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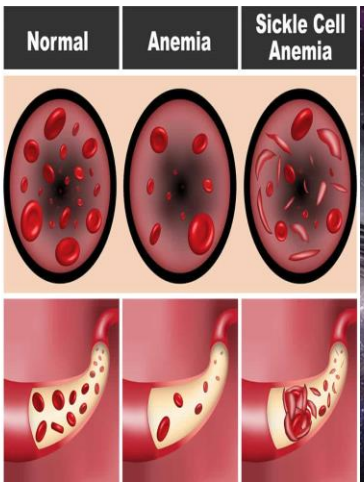
GES REPORTER

The Best magazine for Geography, Environment and Science Current Affairs



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CURRENT AFFAIRS

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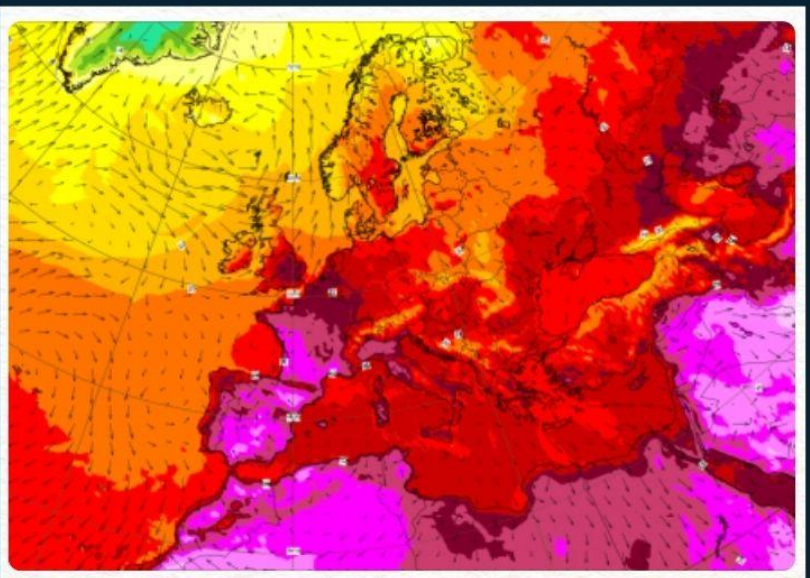

Fault with solar energy

According to the Central Electricity Authority, which was once the final arbiter in electricity matters, moving electricity through high voltage wires is cheaper than moving coal.

- Solar electricity is intermittent and coal electricity is continuous.
- So, you have to add the cost of storage by battery.
- Protagonists of solar power will want us to add the environmental cost of carbon to coal for its greenhouse gas emissions
- Solar energy is made financially viable by misguiding the people by leaving out storage battery cost; handicapping it with subsidies and concessions that are front loaded by the government,
- and forcing it on the industry and hapless discoms through state policy
- We can do more renewable energy in large hydro, which is both low carbon and least cost.
- India has utilised only about 15% of its hydro potential whereas the U.S. and Europe have utilised 90% and 98% of their potential, respectively.
- The extent of utilisation of hydro potential seems to be an index of civilisational development and evolution.
- While China relies on renewable energy, it banks more on coal and hydro.
- The Three Gorges project on the Yangtze is the world's biggest hydro electric project.

Myanmar crisis

There are three camps now in Myanmar:

- the military, which wields power in major towns;
- the opposition named the National Unity Government (NUG) and its partners, which call the shots in the countryside;
- and the ethnic groups on the geographic periphery, which are divided into those which are pro military, pro-NUG, or neutral
- The economy traverses a difficult terrain, marked by a sharp decline in GDP,

- And a massive rise in poverty, unemployment and inflation.
- The currency is in free fall
- On December 21, 2022, the UN Security Council adopted Resolution 2669, expressing deep concern about the situation and urging the release of all political prisoners.
- It attracted no veto, only abstentions by China, Russia, and India.

- But even with such rare unity, the UN has failed to move the military, known for its stubbornness and inflexibility.
- The UN is supportive of ASEAN, ever keen to play a mediator's role in Myanmar.
- But the Myanmar government refuses to cooperate with ASEAN.
- In April 2021, Commander-in-Chief Min Aung Hlaing accepted ASEAN's 'Five-Point Consensus' formula as a way out, but later he resiled from it, refusing to make any concessions to the opposition. The ASEAN persists, but only in form
- China has extensive interests ranging from the strategic to economic domains.
- It dislikes instability, but has enough partners enabling it to keep consolidating its position.
- Shunned by the West due to the war in Ukraine, Russia has found a willing partner in Myanmar's generals who need Russian arms, training and political support.

PVTG

- As Union Finance Minister announced to launch the Pradhan Mantri PVTG (Particularly Vulnerable Tribal Group) Development Mission in order to saturate the PVTG families and habitations with basic facilities, Odisha being home to the highest number of PVTG communities in the country is likely to be benefited the most.
- In fact, given the amount of experience Odisha possesses in handling focused and holistic programmes for PVTGs in the past decade, the State could be a first as well as best-mover among all States as far as the newly announced tribal programme was concerned.
- Of the 75 PVTGs identified in India, 13 such tribes live in Odisha
- Odisha has also been a beneficiary of the Conservation- cum -Development (CCD) scheme, for which the Union Ministry of Tribal Affairs allocates 100% financial assistance to the State governments having PVTG communities
- Tribal communities are often identified by some specific signs such as primitive traits, distinctive culture, geographical isolation, shyness to contact with the community at large and backwardness.
- Along with these, some tribal groups have some specific features such as dependency on hunting, gathering for food, having pre-agriculture level of technology, zero or negative growth of population and extremely low level of literacy.
- These groups are called Particularly Vulnerable Tribal Groups.

  PVTGs are more vulnerable among the tribal groups.

  Government of India follows the following criteria for identifiaction of PVTGs.
- Pre-agricultural level of technology
- Low level of literacy

- Economic backwardness
- A declining or stagnant population.

Accordingly 75 PTVGs have been identified in the country.

The characteristics of PVTGs

- In 1973, the Dhebar Commission created Primitive Tribal Groups (PTGs) as a separate category, who are less developed among the tribal groups.
- In 2006, the Government of India renamed the PTGs as Particularly Vulnerable Tribal Groups (PVTGs).
- PVTGs have some basic characteristics -they are mostly homogenous, with a small population, relatively physically isolated, social institutes cast in a simple mould, absence of written language, relatively simple technology and a slower rate of change etc.

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iCET

- India and the U.S., on Tuesday, launched a programme to enhance their strategic partnership
- Inaugural dialogue of the Initiative on Critical and Emerging Technologies (iCET). The two sides announced a set of programmes whose aim is to increase the depth and scope of bilateral cooperation in cutting edge technology, including in the defence sector.
- The iCET seeks to build supply chains which increase co-production and co-development between the countries and increase linkages between the countries' start-up ecosystems, both governments said in their statements describing the dialogue.
- A White House 'fact sheet' released after the meeting highlighted six areas of planned cooperation: strengthening innovation ecosystems, defence innovation and technology cooperation, resilient semiconductor supply chains, space, STEM talent and next generation telecommunications.
- The programmes include a Research Agency Partnership between the U.S. National Science Foundation and Indian science agencies;
- A mechanism to cooperate on quantum computing that will also involve academia and industry;
- developing a new defence industrial cooperation roadmap;
- supporting the development of semiconductors in India, including by setting up a taskforce to identify opportunities; and increasing space cooperation, including human spaceflight
- Also announced was a private -public dialogue to further 5G/6G cooperation and the adoption of Open

RAN (technology to connect phones to each other and to the Internet) in India.

- The U.S. also committed to a speedy review of an application from General Electric to produce jet engines in India for India- manufactured Light Combat Aircraft
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- The U.S. also committed to a speedy review of an application from General Electric to produce jet engines in India for India- manufactured Light Combat Aircraft
- Among the more consequential areas of cooperation was in nuclear energy where the U.S. helped build India's first reactors for research and power.
- Entire generations of Indian nuclear scientists were trained in the U.S., including some who subsequently helped in making nuclear weapons.
- But this cooperation was abruptly ended after India's first nuclear test in 1974.
- After the Soviet collapse, the U.S. pushed for the unconditional extension of the non-proliferation treaty and began to arm- twist countries to sign a Comprehensive Nuclear Test Ban Treaty.
- At this stage, India realised that there was no option but to come out as a declared nuclear weapons power.
- There was another round of sanctions after the 1998 nuclear tests, but by this time the U.S. had begun to get a measure of the challenge it was facing from China

New start treaty

- The New Strategic Arms Reduction Treaty (New START) was signed April 8, 2010, in Prague by the United States and Russia and entered into force on Feb. 5, 2011.
- New START replaced the 1991 START I treaty, which expired December 2009, and superseded the 2002 Strategic Offensive Reductions Treaty (SORT), which terminated when New START entered into force.
- New START continues the bipartisan process of verifiably reducing U.S. and Russian strategic nuclear arsenals begun by former Presidents Ronald Reagan and George H.W
- Main Treaty Limits (Article II).
- Nuclear warhead limit
- Missile, bomber and launcher limits
- Force structure: Each side has the flexibility to structure its nuclear forces as it wishes, within the overall limits of the treaty.
- New START (Strategic Arms Reduction Treaty) was the last remaining arms reduction pact between the former Cold War rivals and caps to 1,550 the number of nuclear warheads that can be deployed by Russia and the United States of America.
- Its duration was for ten years that is till 2021, but it was extended by five more years till 2026.

