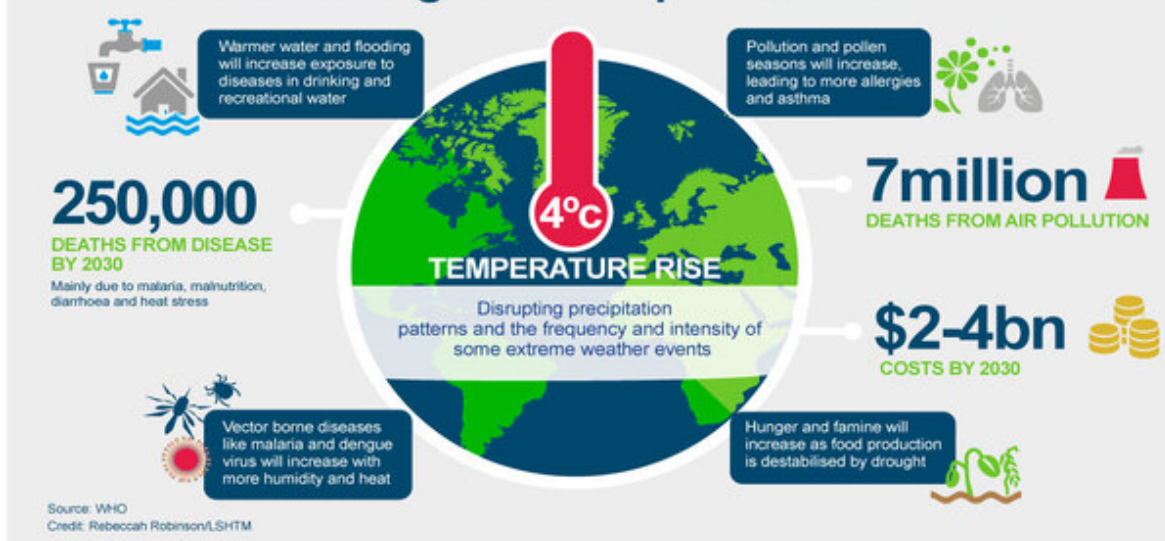# Global Warming Affecting Weather Forecast

Why in News?

Unprecedented warming in 2023-2024 has pushed global temperatures beyond the **1.5ºC** threshold, increasing the unpredictability of weather patterns and challenging current forecasting models amid extreme events like **heatwaves, cyclones,** and **floods**.

What are the Factors Affecting Weather and Climate Forecasting?

- **Global Warming:**
    - **Global warming** refers to the **long-term increase in Earth's average surface temperature** due to human activities, primarily the emission of **greenhouse gasses (GHG)** like **carbon dioxide (CO_2) and methane (CH_4)**.
    - **Impact of Global Warming on Climate Forecasting:**
        - **Increased Unpredictability of Weather:**
            - Rising global temperatures decrease weather predictability, reducing forecast accuracy by about **one day per celsius** increase.
                - Rising temperature is also complicating current forecasting models to accurately predict extreme events such as **heatwaves**, **hurricanes**, **monsoons** and **El Niño**.
        - **Changes in Atmospheric Dynamics:**
            - Rising temperatures **accelerate the growth of atmospheric eddies**-small-scale circulations in the troposphere which impact weather systems.
                - This faster growth **reduces the memory of initial conditions in weather models**, leading to a **narrower window for accurate predictions**, especially in warming regions.
        - **Impact on Forecasting Models:**
            - **Lorenz's "butterfly effect:**
                - It shows that **small changes in temperature, humidity, and wind** can lead to **significant impacts on climate forecasting**.
- **Other Factors:**
    - **Data Quality and Availability:**
        - Accurate forecasts depend on **comprehensive and high-quality data.** Gaps in data may hinder the ability to make precise predictions.
    - **Model Limitations:**
        - Climate models, while sophisticated, have inherent limitations as they often **struggle to replicate historical trends** and can produce varying results based on their configurations.
    - **Natural Variability:**
        - Weather patterns are influenced by natural phenomena such as **El Niño, La Niña,** and the **Indian Ocean Dipole (IOD)** which further complicates predictions.

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How climate change could impact the world

Warmer water and flooding will increase exposure to diseases in drinking and recreational water

Pollution and pollen seasons will increase, leading to more allergies and asthma

250,000
DEATHS FROM DISEASE BY 2030
Mainly due to malaria, malnutrition, diarrhoea and heat stress

4°C
TEMPERATURE RISE
Disrupting precipitation patterns and the frequency and intensity of some extreme weather events

7million
DEATHS FROM AIR POLLUTION

$2-4bn
COSTS BY 2030

Vector borne diseases like malaria and dengue virus will increase with more humidity and heat

Hunger and famine will increase as food production is destabilised by drought

Source: WHO
Credit: Rebeccah Robinson/LSHTM

Causes and Effects of Climate Change

Causes

- Rapid industrialization
- Energy use
- Agricultural practices
- Deforestation
- Consumer practices
- Livestock
- Transport
- Resource extraction
- Pollution

Effects

- Rising temperatures
- Rising sea levels
- Unpredictable weather patterns
- Increase in extreme weather events
- Land degradation
- Loss of wildlife and biodiversity

What are the social impacts of climate change?

Displaced people. Poverty. Loss of livelihood. Hunger. Malnutrition. Increased risk of diseases. Global food and water shortages.

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Read More: World's Oceans Approaching Critical Acidification Level, Rising Global Temperatures.

UPSC Civil Services Examination, Previous Year Questions (PYQs)

Prelims

Q1. Which of the following statements is/are correct about the deposits of 'methane hydrate'? (2019)

1. Global warming might trigger the release of methane gas from these deposits.

2. Large deposits of 'methane hydrate' are found in Arctic Tundra and under the sea floor.
3. Methane in atmosphere oxidises to carbon dioxide after a decade or two.

Select the correct answer using the code given below.

(a) 1 and 2 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

Ans: (d)