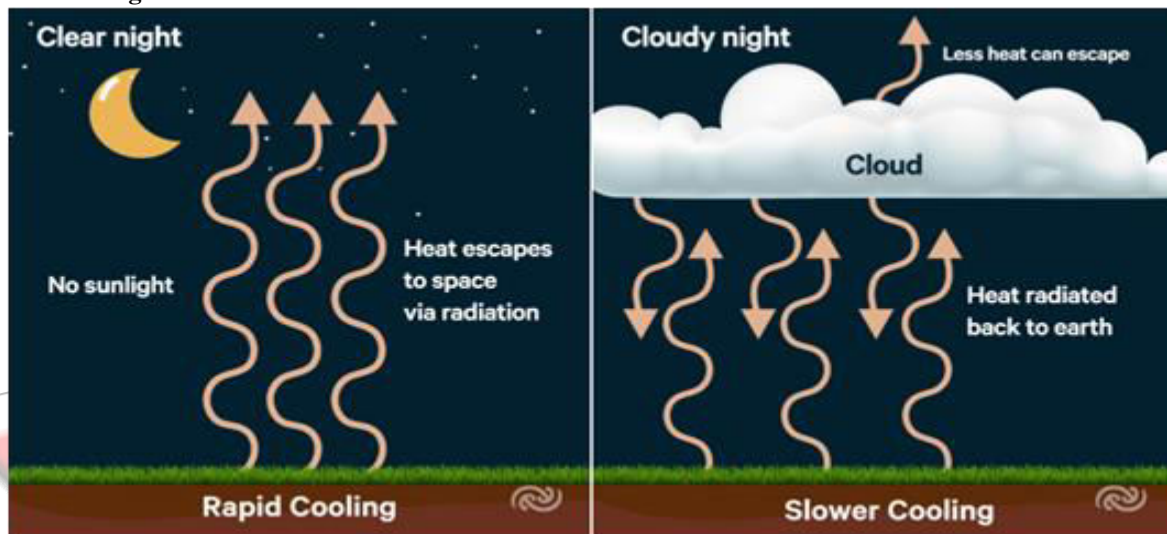


Why Did North India Fog so Heavily last week

Background

- A thick blanket of fog descended on several states of northern India in the last days of 2023 and first of 2024, creating challenging conditions for residents and travellers alike.
- Some places in the country's north reported low temperatures and dense fog for the last week of December.
- According to weather reports in late December 2023, minimum temperatures in Punjab, Haryana, and the northern reaches of Rajasthan and Uttar Pradesh hovered around 6-9 degrees C.
- In New Delhi, south Rajasthan, and north Madhya Pradesh, some places recorded minimum temperatures in the range of 10-12 degrees C, according to the India Meteorological Department (IMD).
- In the same time, most of North India also experienced a dense fog that reduced visibility in many areas to as little as 50 metres for several days.
- Haryana, including Chandigarh, plus isolated pockets of Uttarakhand, Uttar Pradesh, Bihar, Rajasthan, and Madhya Pradesh reported fog with visibility reduced to under 200 metres.

What is Fog?



- About
 - Fog is a common weather phenomenon.
 - It is a collection of small droplets of water produced when evaporated water has cooled down and condensed.
 - In simple terms, it is nothing but a thick cloud, but very close to the earth's surface.
 - For a thick fog to form, temperatures should be lower and abundant moisture should be available near the surface.
- Formation
 - Fog materialises whenever there is a temperature disparity between the ground and the air.
 - This happens frequently during Indian winters: the fog is created when the temperature drops at night and in the early morning, condenses on aerosols present in the atmosphere.
 - High humidity, combined with an ample presence of water vapor or moisture, encourages foggy conditions.
 - The process by which it cools plays a pivotal role in the formation of fog.
- Mechanism
 - One primary mechanism contributing to fog formation is called Infrared Cooling.
 - It typically occurs when the weather is transitioning from summer to winter.
 - In the summer, the ground absorbs radiation from the Sun, becomes warmer, and moistens the air passing over it.
 - When cooler weather kicks in, this mass of warm, moist air comes in contact with processes that cool it.
 - The 'collision' prompts the water vapour in the air to condense rapidly, giving rise to fog.
- Other types
 - Another type of fog, known as radiation fog, is prevalent and occurs when an unseasonably warm day with high humidity is followed by rapidly dropping temperatures.