Upper Bhadra project

- This project was launched with the aim of irrigating 2,25,515 hectares by means of micro-irrigation in drought-prone districts of Chitradurga, Chikkamagaluru, Davangere and Tumakuru.
- It will fill up 367 tanks under drought prone taluks of three districts through Chitradurga and Tumakuru branch canals.
- This project was launched with the objective of providing sustainable irrigation facility in Kharif season.
- Its other objectives include recharging groundwater table and diluting chemical contaminants of which Fluoride is predominant. It is worth Rs 16,125 crore project.
- The Upper Bhadra Project is being undertaken by Visvesvaraya Jala Nigam Ltd.
- It is a major lift irrigation scheme under implementation in Karnataka. In the first stage, this project

would lift water, from Tunga to Bhadra

CITES

The Convention on International Trade in Endangered Species (CITES) is a multilateral treaty designed to ensure that international trade in specimens of wild animals and plants does not threaten the survival of the species in the wild, and it accords varying degrees of protection to more than 33,000 species of animals and plants

- CITES was drafted as a result of a resolution adopted in 1963 at a meeting of members of IUCN (The World Conservation Union).
- The text of the Convention was finally agreed at a meeting of representatives of 80 countries in Washington, D.C., United States of America, on 3 March 1973, and on 1 July 1975 CITES entered in force.
- CITES is an international agreement to which States and regional economic integration organizations adhere voluntarily.
- States that have agreed to be bound by the Convention ('joined' CITES) are known as Parties.
- Although CITES is legally binding on the Parties in other words they have to implement the Convention – it does not take the place of national laws.
- Rather it provides a framework to be respected by each Party, which has to adopt its own domestic legislation to ensure that CITES is implemented at the national level
- TRAFFIC is an organization that was established in 1976 by WWF and IUCN as a wildlife trade monitoring network to undertake data collection, analysis, and provision of recommendations to inform decision making on wildlife trade.
- For over 40 years TRAFFIC performed that function as a leader in wildlife trade research, as a joint program of WWF and IUCN.
- TRAFFIC became an independent non-profit organization in 2017, with WWF and IUCN sitting on its Board of Directors along with independent Board members.
- TRAFFIC is renowned globally for its expertise and influence in the wildlife trade and conservation arena, as a provider of objective and reliable information.

- Its expert staff implements innovative projects and create new tools to deliver the mission of protecting nature and supporting sustainable development, by resolving wildlife trade challenges.

- TRAFFIC is a leading non-governmental organisation working globally on trade in wild animals and plants in the context of both biodiversity conservation and sustainable development
- TRAFFIC plays a unique and leading role as a global wildlife trade specialist.
- Carry out research, investigations and analysis to compile the evidence we use to catalyse action by governments, businesses and individuals, in collaboration with a wide range of partners, to help ensure that wildlife trade is not a threat to the conservation of nature.
- Connects across some of the world's most critical wildlife trade hotspots to identify and help address both biodiversity conservation and sustainable development challenges and opportunities linked to trade in wild species.

Energy transition

With the country's population set to overtake China's some time this year, India's appetite for energy to propel the economy is set to surge exponentially.

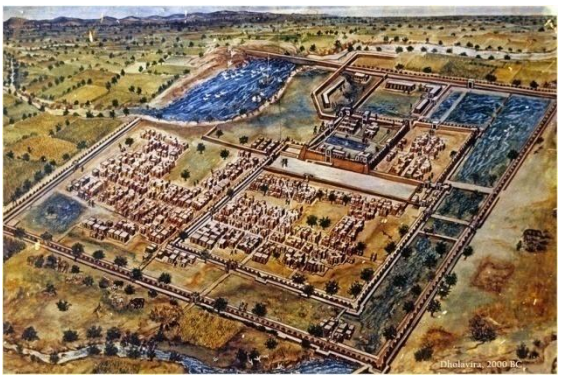
- The transition to green alternatives from the current reliance on fossil fuels is therefore an urgent imperative and an opportunity to leverage this move to catalyse new industries, generate jobs on a sizeable scale, and add to overall economic output.
- In a nod to this, Budget 2023-24 devoted a fair amount of space to the green industrial and economic transition needed.
- With the electric vehicle (EV) revolution poised to take off as every automobile major rolls out new EV models to tap demand, the availability of indigenously produced lithium-ion batteries has become a necessity, especially to lower the cost of EVs.
- The Budget hearteningly proposes to exempt customs duty on the import of capital goods and machinery required to manufacture lithium-ion cells used in EV batteries
- Another key proposal relates to the establishment of a viability gap funding mechanism to support the creation of battery energy storage systems with a capacity of 4,000 MWh.
- Energy storage systems are crucial in power grid stabilisation and essential as India increases its reliance on alternative sources of power generation including solar and wind.
- With wind turbine farms and solar photovoltaic projects characteristically producers of variable electric supply, battery storage systems become enablers of ensuring the electricity these generators produce at their peak output is stored and then supplied to match the demand arriving at the grid from household or industrial consumers.
- Ms. Sitharaman also set aside a vital ₹8,300 crore towards a ₹20,700 crore project for building an

inter-State transmission system for the evacuation and grid integration of 13 GW of renewable energy from Ladakh.

- With its vast stretches of barren land and one of the country's highest levels of sunlight availability, Ladakh is considered an ideal location to site photovoltaic arrays for producing a substantial capacity of solar power.

Archeological tourism

- The Ladpura Khas village of Madhya Pradesh, Khonoma village of Nagaland and heritage sites like Dholavira will be showcased as success stories of rural and archaeological tourism by India during the first tourism working group meeting of the G-20 nations to be held at the Rann of Kutch.
- Rural tourism and archaeological tourism will be the topics for two side events at the first tourism ministerial meeting of the G-20
- Ladpura Khas was nominated as the Best Rural Tourism Village by the UNWTO.
- India will also present the innovative model of community based Astrotourism that involves rural homestays and community spaces that are completely run by villagers and provides travellers an integrated experience of stargazing along with cultural immersion in the Himalayas



- While Nagaland's Khonoma Village will present the model of Ecotourism Management Board that develops Rural Tourism Products and promotes responsible travel.

What is archaeological tourism?

- Archaeotourism or Archaeological tourism is a form of cultural tourism, which aims to promote public interest in archaeology and the conservation of historical sites
- .Archaeological tourism can include all products associated with public archaeological promotion, including visits to archaeological sites, museums, interpretation centres, reenactments of historical occurrences, and the rediscovery of indigenous products, festivals, or theaters.

Observation balloon

- A reconnaissance balloon / observation balloon is a type of balloon that is employed as an aerial platform for gathering intelligence and spotting artillery.
- Use of observation balloons began during the French Revolutionary Wars, reaching their zenith during World War I, and they continue in limited use today. Synonyms include espionage balloon, reconnaissance balloon, and surveillance balloon.
- Historically, observation balloons were filled with hydrogen.
- The balloons were fabric envelopes filled with hydrogen gas, the flammable nature of which led to the destruction of hundreds of balloons
- Observers manning these observation balloons frequently had to use a parachute to evacuate their balloon when it came under attack.
- To avoid the potentially flammable consequences of hydrogen, observation balloons after World War I were often filled with non-flammable helium.

Pseudomonas aeruginosa

Chennai- based Global Pharma Healthcare has recalled its eye drops from the U.S. market after U.S. government agency Centers for Disease Control and Prevention said that several people have suffered from adverse events that are possibly associated with the use of the product

- The U.S. agencies were alerted while investigating an outbreak of a rare, drug resistant strain of Pseudomonas aeruginosa bacteria
- *Pseudomonas* is a type of bacteria (germ) that is found commonly in the environment, like in soil and in water.
- Of the many different types of *Pseudomonas*, the one that most often causes infections in humans is called *Pseudomonas aeruginosa*, which can cause infections in the blood, lungs (pneumonia), or other parts of the body after surgery.
- These bacteria are constantly finding new ways to avoid the effects of the antibiotics used to treat the infections they cause.
- Antibiotic resistance occurs when the germs no longer respond to the antibiotics designed to kill them.
- If they develop resistance to several types of antibiotics, these germs can become multidrug-resistant.

