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Earth at Risk of Becoming 'Hothouse'

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A recent report titled "Trajectories of the Earth System in the Anthropocene", has warned about ill-effects of global temperatures rising more than 2°C above pre-industrial levels.

- Currently, global average temperatures are just over 1°C above pre-industrial and rising at 0.17°C per decade.
- According to the report, a domino effect will kick in leading to "hothouse" conditions even if we manage to keep global temperatures to 2°C above pre-Industrial levels and higher sea levels, making some areas on Earth uninhabitable.
- Hothouse is a condition where the global temperatures will be 4-5 degrees higher than the pre-industrial level and sea levels may surge by up to 60 metres higher than today even if emission reduction targets under the Paris climate deal are met.

Feedback Processes

- Human emissions of greenhouse gas are not the sole determinant of temperature on Earth.
- The scientists looked at 10 natural systems, which they term "feedback processes" which help humanity to avoid the worst impacts of carbon and temperature rises. However, if one of these systems tips over and starts pushing large amounts of CO₂ into the atmosphere, the rest could follow like a row of dominoes.
- These natural systems are: permafrost, methane hydrates trapped in ocean floors, land and ocean carbon sinks, Arctic summer sea ice, Antarctic sea ice, polar ice sheets, etc.
- **Permafrost** refers to the perennially frozen soil found in the Earth's higher latitudes. Technically, it is ground that remains at or below a temperature of 0°C for at least 2 consecutive years.
- **Methane hydrate** is a cage-like lattice of ice inside of which are trapped molecules of methane. Hydrate deposits generally occur in two types of settings: under Arctic permafrost, and beneath the ocean floor.

- **Carbon sinks** are holding tanks for carbon or carbon compounds, like carbon dioxide (CO₂). Carbon sinks can be natural or man-made. There are three main natural carbon sinks: Plants, Soil, Oceans.
Man Made carbon sinks can be created or use existing underground formations, or even the oceans, to store CO₂. The main artificial sinks are landfills and carbon capture and storage processes.
- The **Sahel region** of Africa is a 3,860-kilometre arc-like land mass lying to the immediate south of the Sahara Desert and stretching east-west across the breadth of the African continent. A largely semi-arid belt of barren, sandy and rock-strewn land, the Sahel marks the physical and cultural transition between the continent's more fertile tropical regions to the south and its desert in the north.
- The **boreal forest** (also known as the **taiga**, a Russian word meaning swampy moist forest) is found in a nearly continuous belt across North America and Eurasia.
- The deep-ocean currents are driven by differences in the water's density, which is controlled by temperature (thermo) and salinity (haline). This process is known as **thermohaline circulation**.
- **El Niño Southern Oscillation (ENSO)** is a single climate phenomenon comprising of three states. The two opposite phases, "El Niño" and "La Niña," and "Neutral" is in the middle of them. El Niño is warming of the ocean surface, in the central and eastern tropical Pacific Ocean. La Niña is cooling of the ocean surface, in the central and eastern tropical Pacific Ocean.

Impact

- Crossing into a Hothouse Earth period would see a higher global temperature than at any time in the past 1.2 million years.
- Although the worst impacts may not be felt for a century or two, it would be irreversible once it starts.
- The report says that the extreme weather events being experienced right now around the world cannot be immediately associated with the risk of passing 2 degrees C. However, it may be evidence of the Earth becoming more sensitive to warming than previously thought.

Solution

- The hothouse scenario can be avoided by fundamentally re-adjusting mankind's relationship with the planet.
- A total re-orientation of human values, equity, behaviour and technologies are required.
- Not only burning of fossil fuels must be stopped by the middle of this century, but mitigation measures like planting trees, protecting forests, working out how to block the Sun's rays and developing machines to suck carbon out of the air must be taken up at massive scale.

- Maximizing the chances of avoiding a "Hothouse Earth" requires not only reduction of carbon dioxide and other greenhouse gas emissions but also enhancement and/or creation of new biological carbon stores, for example, through improved forest, agricultural and soil management; biodiversity conservation; and technologies that remove carbon dioxide from the atmosphere and store it underground.
- However, many scientists argue that we have entered a new geological era, the Anthropocene, in which human activity is directly affecting the planet.

Editorial: Pulling Back From the Brink