- The specific type of fog, its duration, and its effects are contingent on various environmental conditions.
- For example, there exists a unique type of fog that encourages snow to melt faster.

Why is North India Prone to Fogging?

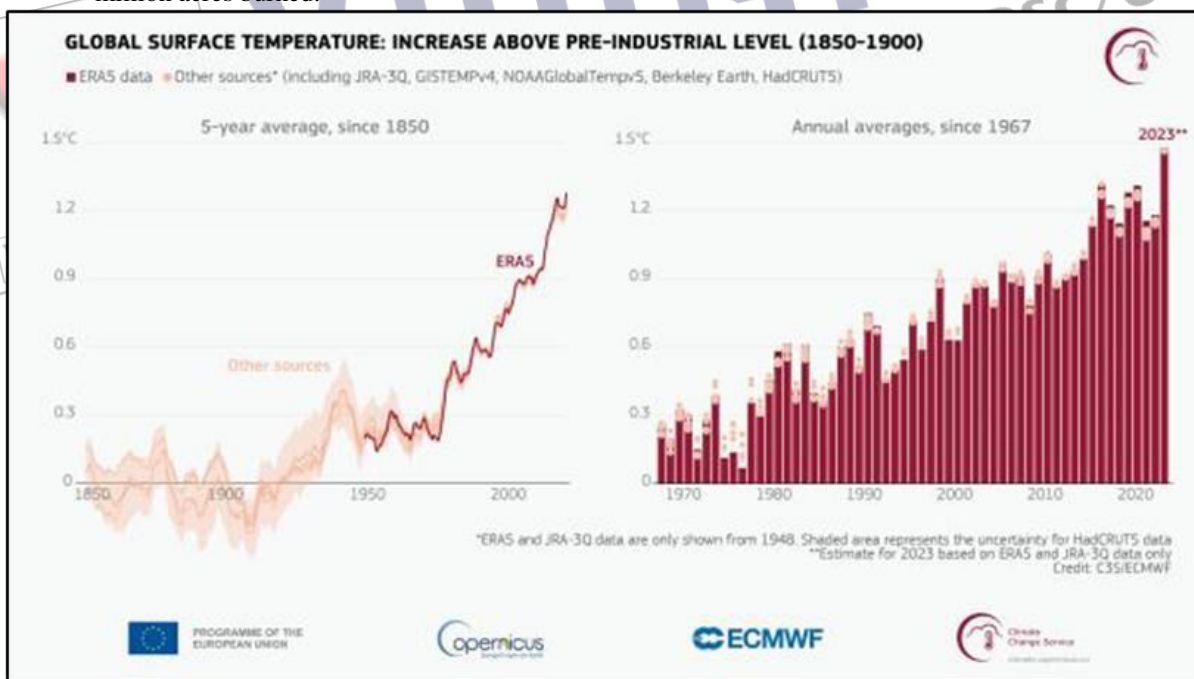
- The entire Indo-Gangetic plains are prone to formation of fog during winter season, as all the conditions — low temperatures, low wind speed, moisture availability and plenty of aerosols — are present in this region.
- Winds called the Western Disturbances, originating in the Mediterranean, bring in moisture to Northern India.
 - Sometimes, the Arabian Sea also elevates the moisture content in the northern region.
- Moreover, the Himalayas in the north act as a barrier, preventing the eastward movement of the fog over the plains, leading to its concentration over the Indo-Gangetic region.
- In Delhi’s case, air pollutants such as particulate matter add to the load, creating smog (smoke fog).