Embalming

- Specific ancient Egyptian recipes for chemical mixtures used in embalming different human body parts have been identified (Nature).
- The mummification process involved the use of many different embalming substances.
- Researchers found three different mixtures (which included substances such as elemi resin, Pistacia tree resin, by-products of juniper or cypress and beeswax) that were specifically used for embalming the head, and other mixtures used for washing the body or softening the skin
- Embalming is the process of preserving a body by delaying the natural effects of death.
- This is done by introducing specialist embalming solutions into the body after someone has passed away, helping to give them a more peaceful appearance

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Mammals in group

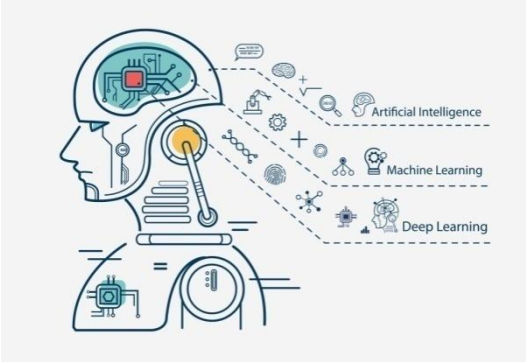
Mammals that live in groups may generally live longer than members of solitary species, suggests a new study (Nature Communications).

- The findings are based on an analysis of nearly 1,000 mammals including the golden snub-nosed monkey, bowhead whale and horseshoe bat and may improve our understanding of longevity in these species.
- They found that group -living species generally live longer than solitary species, supporting the correlated evolution of social organisation and longevity.

What is machine learning?

Machine learning is a branch of artificial intelligence (AI) and computer science which focuses on the use of data and algorithms to imitate the way that humans learn, gradually improving its accuracy.

- Machine learning is an important component of the growing field of data science.
- Through the use of statistical methods, algorithms are trained to make classifications or predictions, and to uncover key insights in data mining projects.
- These insights subsequently drive decision making within applications and businesses, ideally impacting key growth metrics.



- As big data continues to expand and grow, the market demand for data scientists will increase.
- The way in which deep learning and machine learning differ is in how each algorithm learns.
- "Deep" machine learning can use labeled datasets, also known as supervised learning, to inform its algorithm, but it doesn't necessarily require a labelled dataset.
- Deep learning can ingest unstructured data in its raw form (e.g., text or images), and it can automatically determine the set of features which distinguish different categories of data from one another.
- This eliminates some of the human intervention required and enables the use of larger data sets.
- Machine learning and deep machine learning
- Researchers have presented a machine learning method that could be used to identify unusual radio signals from space, while filtering out interference (Nature Astronomy).

Earth's volatile chemicals

- By analysing meteorites, researchers of Imperial College, London have uncovered the origin of Earth's volatile chemicals.
- They found that around half the Earth's inventory of zinc came from asteroids originating in the outer Solar System the part beyond the asteroid belt that includes the planets Jupiter, Saturn, and Uranus

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Magnetite and pollution

- **A**rea of environmental magnetism which is "magnetism as it depicts the impact of climate change, pollution and environmental footprints on magnetic minerals present in environmental samples such as soil, dust and sediments
- Magnetite was proportional to the traffic on a given road; it is produced when fossil fuels are combusted in vehicle engines.
- Using the microscope, they were able to classify the particles' surfaces as "rough and meld-like".
- According to their paper, "Meldlike structure of these particles is due to the high -temperature combustion of fossil fuels"

Climate change and hydropower generation

- Unlike coal -powered power plants, hydropower, which is the second highest power producing source at 13%, is a significant contributor to clean global electricity generation
- increase across the country due to substantial increase in precipitation leading to increased inflow to the reservoirs
- A warmer and wetter climate is projected to bring about 5%-33% increased rainfall.
- As a result, hydropower production is very likely to increase by 9%-36% for most dams and this will come from increased inflow (7-70%) into the dams.
- The dams in central India show significant increase compared to dams in north and south India
- Due to global warming, there will be a simultaneous rise in extreme inflow and high reservoir storage conditions for most dams
- "Reservoirs can help prevent flooding, but when they are already full and if the inflow is high, then the dams can create a floodlike situation due to sudden water release.
- Compared with central and south India, north India is projected to experience higher warming in the future.
- As per the study, the highest warming (about 5 degree C) is projected for north India, while the warming is projected to be around 3-4 degree C for central and south India.
- Similar to substantial warming, most reservoir catchments are likely to witness increased precipitation due to global warming
- The study found that inflow to a few dams in Ganga, Mahanadi, Brahmani, and west-coast river basins is projected to decline in the future.
- This reduction in inflow is due to increase in atmospheric water demands in response to the considerable warming compared to increase in precipitation.
- Dams in central India are projected to experience a more substantial increase in hydropower generation than north and central India
- Substantial warming projected for north India may reduce snow and glacial storage, reducing snowmelt water contribution in the long run

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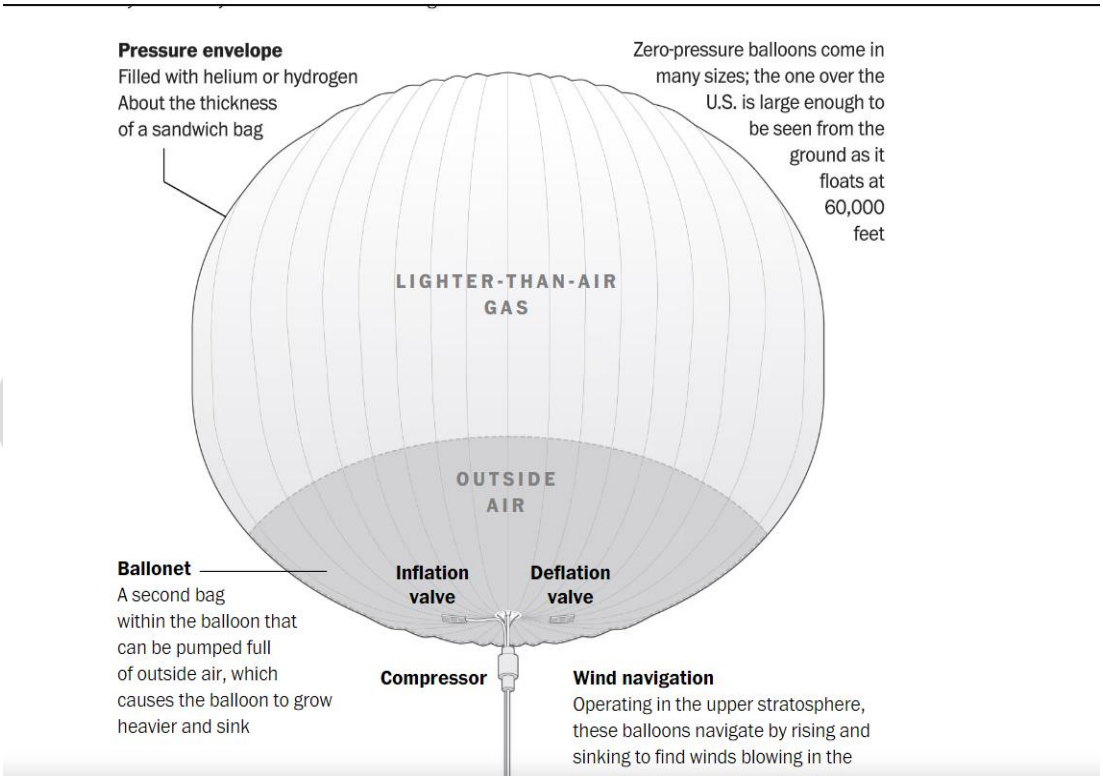
Stratospheric balloon

The balloon floating over the United States appears to match the general characteristics of what aerospace engineers call a zero-pressure ultra-long duration balloon, a high-tech eye in the sky that can hover over a target area for weeks or months

- balloon is using to maneuver through the stratosphere.
- Some high-altitude balloons are carried by the current, while others may use a semi autonomous navigation system to set their course.
- In some cases, they navigate by finding a wind current heading in the intended direction and lock into it by moving up or down in the air
- The Thunderhead balloon, for instance, made by the aerospace and defence contractor Aerostar for stratospheric missions, can search independently for optimal wind conditions.



