brand name **VisionIAS**, is an established leading EdTech company in India. The **Infinity Vision**, **Galaxy Classes**, and **StudentEdge** are several other wings that make up the larger organisation.

Since its incorporation in May 2013, **VisionIAS** has had a huge impact on the education industry nationwide. **VisionIAS** creates innovative web-based platforms and mobile apps using AI and ML technologies to give students a unique learning experience.

Moreover, the organization actively engages in CSR initiatives, extending quality education to rural households, thus expanding educational access. **Rajni Devi Global Village School (RDGV School)** and **Paras India** are key parts of this ecosystem.

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