ENVIRONMENT & ECOLOGY

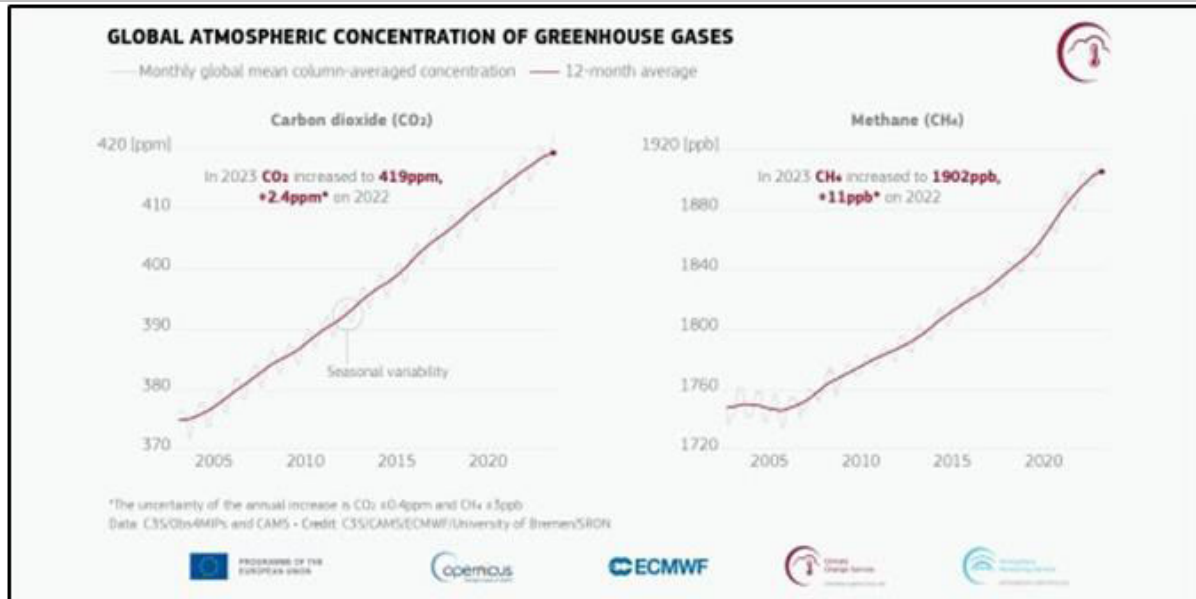
Why was 2023 the Warmest Year Ever?

Background

- As per the Europe’s Copernicus Climate Change Service (C3S), 2023 was the warmest year since records began in 1850, beating the previous record of 2016.
- The announcement said temperatures in 2023 likely exceeded those of any year-long period in at least the last 100,000 years.
- Last year was 1.48 degree Celsius warmer than the average of the 1850-1900 pre-industrial level and 0.17 degree Celsius warmer than 2016, C3S said.
- The announcement was confirmation of what scientists have known for a few months.
- The World Meteorological Organisation (WMO) had already said in November that 2023 was set to emerge as the warmest year on record, based on data until October.
- Rising temperatures contributed to a large number of extreme weather events around the world in 2023, including heatwaves, floods, droughts, and wildfires.
- Canada had its most destructive wildfire season (May to September) on record, with more than 45 million acres burned.



Reasons Behind 2023 Being the Warmest Year



- The main driver behind the extreme warming is the increasing greenhouse gas concentrations in the atmosphere.
- Greenhouse gases like carbon dioxide and methane, and water vapor trap the Sun's energy in the Earth's system before it escapes to space, causing warming.
- Since the industrial revolution, human activities like burning fossil fuels such as coal, oil, and gases have released unprecedented levels of such gases.
- As a result, the planet has warmed rapidly, especially in recent decades.
- In 2023, greenhouse gas concentrations reached the highest levels ever recorded in the atmosphere, according to C3S and the Copernicus Atmosphere Monitoring Service (CAMS).
- Carbon dioxide concentrations in 2023 were 2.4 parts per million (ppm) higher than in 2022; methane concentrations increased by 11 parts per billion (ppb).
- The onset of El Niño last year, after seven years, also played a key role.
 - El Niño refers to an abnormal warming of surface waters in the equatorial Pacific Ocean.
 - It increased the likelihood that temperature records would be broken, and there would be more extreme heat in many parts of the world and the ocean.

What Could Happen Now?