Just Energy Transition Partnership (JET-P)

Just Energy Transition Partnership (JET-P) is emerging as the key mechanism for multilateral financing by developed countries to support an energy transition in developing countries.

- This has taken on particular significance following the insertion of the phrase ‘phase-down’ of coal in the Glasgow Pact.
- After South Africa, Indonesia, and Vietnam, India is considered the next candidate for a JET-Partnership. India’s G-20 presidency could potentially be an opportune moment to forge a deal.
- However, India must develop a coherent domestic just energy transition (JET) strategy in order to

negotiate a financing deal that addresses its unique set of socio-economic challenges

Issues that concern transitions

- Energy transitions could give rise to intra-generational, intergenerational, and spatial equity concerns.
- Transitions affect near-term fossil- dependent jobs, disrupt forms of future energy access, shrink State's capacity to spend on welfare programmes
- and thus exacerbate existing economic inequities between coal and other regions

- Existing JET-P deals, pay limited attention to intra -generational inequity, such as job losses resulting from a coal phase-down
- Energy transition in the industrialised world involves a natural tapering of energy consumption alongside fuel switching to clean energy sources;
- India's transition requires significant simultaneous growth in energy demand.
- The Central Electricity Authority projects a near doubling of electricity demand by 2030.
- A country that is likely to multiply its energy demand requires adequate supply from a diverse mix of sources. India cannot afford to put its development on hold while decarbonising.

The path to a clean energy quest

- India has signalled a commitment to clean energy with ambitious targets like 500GW of non fossil, including 450 GW renewable energy (RE) capacity addition and 43% RE purchase obligation by 2030.
- These targets are supported through complementary policy and legislative mandates (Energy Conservation (Amendment) Act), missions (National Green Hydrogen Mission), fiscal incentives (production -linked incentives) and market mechanisms (upcoming national carbon market
- acceleration in RE deployment rates to match the pace of demand growth is critical to India's JET
- :Solarisation of agricultural electricity demand
- Electrification of diesel- powered Micro, Small and Medium Enterprises (MSMEs); and decentralised RE for residential cooking and heating.
- Stimulation of energy demand through rural productivity enhancement will further aid RE acceleration as well as help to address the rural- urban economic divide, create rural jobs, and thereby address inter-generational and spatial inequities.
- Second, domestic manufacturing of clean energy components is critical to sustain a JET, build energy self-sufficiency, and tap the green jobs promise of 21st century energy
- While In dia has recognised the importance of domestic manufacturing, the challenge is in achieving cost competitiveness Indian components are 20% costlier than Chinese components.
- Giving preference to domestic components without addressing cost competitiveness may slow down the pace of deployment.

- Third, there is a case for re-aligning the current use of coal resources to enhance efficiencies until the period of phase-down.
- One option is to optimise use of coal- fired power plants closer to where coal is mined rather than based on energy demand in States.

5G auction

Government proposes to conduct the "required spectrum auctions" in 2022 to facilitate the roll-out of 5G mobile phone services in fiscal 2022-23 has understandably triggered speculation including about the feasibility of the timeline.

- The Government's keenness to expedite the roll-out was framed by Ms. Sitharaman as being propelled by an appreciation of the latest generation telecommunication technology's ability to serve as an enabler of economic growth and job creation
- However, most countries that have commercialised 5G so far largely find the technology still predominantly deployed as an upgraded replacement for 4G in terms of end use, with the industrial and public utility applications envisaged still at least a few years away.
- Also, for the new technology to work at its optimum potential the Government would need to not only offer the key operational frequencies including the below 1 GHz, the C-Band frequencies around 3.5 GHz, and the higher 26 GHz but also crucially enable the transport or backhaul of signals between the base stations and telecom operator's core network by offering no- to low-cost E-Band airwaves.
- With the COVID-19 pandemic having shown up the existing mobile networks' inadequacies in terms of reach, especially in enabling the delivery of education to remote and rural students, it may make the most sense to delay the introduction of 5G until policymakers are sure its economic payoff will outweigh the high cost

About 5G

- 5G is the fifth generation of cellular technology. It is designed to increase speed, reduce latency, and improve flexibility of wireless services. 5G technology has a theoretical peak speed of 20 Gbps, while the peak speed of 4G is only 1 Gbps.
- 5G also promises lower latency, which can improve the performance of business applications as well as other digital experiences (such as online gaming, videoconferencing, and self-driving cars)

Health data retention plan

In a welcome development, the National Health Authority (NHA) the body responsible for administering the Ayushman Bharat Digital Mission (ABDM) has initiated a consultation process on the retention of health data by health-care providers in India

The need for such a policy

- The Supreme Court of India has clarified that privacy is a fundamental right, and any interference into the right must pass a four-part test: legality; legitimate aim; proportionality, and appropriate safeguards.
- The mandatory retention of health data is one such form of interference with the right to privacy. In this context, the question of legality becomes a question about the legal standing and authority of the NHA

Balancing benefits and risks

- The aim of data retention is described in terms of benefits to the individual and the public at large.
- Individuals benefit through greater convenience and choice, created through portability of health records.
- The broader public benefits through research and innovation, driven by the availability of more and better data to analyse
- In particular, privacy risks should make us very hesitant about retaining an individual's entire health or medical record on the grounds that they might be useful for research someday

Possible safeguards

- The test for retaining data should be that a clear and specific case has been identified for such retention, following a rigorous process run by suitable authorities.
- A second safeguard would be to anonymise data that is being retained for research purposes again, unless a specific case is made for keeping personally identifiable information.
- An alternate basis for retaining data can be the express and informed consent of the individual in question

Rare insect

- Black percher or black ground skimmer (Diplacodes lefebvrii), a species of dragonfly, was sighted for the first time in the Seshachalam Hill ranges recently.
- It belongs to the phylum arthropoda, class insecta and order odonata.

Spy balloon

What are spy balloons?

- Spy balloons are high- altitude surveillance tools that usually operate at 80,000- 1,20,000 feet well above the cruising altitude of commercial aircraft to gather intelligence and carry out other military missions.
- Typically, a spy balloon is equipped with cameras and imaging devices suspended beneath the gas- filled white object to capture things of interest.
- Unlike satellites, balloons are economically viable.
- Due to their proximity to the Earth's surface, they can widely scan an area from close quarters and capture clearer, high resolution images of the target.
- The disadvantage is that these are not directly steered, but can be roughly guided by changing altitudes to catch different wind currents, as per a study by the Air Force's Airpower Research Institute.
- They are also a relatively easy target. Taiwan has accused the Peoples Liberation Army (PLA) of using spy balloons in the past.
- A similar sighting was reported over Andaman and Nicobar Islands in January last year

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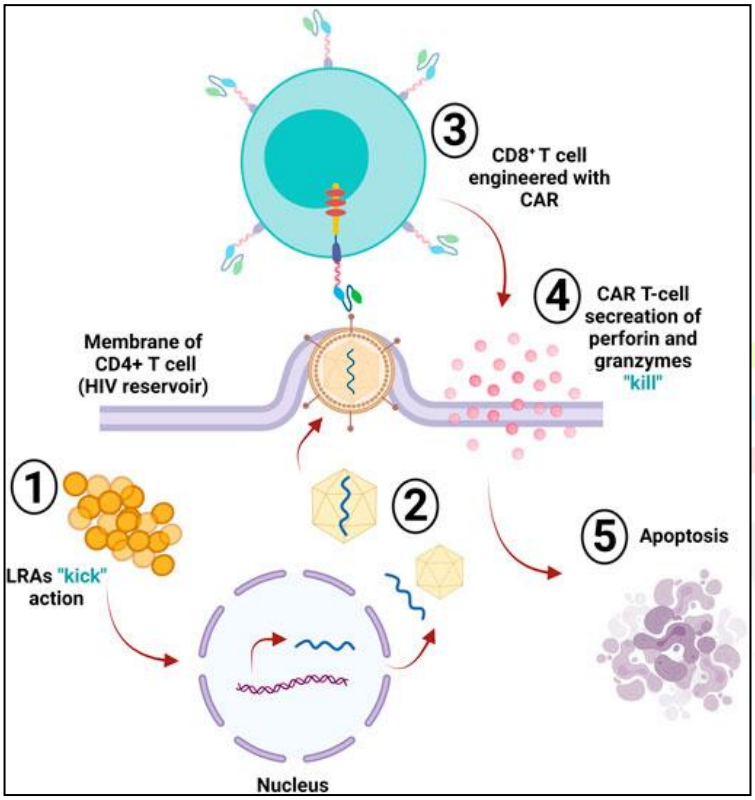
CAR -T therapy

- Chimeric antigen receptor (CAR) T-cell therapies represent a quantum leap in the sophistication of cancer treatment.
- Unlike chemotherapy or immunotherapy, which require mass -produced injectable or oral medication, CAR T-cell therapies use a patient's own cells.

