



Climate Change Alters Ocean Colour

For Prelims: [Climate Change](#), Marine Ecosystem, [Global Warming](#)

For Mains: India's climate change mitigation initiatives, climate change impact on oceans

Source: [DTE](#)

Why in News?

Recently, a new study reveals that **56% of the world's oceans** have experienced a **change in colour due to [climate change](#)**.

- Tropical waters, particularly the **southern [Indian Ocean](#)**, have **turned green**, indicating an **increase in [phytoplankton](#)** and marine life.

What are the Key Highlights of the Study?

- **Long-Term Trends and Data Analysis:**
 - **Aqua Satellite Data:**
 - Researchers analyzed data from the **[Moderate Resolution Imaging Spectroradiometer \(MODIS\)](#)** on the **Aqua satellite (NASA's Earth Science satellite mission)**, monitoring ocean colour for two decades (2002-2022).
 - MODIS takes measurements in seven **visible wavelengths (Light of different wavelengths produces different perceptions of colour)**.
 - **Subtle Colour Changes:**
 - Human eyes cannot detect subtle colour changes in the oceans, which may contain a **mix of wavelengths ranging from blue to green and even red**.
 - **Green Waters and Phytoplankton:**
 - The study finds that **green-coloured water indicates the presence of phytoplankton**, essential microscopic plant-like organisms.
 - Phytoplankton serve as the **base of the marine food web**, similar to plants on land, and play a crucial role in supporting marine life.
 - The colour of the ocean affects the amount of carbon dioxide absorbed by the oceans, with current estimates indicating that **oceans absorb 25% of [global CO2 emissions](#)**.
 - **Role of Climate Change:**
 - By comparing annual variations in ocean colour over the two decades, the study identified climate change as the primary factor behind the observed changes.
 - Using a model, researchers simulated two scenarios—**one considering [greenhouse gas emissions](#)** and the other without them.
 - The scenario accounting for greenhouse gas emissions predicted that **colour changes could occur in approximately 50% of the world's surface oceans**, aligning with satellite observations indicating a **56% shift to green or blue waters**.

- **Implications for Marine Life and Conservation:**
 - **Impact on Organisms:**
 - The green hue comes from **chlorophyll**, a pigment that helps phytoplankton make food. A change in colour due to an increase or decline in the population will **impact organisms that feed on plankton**.
 - **Carbon Sequestration:**
 - Different types of plankton have varying abilities to absorb carbon, potentially influencing the ocean's capacity for carbon uptake.
- **Regional Variability and the Need for Further Study:**
 - The **southern Indian Ocean exhibits significant changes in colour**, while waters near India do not follow the same trend, potentially due to natural variability.
- **Recommendations:**
 - Researchers emphasize the need for individuals and policymakers to recognize the significance of these changes and take appropriate action to protect **marine ecosystems**.
 - Ongoing monitoring and further research are crucial to understanding regional variations and the full extent of climate change's impact on ocean colour.

What are India's Climate Change Mitigation Initiatives?

- **National Action Plan on Climate Change (NAPCC):**
 - Launched in 2008 to **address climate change challenges** in India.
 - Aims to **achieve low-carbon and climate-resilient development for India**.
 - There are **8 national missions** forming the core of the NAPCC which represent multi-pronged, long term and integrated strategies for achieving key goals in climate change. These are-
 - **National Solar Mission**
 - **National Mission for Enhanced Energy Efficiency**
 - **National Mission on Sustainable Habitat**
 - **National Water Mission**
 - **National Mission for Sustaining the Himalayan Ecosystem**
 - **National Mission for A Green India**
 - **National Mission for Sustainable Agriculture**
 - **National Mission on Strategic Knowledge for Climate Change**
 - **Nationally Determined Contributions (NDC)**
 - **National Adaptation Fund on Climate Change (NAFCC):**
 - **State Action Plan on Climate Change (SAPCC).**
- **Nationally Determined Contributions (NDC):**
 - India's commitments to reduce greenhouse gas emissions and adapt to climate change.
 - Pledged to **reduce the emissions intensity of GDP by 45%** by 2030 from 2005 levels and generate **50% of electricity from non-fossil fuel sources by 2030**.
 - Pledged to create additional carbon sink and **achieve net zero emissions by 2070**.
- **National Adaptation Fund on Climate Change (NAFCC):**
 - Established in 2015 to **provide financial assistance to state governments for implementing adaptation projects** in various sectors.
- **State Action Plan on Climate Change (SAPCC):**
 - Encourages all states and union territories to prepare their own SAPCCs based on their specific needs and priorities.
 - SAPCCs outline strategies and actions for addressing climate change at the sub-national level.
 - Aligned with the objectives of the NAPCC and the NDC.

Q. What are the consequences of spreading 'Dead Zones' on marine ecosystems? (2018)

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