- Scientists have suggested that 2024 could be warmer than even 2023.
- Typically, in the past few decades, very hot years have been ones that began in an El Niño state.
- Last year, El Niño didn't set in until around July, which means that it wasn't the primary reason behind the abnormal heat at that point. Therefore, 2024 could be hotter than last year.
- It is also possible that the next year may surpass the 1.5-degree Celsius warming threshold across the entire calendar year for the first time.
- The WMO in its 2023 State of Global Climate report said there was a 66% chance that at least one of the years between 2023 and 2027 would cross the threshold.
- A long-term breach of the 1.5-degree limit would unleash far more severe climate change impacts, including more frequent and severe droughts, heatwaves, and rainfall.
- To prevent this, the world needs to urgently implement certain steps, including greenhouse gas emission cuts, which it has failed to do so far.

PRELIM FACTS

1. Einstein Probe (EP)

- China recently sent a new astronomical satellite called the Einstein Probe into space to observe mysterious transient phenomena in the universe that flicker like fireworks.

About Einstein Probe (EP):

- The EP is a mission of the Chinese Academy of Sciences (CAS) dedicated to time-domain high-energy astrophysics.
- The primary scientific goal of the EP is to explore the transient and variable X-ray sky, capturing powerful bursts of high-energy light emanating from objects such as merging neutron stars and black holes.
- It was successfully launched on January 9, 2024, from the Xichang Satellite Launch Center in China with a "Long March-2C" rocket.

- It is equipped with state-of-the-art X-ray mirrors and detectors.
- Unlike conventional X-ray telescopes, Einstein Probe's unique design allows it to monitor almost a tenth of the sky simultaneously, discovering new sources as they light up in X-rays and enabling in-depth studies of known and new celestial phenomena over extended periods.
- It will also detect light from gamma-ray bursts, supernovae, flares from other stars, and events within the Solar System, such as emissions from comets.
- The satellite has a weight of ~1450 kg and an average power of ~1212 W in total.

2. Rock Glaciers

- A new study revealed that over 100 active permafrost structures identified in Jhelum basin, can cause catastrophic disasters in future.

About Rock Glaciers:

- A rock glacier is a mass of rock, ice, snow, mud, and water that moves slowly down a mountain under the influence of gravity.
- Unlike an ice glacier, rock glaciers usually have very little ice visible at the surface.
- The rock glacier might consist of a mass of ice covered by rock debris, or it might consist of a mass of rock with interstitial ice.
- Formation:
 - Rock glaciers typically form in mountainous regions where there is a combination of permafrost, rock debris, and ice.
 - One common scenario involves a pre-existing glacier that accumulates debris and rocks as it moves.
 - Over time, if the glacier recedes or thaws, the debris-covered ice can transform into a rock glacier.
- These are classified as 'active' or 'relict' to indicate the status of permafrost within them, identified by the appearance of the rock surfaces.
- Impacts
 - It increases the risk of glacial lake outburst floods (GLOFs).
 - It may also make landslides more frequent with the land on the melting ice becoming loose.

3. Momentum Investing

- Many academic studies have shown that momentum investing can generate high returns that comfortably beat the benchmark indices.

About Momentum Investing:

- It refers to a style of investing wherein investors purchase assets such as stocks or bonds that are consistently rising in price while selling assets whose prices are falling.
- Momentum investors buy assets with rising prices in the hope that the upward price momentum of these assets would continue, thus allowing them to sell these assets at higher prices in the future to make profits.
- It is based on the philosophy that there can be discernible trends in asset prices and that these trends tend to persist over time.
- The persistence of such trends gives investors an opportunity to recognise and participate in them early enough to make significant profits from their investments.
- Similarly, they sell assets that are falling in price expecting the fall in prices to continue for some time.
- Momentum investors generally do not conduct a deep analysis of the fundamental or intrinsic value of the assets in which they invest their money.
- They invest purely based on whether the price of an asset is showing a strong trend, either upward or downward, that they can ride on.
- The "buy high, sell higher" philosophy of momentum investing is in stark contrast to the traditional "buy low, sell high" advice given to investors.