- They are modified in the laboratory to activate T-cells, a component of immune cells, to attack tumours.
- These modified cells are then infused back into the patient's bloodstream after conditioning them to multiply more effectively
- The cells are even more specific than targeted agents and directly activate the patient's immune system against cancer, making the treatment more clinically effective.
- This is why they're called 'living drugs

How does it work?



- In CAR T-cell therapy, the patient's blood is drawn to harvest T-cells which are immune cells that play a major role in destroying tumour cells
- Researchers modify these cells in the laboratory so that they express specific proteins on their surface, known as chimeric antigen receptors (CAR).
- They have an affinity for proteins on the surface of tumour cells.
- This modification in the cellular structure allows CAR T-cells to effectively bind to the tumour and destroy it.

Where is it used?

- As of today, CAR T-cell therapy has been approved for leukaemias (cancers arising from the cells that produce white blood cells) and lymphomas (arising from the lymphatic system).
- These cancers occur through the unregulated reproduction of a single clone of cells, that is, following the cancerous transformation of a single type of cell, it produces millions of identical copies.
- Even for solid tumours like those of the prostate, lung, colon, and some other organs CAR T-cell therapy has shown results, particularly in patients whose tumours have recurred or have evaded multiple lines of treatment.
- The challenge with harnessing these techniques for solid tumours remains significant
- Progress in the field, however, has the potential to unlock a host of newer treatments on the horizon called cell therapies.
- They include personalised anti-cancer vaccines and tumour infiltrating lymphocyte therapies (where white blood cells that attack the tumour are extracted, modified, and reintroduced into the patient).

- Cancer constantly evolves to evade treatment; similarly, we also need to keep developing more sophisticated therapies with as few -side effects as possible.

Gaganyaan

- A Crew Module Recovery Model (CMRM) that simulates the mass, centre of gravity, outer dimensions, and externals of the actual crew module at touchdown was used for the trials.
- The sequence of operations required for the recovery of the crew module was carried out as part of the trials.
- As the safe recovery of the crew is the final step to be accomplished for any successful human spaceflight, it is of paramount importance and it has to be carried out with the minimum lapse of time.
- Hence the recovery procedures for various scenarios need to be extensively practiced by carrying out a large number of trials.
- The Standard Operating Procedures (SoPs) for recovery of crew and the crew module need to be finalized
- Gaganyaan project envisages demonstration of human spaceflight capability by launching crew of 3 members to an orbit of 400 km for a 3 days mission and bring them back safely to earth, by landing in Indian sea waters.
- The project is accomplished through an optimal strategy by considering inhouse expertise, experience of Indian industry, intellectual capabilities of Indian academia & research institutions along with cutting edge technologies available with international agencies.
- The pre-requisites for Gaganyaan mission include development of many critical technologies including human rated launch vehicle for carrying crew safely to space, Life Support System to provide an earth like environment to crew in space, crew emergency escape provision and evolving crew management aspects for training, recovery and rehabilitation of crew.
- Various precursor missions are planned for demonstrating the Technology Preparedness Levels before carrying out the actual Human Space Flight mission.
- These demonstrator missions include Integrated Air Drop Test (IADT), Pad Abort Test (PAT) and Test Vehicle (TV) flights. Safety and reliability of all systems will be proven in unmanned missions preceding manned mission.

Human rated LVM3 - HLVM3

- LVM3 rocket - The well proven and reliable heavy lift launcher of ISRO, is identified as the launch vehicle for Gaganyaan mission.
- It consists of solid stage, liquid stage and cryogenic stage.
- All systems in LVM3 launch vehicle are re-configured to meet human rating requirements and christened Human Rated LVM3.
- HLVM3 will be capable of launching the Orbital Module to an intended Low Earth Orbit of 400 km.

QRSAM- quick reaction surface -to- air missile

Application

Quick reaction surface to air missile (QRSAM) is a quick reaction Surface to Air Missile capable of Search on Move, Track on Move and Fire on Short halts.

Features:

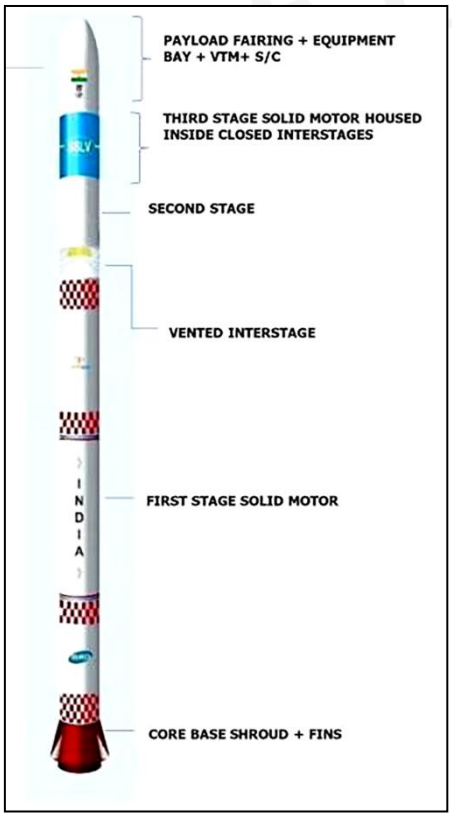
- Length : 4364 mm
- Weight : 270 kgs
- Range & Altitude : 05 to 30 Km & 6 Km
- SSKP : > 80%
- Length & Dia : 4.4 m & 0.225 m
- Propulsion : Single Stage Solid Rocket Motor
- Guidance : Mid Course Inertial + Target Update Terminal Active Homing Seeker
- Warhead : Pre-Fragmented & High Energy
- Launch : Canisterized Inclined Launch
- Engagement : Simultaneous 6 Targets

Why Shimla is losing snow?

Local residents and environmentalists blame unchecked urbanisation for the shrinking snowline

- The hill city has lost its green cover as trees have been cut down mercilessly.
- Vehicular pollution has increased the temperatures, which is the primary reason why snow eludes Shimla"
- Reckless cutting of hills, construction of multi-storey concrete buildings, manifold increase in population and increasing human activity have become the bane of Shimla and the town is now warmer than plains during winters
- Apple growers in the upper Shimla region are now deprived of "white manure" (snow), and are adopting new varieties and techniques to sustain.
- Temperatures are low in December and January but adequate moisture is not available due to scanty snowfall.
- As a result, the cropping pattern is changing with apple growers taking to high density apple plantation.

SSLV



- The Indian Space Research Organisation (ISRO) will undertake the second development flight of the Small Satellite Launch Vehicle (SSLV) from Sriharikota
- The vehicle is intended to inject the ISRO's EOS-07, the U.S.-based firm Antaris's Janus-1 and the Chennai-based space start-up Space Kidz's AzaadiSAT-2 satellites into a 450-km circular orbit in its 15-minute flight.
- The EOS-07 is a 156.3-kg satellite designed, developed and realised by the ISRO.
- Its mission objective is to design and develop payload instruments compatible with micro satellite bus and technologies that are required for future operational satellites.
- It would design and develop a micro satellite accommodating new technology payloads in a quick turnaround time.

- New experiments include mm-Wave humidity sounder and spectrum monitoring payload.
- Weighing around 10.2 kg, Janus-1 is a technology demonstrator, smart satellite mission based on the Antaris software platform.
- A 8.7-kg satellite, AzaadiSAT-2 is a combined effort of about 750 girl students across India guided by Space Kidz India, Chennai.

Infrastructure and environment case study

- A 7-km undersea tunnel will be constructed for the bullet train project in a bid to save about 12 hectares of mangrove forests in Maharashtra's Thane creek.
- This will escalate the construction cost of the Mumbai Ahmedabad High Speed Rail Corridor project's 21- km stretch from Bandra Kurla Complex Station to Shilphata, from ₹100 crore to ₹10,000 crore
- China's military is likely behind a huge aerial spy programme that has targeted more than 40 countries on five continents with high altitude surveillance balloons similar to one the U.S. shot down over the Atlantic coast last weekend, the Biden administration said on Thursday.
- The fleet of balloons is used specifically for spying, outfitted with hightech equipment and capable of collecting communications signals and other sensitive information from targets across the globe, the U.S. government said.

