# Climate Change: The Hopes & Miseries

## What is the issue?

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- 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.
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- Considering the risks, extraordinary changes are required to prevent the ‘hot house earth’ pathway that has been hypothesised.
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## What is the earth’s overall climatic context?

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

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- The delicate equilibrium of the biosphere/earth system has to do with processes that amplify or dampen signals that are given out.
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- For instance, melting of Greenland ice increases open waters that absorb more sunlight and then increase warming and cause further melting.
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- This is a self propelling cycle or a positive feedback loop.
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- Contrastingly, with increase in CO2, chemical-weathering increases and removes CO2 from the atmosphere over time.
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- This is a negative feedback loop that ensures stable equilibrium.
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- When positive feedbacks become stronger than the negative ones, the system may change abruptly and get pushed out of equilibrium.
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- The earth and its systems have shifted between alternative phases stable and unstable states throughout its geological history.
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- 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.
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## What is the crux of the paper?

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- 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.
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- 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.
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- 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.
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- 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.
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- 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.
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- 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.
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- These would irrevocably disrupt ecosystems and societies and there would be a runaway climate change, taking us to a hothouse earth.
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## What are some important themes covered in detail?

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- The authors identify three clusters of tipping-linked cascades, out of human control, that could happen over time with rising temperatures.
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- Atmospheric concentration of CO2 (now over 400 ppm) has caused the global average temperatures to rise about a degree Celsius higher than 1750 levels.
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- **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.
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- The paper states that, for the current phase to remain stable, a great deal of concerted effort in a remarkably short period is indispensible.
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- 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.
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- 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.
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- **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.
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- The cascade of feedbacks that pushes the earth into the hothouse path is difficult to assess and estimate, which calls for serious brainstorming.
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- Sustained action to secure “earth systems” and the capacity building to adapt to a warmer world are indispensible in this scenario.
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- Global emissions have not reached a plateau yet, reportedly rose by 1.4% last year, which is a serious concern.
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## How does the future look?

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

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