4. Henley Passport Index 2024

- The average number of visa-free destinations has nearly doubled since 2006, according to the 2024 Henley Passport Index.

About Henley Passport Index:

- It is the original, authoritative ranking of all the world's passports according to the number of destinations their holders can access without a prior visa.
- It started in 2006 as the Henley & Partners Visa Restrictions Index (HVRI).
- The index is based on exclusive data from the International Air Transport Association (IATA), the largest, most accurate travel information database, and enhanced by Henley & Partners' research team. (Henley & Partners is a London-based advisory firm).
- The index includes 199 different passports and 227 different travel destinations.
- The number of countries that a specific passport can access becomes its visa-free 'score'.

- Highlights of Henley Passport Index 2024:
 - France, Germany, Italy, Japan, Singapore, and Spain hold the top spot as the world's most powerful passports, allowing visa-free entry to 194 global destinations.
 - The top 10 is largely dominated by European countries.
 - The average number of destinations travellers are able to access visa-free has nearly doubled, from 58 in 2006 to 111 in 2024.
 - India's passport ranked 80th in the list, with citizens allowed to travel to 62 countries without a visa.
 - Afghanistan occupies the bottom spot on the list, with access to just 28 countries without a visa.
 - Syria, with visa-free access to only 29 destinations, holds the second-lowest position, followed by Iraq with 31 and Pakistan with 34.
 - The United Arab Emirates was the fastest climber over the past decade, jumping to 11th place and offering access to 183 destinations without a visa.

5. Kateel Yakshagana Mela

- A century-old Yakshagana mela in Dakshina Kannada will resume its all-night performances following approval from the Karnataka High Court.

About Kateel Yakshagana mela:

- It is a famous Yakshagana troupe started in the mid-19th century.
- The Yakshagana troupe, Kateel Sri Durgaparameshwari Yakshagana Dashavatara Mandali, popularly known as Kateel Mela is an important 'Harake Seva' (hosting the Yakshagana show for God fulfilling a wish) troupe.
- It performs on request by devotees who have taken a vow (Harake) to arrange a show of Yakshagana for fulfillment of a desire or as a service.

Key facts about Yakshagana:

- It is a traditional folk dance form popular in Coastal Karnataka.
- It is a rare combination of dance, music, song, scholarly dialogues and colourful costumes.
- Traditionally, men portray all roles, including the female ones, though women are now part of Yakshagana troupes.
- A typical troupe consists of 15 to 20 actors and a Bhagawatha, who is the master of ceremonies and the main storyteller.
- Elements of Yakshagana
 - The Act: Each performance typically focuses on a small sub-story (known as 'Prasanga') from ancient Hindu epics of Ramayana or Mahabharata.
 - The show consists of both stage performances by talented artists and commentary (performed by the lead singer or Bhagawatha) accompanied by traditional music.
 - The Music: Musical instruments used in Yakshagana include Chande (drums), Harmonium, Maddale, Taala (mini metal clappers) and flute among others.
 - The Dress: Costumes used in Yakshagana are very unique and elaborate. Large size headgear, coloured faces, elaborate costumes all over the body and musical beads on the legs (Gejje).

ANSWER WRITING

Explaining the concept, state the significance of and challenges to the carbon markets.

To keep global warming within 2 degrees Celsius, multiple steps are being promoted to limit carbon emissions like NDCs (Nationally Determined Contributions). To meet NDCs, Carbon Markets are used as a tool for putting a price on carbon emissions by establishing a trading system where carbon credits (a tradable permit, equal to one tonne of CO₂ removed, reduced or sequestered from the atmosphere) can be bought and sold.

They broadly are of two types:

- a) Compliance Markets: officially regulated - set up by policies at the national, regional and International Levels. For example, the EU's emissions trading system (ETS) – operates under a principle of cap-and-trade.
- b) Voluntary Markets: corporations and private individuals buy and sell carbon credits. For instance, airlines may purchase carbon credits from an entity in projects that reduce, remove, capture, or avoid emissions to offset their carbon footprints.