Discovery of lithium in J&k

The discovery of 5.9 tonnes of lithium deposits in Jammu and Kashmir, a first for India, would reduce the need for imports and improve employment opportunities, officials in the Union Territory

- The find was a major boost to the manufacture of rechargeable batteries for smartphones, laptops and electric cars.
- The lithium inferred resources have been established in Reasi district.
- "There was a presence of bauxite in composite form and during its processing lithium was also discovered
- News of the discovery of "5.9 million tonnes inferred resources of lithium" in the Salal-Haimana area of Reasi district, Jammu & Kashmir, by the Geological Survey of India has been received as a game-changer in India's impending transition to a green economy.
- The term 'inferred' refers to the 'preliminary exploration stage',

Why is this significant?

- Lithium-ion batteries are used in wind turbines, solar panels, and electric vehicles, all of which are crucial in a green economy.
- A World Bank study suggests that the demand for critical metals such as lithium (Li) and cobalt is expected to rise by nearly 500% by 2050.
- While "the global electric vehicle market is projected to reach $823.75 billion by 2030, registering a compounded annual growth rate (CAGR) of 18.2% from 2021 to 2030," India's market is projected to register a CAGR of 23.76% by 2028.
- India is seeking to secure its critical mineral supplies and build self- sufficiency in this sector.
- As India currently imports all of its Li from Australia and Argentina and 70% of its Li-ion cell requirement from China and Hong Kong, the lithium reserves in J&K could boost the domestic battery- manufacturing industry
- The J&K reserves will also help advance the Indian government's ambitious plan of "30% EV penetration in private cars, 70% for commercial vehicles, and 80% for two and three -wheelers by 2030 for the automobile industry."
- They will strengthen India's National Mission on Transformative Mobility and Battery Storage as well.

How much lithium does the world need?

- The global market for the alkali metal lithium is growing rapidly. Between 2008 and 2018 alone, annual production in the major producing countries rose from 25,400 to 85,000 tons.
- An important growth driver is its use in the batteries of electric vehicles. However, lithium is also used in the batteries of laptops and cell phones, as well as in the glass and ceramics industry.

Where is lithium available from?

- With 8 million tons, Chile has the world's largest known lithium reserves.
- This puts the South American country ahead of Australia (2.7 million tons), Argentina (2 million tons) and China (1 million tons).
- Within Europe, Portugal has smaller quantities of the valuable raw material.
- The total global reserves are estimated at 14 million tons. This corresponds to 165 times the production volume in 2018.

Where is the most lithium mined?

- With 51,000 tons, Australia was by far the most important supplier of lithium in 2018 – ahead of Chile

(16,000 tons), China (8,000 tons) and Argentina (6,200 tons).

- This is shown by figures from the USGS (United States Geological Survey).
- The four countries mentioned have long dominated the picture, with Australia only gaining a clear lead over Chile in recent years.

How do the mining methods differ?

- Put simply, lithium from Australia comes from ore mining, while in Chile and Argentina lithium comes from salt deserts, so-called salars.
- The extraction of raw materials from salars functions as follows: lithium-containing saltwater from underground lakes is brought to the surface and evaporates in large basins.
- The remaining saline solution is further processed in several stages until the lithium is suitable for use in batteries.

Why is lithium mining under criticism?

- There are always critical reports on the extraction of lithium from salars: In some areas, locals complain about increasing droughts, which for example threatens livestock farming or leads to vegetation drying out.
- From the point of view of experts, it is still unclear to what extent the drought is actually related to lithium mining.
- It is undisputed that no drinking water is needed for the lithium production itself.
- What is disputed, on the other hand, is the extent to which the extraction of saltwater leads to an influx of fresh water and thus influences the groundwater at the edge of the salars.
- In order to assess this, the underground water flows in the Atacama Desert in Chile, for example, have not yet been sufficiently researched.

What are the geostrategic concerns?

- Critical mineral dependencies constitute a major geostrategic concern in the transition to net-zero carbon energy systems.
- In the present scenario, as countries seek to avoid dependencies and vulnerabilities related to critical minerals, the latter are likely to be at least as important as oil and gas in the near future.
- A high level of dependence on China for Li and other crucial metals and their derivatives are also perceived to be sources of energy security risks.
- China currently controls 77% of the global lithium- ion battery manufacturing capacity and is home to six of the world's 10 manufacturing companies
- The growing geopolitical rivalry with China makes India's security considerations more immediate as well, especially also in light of the longstanding, and recently escalating, territorial and border disputes

What are the environmental effects?

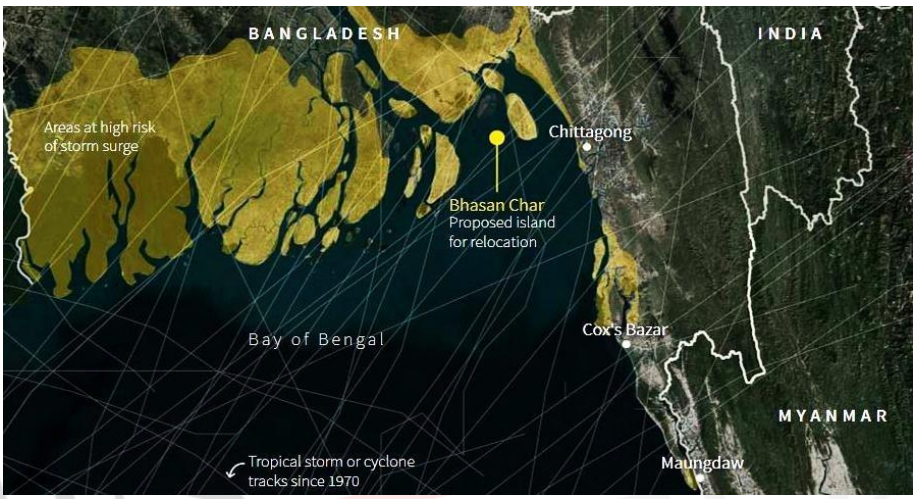
- The applications of Li in renewable energy infrastructure often obscures its significant environmental consequences.
- Extracting Li from hard rock mines, similar to what has already been proposed in J&K, entails open -pit -mining followed by roasting the ore using fossil fuels.
- Industry estimates suggest that this process consumes 170 cubic metres of water and releases 15 tonnes of CO2 for every tonne of Li extracted.
- Open -pit- mining, refining, and waste disposal from these processes substantially degrade the environment, including depleting and contaminating waterways and groundwater, diminishing biodiversity, and releasing considerable air pollution.
- This said, the geological context of mining in J&K differs from Australia, which has the largest Li stock in hard rock mines, in one major way.
- In Australia, Li-bearing pegmatite deposits are found in the ancient geological regions of Pilbara and Yilgarn cratons, whose continental rocks have been stable for over a billion years.
- The Himalaya on the other hand is the youngest mountain range in the world and is much more unstable (as evidenced by the ongoing tragedy in Joshimath).
- Incidents of land sinking have also been reported from a village in Doda district in Chenab valley, which extends to some parts of Reasi.
- the 'lithium triangle' of Bolivia, Chile, and Argentina, which contain roughly half the world's known Li.
- Indigenous resistance and increased awareness of the environmental impact of Li-mining has prompted global carmakers, including Mercedes -Benz and Volkswagen, to look for Li mined with the lowest socio ecological impact. Other corporations are making similar amends.

  What safeguards does India's mining sector have?

  State government officials in J&K have said plans for Li exploration will involve local communities, who will also be prioritised for jobs in exploration and mine development.
- Yet employment in mining may not fully offset the consequences on local agriculture, animal husbandry, and tourism.
- In recognition of the local effects of mining, in 2015, the Lok Sabha amended the Mines and Minerals (Development and Regulation) Act 1957 to establish the 'District Mineral Foundation' (DMF).
- The DMF is a non-profit statutory 'trust' for every Indian district affected by mining- related operations that should "work for the interest and benefit of persons, and areas affected by mining -related operations"
- In practice, the DMFs have become sites of centralised bureaucratic control, without meaningful public participation or accountability

Char

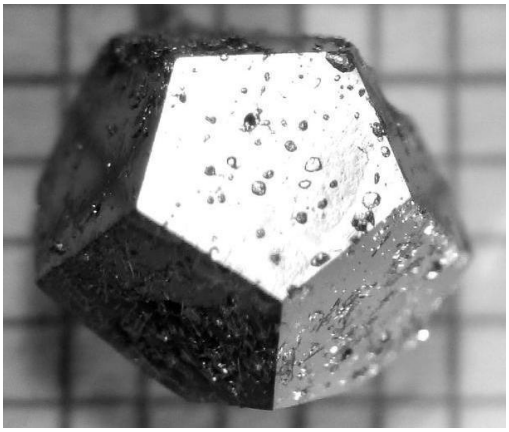
- Birders, wildlife enthusiasts and forest officials have sighted 145 different bird species during the first Sundarban bird festival.
- The first- ever festival was organised by the Sundarban Tiger Reserve (STR) division of West Bengal Forest Department, where six teams visited different areas inside the Sundarban Biosphere Reserve
- Despite being home to so many species of birds the habitats face threats including plantation activity along the chars (river islands) which disturbs the birds, and illegal activities along chars and uninhabited islands.



