Climate Change: The Hopes & Miseries

What is the issue?

\n\n

\n
- A recent scientific paper by “National Academy of Sciences” has deliberated on how the planet might move into a high temperature path with no return.
\n
- Considering the risks, extraordinary changes are required to prevent the ‘hot house earth’ pathway that has been hypothesised.
\n

\n\n

What is the earth’s overall climatic context?

\n\n

\n
- Standard life forms started evolving when earth reached a precariously equilibrated temperature is just right for ecosystems to flourish.
\n
- Holocene Age, which began about 12,000 years ago, is the stable epoch during which Homo sapiens settled and developed agriculture and other technologies.
\n
- These led to social and economic transformations through intensive use of resources, which have brought the world to this juncture.
\n
- Human activity, supported by the burning of fossil fuels and deforestation, led to an increase in greenhouse gas (GHG) emissions.
\n
- Consequently, global warming is presently on the rise, which is largely attributed to human activities alone.
\n
- With humans acquiring the potential to dominantly influence earth’s geography, the new epoch called “Anthropocene” is said to have commenced.
\n

\n\n

What is the likelihood of earth approaching a climatic trap?

\n\n

\n
- The delicate equilibrium of the biosphere/earth system has to do with processes that amplify or dampen signals that are given out.
\n
- For instance, melting of Greenland ice increases open waters that absorb more sunlight and then increase warming and cause further melting.
\n
- This is a self propelling cycle or a positive feedback loop.
\n
- Contrastingly, with increase in CO2, chemical-weathering increases and removes CO2 from the atmosphere over time.
\n
- This is a negative feedback loop that ensures stable equilibrium.
\n
- When positive feedbacks become stronger than the negative ones, the system may change abruptly and get pushed out of equilibrium.
\n
- The earth and its systems have shifted between alternative phases stable and unstable states throughout its geological history.
\n
- Now, it appears we are approaching some critical thresholds where the stable earth that we've known all along is likely to slip into an unstable phase.
\n

\n\n

What is the crux of the paper?

\n\n

\n
- The paper identifies a threshold (2 degrees more than 1750 levels) beyond which the earth's systems will no longer able to stabilise in the near future.
\n
- It points out that technology trends in the next decade or two will determine the path of the "earth system" over the next thousands of years.
\n
- Many indicators respond either continuously or show abrupt changes and

in either of these, there is a tipping point beyond which there is no return.
\n
- A geophysical tipping point is a threshold beyond which a system tends to move from one stable state to another rather than returning to equilibrium.
\n
- This study indicates that once the threshold is crossed, it would lead to the tumbling of a series of tipping points, like a set of dominoes.
\n
- Destruction of the Amazon forest due to wildfires, loss of permafrost covers, weakening of CO2 absorption by the oceans, are among others that are feared.
\n
- These would irrevocably disrupt ecosystems and societies and there would be a runaway climate change, taking us to a hothouse earth.
\n

\n\n

What are some important themes covered in detail?

\n\n

\n
- The authors identify three clusters of tipping-linked cascades, out of human control, that could happen over time with rising temperatures.
\n
- Atmospheric concentration of CO2 (now over 400 ppm) has caused the global average temperatures to rise about a degree Celsius higher than 1750 levels.
\n
- **Previously -** Current temperature levels were previously noted some 3-4 million years ago in the mid-Pliocene, when sea levels were 10-22 m higher.
\n
- The paper states that, for the current phase to remain stable, a great deal of concerted effort in a remarkably short period is indispensible.
\n
- But if the current trends go unabated, the projections are that the earth's temperature will cross the mid-Pliocene levels and reach mid-Miocene levels.
\n
- Notably, in mid-Miocene (about 15-17 million years ago), CO2 concentrations were 300-500 ppm and sea levels were 10-60 m higher

than today.
\n
- **Now -** Even if the Paris Agreement of 2015 is implemented fully and we managed to keep warming below 2º C or even 1.5º C, unavoidable risks exist.
\n
- The cascade of feedbacks that pushes the earth into the hothouse path is difficult to assess and estimate, which calls for serious brainstorming.
\n
- Sustained action to secure “earth systems” and the capacity building to adapt to a warmer world are indispensible in this scenario.
\n
- Global emissions have not reached a plateau yet, reportedly rose by 1.4% last year, which is a serious concern.
\n

\n\n

How does the future look?

\n\n

\n
- **Way Ahead -** Increasing contributions from renewable sources and improvements in energy efficiencies would be a start but will not be sufficient.
\n
- There should instead be major changes in technological innovation, behaviour, values and governance as this is an unprecedented challenge for humanity.
\n
- Notably, modifying the energy balance would be needed alongside developing ways for people to adapt to living in a warmer world.
\n
- Deep cuts in GHG emissions, increasing carbon sinks, removing atmospheric CO2 and even deflecting solar radiation could help in reducing temperatures.
\n
- **Opinions -** Given history and the state of the biosphere, some scientists are not hopeful about avoiding the hothouse path.
\n
- But some others are optimistic that earth could stabilise at a rise below 2º C through infrastructural, societal and institutional measures.
\n
- What changes are required and ways to make them are still being

debated, with a lot of uncertainty on whether these can be accomplished.
\n

\n\n

\n

- In any case, some changes like loss of Arctic ice could be reversed over a few hundred years, but others such as Antarctic ice would take much longer.
\n

\n\n

\n\n

Source: The Hindu

\n