Significance:

- Limit industrial emissions and reduce carbon intensity in the economy.
- Will promote energy efficiency to sell credits by trading.
- Will help encourage a shift to cleaner fuels like achieving 500 GW of renewable energy capacity by 2030.
- Less fiscal burden on the government to implement reduction Goals.
- Will lead to better environmental accounting while calculating economic growth.
- Move towards the achievement of net zero emissions by 2070.

Challenges:

- The problem of double counting of reductions.
- Lack of transparency in markets as alleged under the Clean Development Mechanism of Kyoto leads to trust issues.
- Questions on the quality and authenticity of climate projects that generate carbon credits lead to concerns of greenwashing (false labelling just for marketing purposes).

Conclusion

Government of India has come up with a stabilisation fund to decrease volatility in prices and bolster the carbon trading market. Aligning the market with our Nationally Determined Contributions along with ensuring transparency in institutional and financial infrastructure for transactions can help us move towards Net zero targets to stand as an example (Vishwaguru) for the world to follow.

MCQs

- Consider the following pairs of Partnership Initiatives and relevant partners:
 - Strategic Clean Energy Partnership: India-USA
 - Green Hydrogen Taskforce: India-Australia
 - Green strategic partnership: India-Denmark
 How many of the above pairs are correctly matched?

(a) Only one (b) Only two
(c) **All three** (d) None
- ICD11 is an international standard, related to

(a) **Traditional medicine**
(b) White good production
(c) Intellectual property rights
(d) Shipbuilding industry
- The report "World Employment and Social Outlook Trends 2024" has been released by

(a) Organisation for Economic Co-operation and Development (OECD)
(b) **International Labour Organisation (ILO)**
(c) World Bank (WB)
(d) International Monetary Fund (IMF)
- Consider the following statements:
 - It is a traditional folk dance form popular in Coastal Karnataka.
 - It is a famous Yakshagaana troupe started in the mid-19th century.
 - It is a rare combination of dance, music, song, scholarly dialogues and colourful costumes.
 How many of the above statements are correct?

(a) Only one (b) Only two
(c) **All three** (d) None
- Consider the following statements about the 'Sisal' plant:
 - Sisal is a xerophytic plant.
 - These are grown in the states of Odisha, Jharkhand, Maharashtra and Bihar.
 - Sisal plants are prone to Zebra disease.
 How many of the above statements are correct?

(a) Only one (b) Only two
(c) **All three** (d) None
- With reference to Superconductivity, consider the following statements:
 - Superconductivity refers to a state in which a material offers zero, or near-zero, resistance to electric current.
 - The first material to have been discovered to show super conductive properties was Mercury.
- Which of the statements given above are incorrect?

(a) 1 only (b) **2 only**
(c) Both 1 and 2 (d) Neither 1 nor 2
- Identify the incorrect statement in the context of the Anti-defection.

(a) It is covered in 10th Schedule of the Constitution.
(b) A nominated member becomes disqualified if s/he joins any political party after expiry of 6 months from the date on which he takes the seat.
(c) It allows a political party to merge with or into another party provided at 2/3rd of its legislators is in favour.
(d) **An independent house member is not disqualified if he/she joins any political party after the election.**
- Consider the following statements about Henley Passport Index:
 - It started in 2006 as the Henley & Partners Visa Restrictions Index (HVRI).
 - The index includes 199 different passports and 227 different travel destinations.
 - India's passport ranked 80th in the list, with citizens allowed to travel to 62 countries without a visa.
 How many of the above statements are correct?

(a) Only one (b) Only two
(c) **All three** (d) None
- With reference to the Northern Black Polished Ware (NBPW) phase, consider the following pairs:

Terms	Meaning
1. Bhojaka	: Village headman.
2. Shaulkika	: Rich peasants of the village.
3. Gahapatis	: Toll collecting officers.

 How many of the above pairs are incorrectly matched?

(a) Only one pair (b) **Only two pairs**
(c) All three pairs (d) None
- With reference to Sickle Cell Disease, consider the following:
 - It is hereditary in nature.
 - It restricts the formation of White Blood Cells.
 - There is currently no cure for the Sickle Cell Disease.
 How many of the above statements are correct?

(a) **Only one** (b) Only two
(c) All three (d) None