What are char?

- Char a tract of land surrounded by the waters of an ocean, sea, lake, or stream; it usually means, any accretion in a river course or estuary.
- It includes all types of bars including both lateral (point-bars) and medial (braid-bars).
- eq-Bhashan Char island was formed about two decades ago on the mouth of river Meghna.
- The uninhabited island is located around 30 kilometres east of Hatiya island in South-East Bangladesh.

Quasicrystal



- Scientists have reported finding only the third natural source of quasicrystals, a material once deemed impossible and whose unusual properties scientists are still unravelling.
- In a crystal, the atoms are arranged in a pattern that periodically repeats itself.
- A quasicrystal atoms are arranged in a pattern that repeats itself at irregular intervals. Quasicrystals were discovered in the

lab in 1982.

- In the late 1990s, scientists began looking for quasicrystals in nature.
- After a decade-long quest, Luca Bindi, Paul Steinhardt, and others reported finding the first natural quasicrystal in 2009 as microscopic grains in a piece of the Khatyrka meteorite in the Koryak mountains of Russia.
- This meteorite was involved in several collisions in space over millions of years, heating and pressurising it to a great degree and creating the quasicrystals.
- Reported finding a quasicrystal in the remains of the first nuclear weapon test, conducted on July 16, 1945, in New Mexico.

Collapse of Hittie empire

- A major drought that occurred in central Anatolia between around 1198 BC and 1196 BC may have had a key role in the collapse of the Hittite Empire (Nature).
- The findings suggest that extreme climate change can push populations beyond their limits.
- Researchers created a high- resolution dryness record using stable isotope records and measurements from tree rings of juniper trees in central Anatolia.
- They identified an unusually severe dry period around 1198 BC and 1196 BC causing severe drought.

Loss of wetland

- The world lost about 20% of its natural wetlands between 1700 and 2020, says a new study (Nature).
- Researchers reconstructed the timing and spatial distribution of wetland loss due to human intervention by combining 3,320 international and regional records of wetland drainage and land conversion from 154 countries.
- They estimate that 3.4 million square km of inland wetlands have been lost since 1700, a net loss of 21% of global wetlands.

Millets for healthier future

Half of all calories consumed by humans come from maize, rice and wheat.

- We depend on 13 crops for 80% of our nutritional needs. Their inventories will dwindle as climate change leads to erratic rainfall and weather extremes.
- There is a need for growing hardier species to help secure our needs, which is why millets are gaining significance.
- Millets are grown in warm regions with poor soil and yield large crops of small seeds which are used to make flour.
- Some examples of millets are pearl millet or bajra, sorghum or jowar, finger millet or ragi.
- The minor millets are foxtail millet or thenai, little millet or samai, and barnyard millet or sanwa, which is used in bread and biscuits.
- Millets have been staple foods for people in Asia and Africa for over 10,000 years.
- They are climate- resilient, need little water and grow well in warmer, drier environments.
- India produces around 12 million metric tonnes of millets annuall
- The Food and Agricultural Organization (FAO/UNO) has declared the year 2023 as the international year of millets.
- In keeping with this, India's Agriculture Ministry has lined up a series of millet- centric plans and activities on the use of millets, particularly in Andhra Pradesh, Madhya Pradesh and Bihar.
- It also plans "eat right melas" in Punjab, Kerala and Tamil Nadu

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H5N1

- Avian influenza, or bird flu, is a highly contagious viral infection that primarily affects birds.
- Infrequently, the virus can infect mammals from birds, a phenomenon called spillover, and rarely can spread between mammals.
- There are several different subtypes of avian influenza viruses, ranging from low pathogenic to highly pathogenic types.
- H5N1 is a highly pathogenic subtype of avian influenza that causes severe disease and death in birds.
- This subtype has caused a number of human infections through close contact with infected birds or contaminated environments, and is often fatal.

- The H5N1 subtype has the potential to spill over to other mammals such as minks, ferrets, seals and domestic cats when the animals come in contact with infected birds or their feces or consume carcasses of infected birds and further serve as reservoirs.
- It is also possible that over time, the virus could evolve to adapt to new hosts, leading to further outbreak
- A new strain of H5N1, named 2.3.4.4b, emerged in 2020 and rapidly spread across Asia, Africa and Europe and subsequently to North and South America by 2021 and 2022, respectively.
- Many mammals were also infected in these outbreaks, including human infections
- Influenza H5N1 can rarely infect humans through direct contact with animals, but often causes severe disease and death.
- In addition, the widespread H5N1 outbreaks have substantial economic impact, resulting from significant losses to the poultry industry and threatening food and vaccine security (eggs are used for vaccine production), apart from raising animal welfare.

What can be done?

- Preventing H5N1 spillovers and outbreaks requires a combination of measures including vaccination of poultry, safe disposal of dead birds, quarantine and culling of affected animals, wearing personal protective equipment when handling birds, and improved surveillance and monitoring of H5N1 in birds and other animals.
- Human vaccines against H5N1 avian influenza have been designed to protect against the most severe forms of the disease.
- However, the highly mutable nature of the H5N1 virus could potentially decrease vaccine efficacy over time.
- Therefore, molecular surveillance of H5N1 and its subtypes is essential in understanding and responding to outbreaks.
- Genome sequencing can be employed to monitor the emergence of new subtypes, and keep a close watch on mutations and virulence factors that may increase the ability to infect humans.

Tipraland

What is Greater Tipraland?

- Greater Tipraland is the core ideological demand of the TIPRA Motha.
- The party released what it called a Vision Document last week, where it said that it was committed to

seeking a permanent solution upholding the rights of the indigenous people of Tripura as per the Constitution of India.

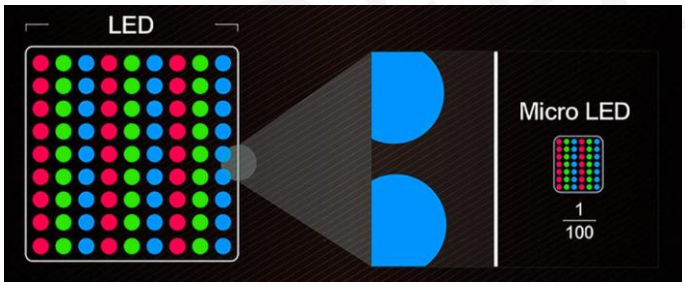
- The objective is to carve out a new State for the 19 indigenous tribes of Tripura under Articles 2 and 3 of the Constitution.
- In its current form, the contours of the new State would go beyond the TTAADC areas to include several other villages where the Tiprasa (indigenous people of Tripura) reside in large numbers.

How has this affected Tripura?

- It seems to have considerably polarised an already uneasy relationship between the tribals and the non- tribals since the State emerged from the days of armed insurgency.
- The TIPRA Motha put up a massive roadshow in November which is being hailed as one of the largest political mobilisation of tribals in the State.

Micro LED

What is microLED display technology?



- The basis of microLED technology are sapphires. A sapphire can shine on its own forever.
- A microLED screen is filled with such small but strong light.
- The picture in a microLED screen is generated by several individual light -emitting diodes.
- Samsung, the pioneer in microLED technology explained in a video that a microLED is as small as cutting a centimetre of hair into 200 smaller pieces.
- Each of these microLEDs are semiconductors that receive electric signals.
- Once these microLEDs are gathered, they form a module. Several modules are then combined to form screens.

What are its benefits over other displays?

- MicroLED displays are brighter, have better colour reproduction and provide better viewing angles.
- They make images appear as if they were painted on top of the device's glass and are quite the technological feat, according to a report by Bloomberg.

- Micro LEDs have limitless scalability, as they are resolution free, bezel free, ratio-free, and even size free.
- In addition to being self -emissive, Micro LEDs also individually produce red, green, and blue colours without needing the same backlighting or colour filters as conventional displays, according to Samsung.

Postpartum depression

Postpartum depression is a real medical illness that can affect any mother regardless of age, income or cultural and/or educational background.

- Women are not to be blamed or faulted for having postpartum depression.
- Women who present with psychiatric symptoms in the postpartum period are at higher risk of being diagnosed with a severe mental illness called bipolar disorder.
- In a 2012 Danish study, around 14% of women with first-time psychiatric symptoms within a month of childbirth were later diagnosed with bipolar disorder in a follow -up time frame of 15 years.
- Psychological interventions have been shown to be effective for mild postpartum depression in clinical trials.
- Given that many people don't wish to take medicines while breastfeeding, peer -support, counselling, cognitive behavioural therapy (CBT), and interpersonal therapy become important interventions.
- In severe depression characterised by suicidal ideas, doctors perform electroconvulsive therapy.
- Postpartum depression is a common but serious disorder that is amenable to bio-psycho-social interventions.
- Right treatment at the right time in fact leads to rapid recovery and a better quality of life.

Saudi Arabia will send its first-ever woman astronaut

Saudi Arabia will send its first-ever woman astronaut on a space mission later this year, state media has reported, in the move to revamp the kingdom's ultra-conservative image.

- Rayyana Barnawi will join fellow Saudi male astronaut Ali Al-Qarni on a mission to the International Space Station "during the second quarter of 2023",
- The astronauts "will join the crew of the AX-2 space mission" and the space flight will "launch from the USA", it said.

- The oil- rich country will be following in the footsteps of the neighbouring United Arab Emirates which in 2019 became the first Arab country to send one of its citizens into space.

Differently abled digital ecosystem

- The estimation in, that 2.21% of India's population is disabled is a gross underestimation.
- According to the World Health Organization, about 16% of the global population is disabled.
- If that figure is extrapolated to the Indian context, it would mean at least 192 million disabled people.
- While technology has enormous potential to level the playing field for the disabled, it can, at the same time, reinforce the barriers that the disabled otherwise face if it is not designed with their needs in mind.
- Here is another point. India, it is reported, had 750 million Internet/smartphone users in 2020.
- Applying the 16% figure here, this works out to be roughly 120 million (12 crore) Internet/smartphone users with disabilities.
- AI can help to further automate the accessibility testing process, and feedback from users with disabilities can now be analysed at scale to provide actionable insights to developers and companies
- securing a more disabled friendly digital ecosystem must be the conviction that, "everything digital must be accessible to everyone" .
- This starts with incorporating the principles of accessibility and inclusive design into every digital offering, right from inception.
- India needs to be truly accessible for all people with disabilities

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Fossil and Time

- Sporadically, but surely, palaeontologists report intriguing discoveries from India.

- In January, a team discovered 92 dinosaur nesting sites with 256 fossilised eggs of the titanosaurus among the largest of its kind, from 100-- 66 million years ago, when 'India' was a continent and yet to merge into the Eurasian land mass.
- Similarly, the deserts of Kutch, Gujarat and the Deccan traps in Maharashtra bear witness to the forces that shaped the diverse geography, and tangentially history, of the most populous country.
- Unlike the quest to preserve cultural history and man-made artefacts from archaeology, there has been

limited effort to preserve and communicate at large this natural 'geo-history' such as rock formations, sediment and fossils.

- To that end, the draft Geo-heritage Sites and Geo-relics (Preservation and Maintenance) Bill, 2022, piloted by the Ministry of Mines, is seen as a step to give the process of such conservation firmer footing.
- The Bill's provisions give the Director General of the Geological Survey of India (GSI), a subordinate body of the Ministry of Mines, the power to declare sites as having 'geo-heritage' value, take possession of relics (fossils, rocks) that rest in private hands, prohibit construction 100 metres around such a site, penalise with fines of up to ₹5 lakh and possibly imprisonment vandalism, defacement, and violations of directives by the Director General of the GSI.
- This has rankled experts who work outside the GSI- fold in central and State universities, institutes of national importance and private organisations who fear that such absolute vesting of powers in the GSI alone may impede palaeontological research.
- They demand a more inclusive body, on the lines of a National Geoheritage Authority, that can, more democratically, decide on declaring sites as being of 'geohistorical' importance and how best to preserve artefacts and finds

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India's Mental Healthcare Act 2017

The National Human Rights Commission (NHRC) in a report flagged the "inhuman and deplorable" condition of all 46 government-run mental healthcare institutions across the country.

The report notes that the facilities are "illegally" keeping patients long after their recovery, in what is an "infringement of the human rights of mentally ill patients"

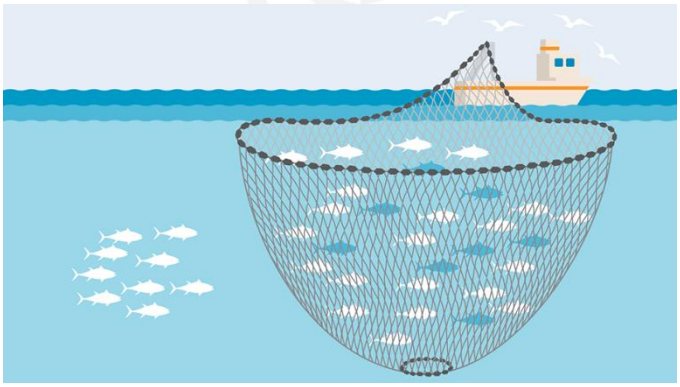
What does the MHA, 2017 say?

- The MHA, 2017 "centered the agency of individuals, acknowledged their right to live as part of a community [under Section 19], and focused on rehabilitation," says Ms. Priti Sridhar, CEO of Mariwala Health Initiative (MHI).
- Under Section 19 of the Act, the government was made responsible for creating opportunities to access less restrictive options for community living such as halfway homes, sheltered accommodations, rehab homes, and supported accommodation.
- The Act also discourages using physical restraints (such as chaining), unmodified electro-convulsive therapy (ECT), and pushes for the right to hygiene, sanitation, food, recreation, privacy, and infrastructure.
- More importantly, the Act recognised that "people have a capacity

What are the challenges?

- While the MHA safeguards the rights of people in mental healthcare establishments, enforcement challenges remain.
- Almost 36.25% of residential service users at state psychiatric facilities were found to be living for one year or more in these facilities, according to a 2018 report by the Hans Foundation.
- Under the MHA, all States are required to establish a State Mental Health Authority and Mental Health Review Boards (MHRBs) bodies that can further draft standards for mental healthcare institutes, oversee their functioning and ensure they comply with the Act.
- majority of States, "these bodies are yet to be established or remain defunct…Further, many States have not notified minimum standards which are meant to ensure the quality of MHEs."
- the Act takes on a human rights lens by shifting the obligation of care onto different stakeholders — including caregivers, government institutions, police officials, and mental health practitioners.
- Poor budgetary allocation and utilisation of funds creates a scenario where shelter homes remain underequipped, establishments understaffed, and professionals and service providers not adequately trained to deliver proper healthcare, she added.
- While Section 19 recognises the right of people to "live in, be part of, and not be segregated from society," there have been no concrete efforts towards implementation
- The dearth of alternative community- based services further complicates access to rehabilitation.

Deep sea fishing



- The Supreme Court of India has given permission to fishermen using purse seine fishing gear to fish beyond territorial waters (12 nautical miles) and within the Exclusive Economic Zone (EEZ) (200 nautical miles) of Tamil Nadu, but observing certain restrictions
- The top court should seek guidance from the obligations arising from the multilateral and regional conventions which are meant to bring in sustainable fishing practices over a certain period of time, thereby allowing a common resource such as fish to be naturally replenished.
- Under Articles 56.1(a) and 56.1(b)(iii) of UNCLOS, coastal states have sovereign rights to ensure that the living and non-living resources of the EEZ are used, conserved and managed, and not subject to overexploitation.
- Access to the zone by foreign fleets is also solely within the coastal state's discretion and subject to its

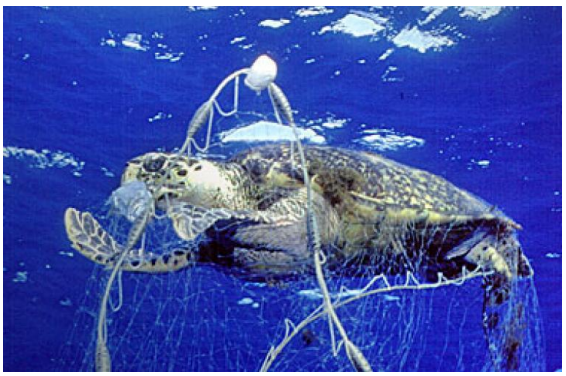
laws and regulations.

- In order to prevent overexploitation, coastal States must determine the total allowable catch (TAC) in the EEZ (Articles 61(1) and (2) of UNCLOS) in light of the best scientific evidence available.
- The guidance from the Convention for the Conservation of Southern Bluefin Tuna 1993 (SBT) could have also been sourced by the top court to enable recovery of depleted fishing stocks.
- The crux of the SBT is TAC and distribution of allocations among the parties to the SBT, which are very relevant from the angle of conservation of general fishery.
- TAC and the catch quotas are aimed at putting sustainable use into practice among fishermen and maintaining maximum sustainable yield (MSY).

Regulation of fishing methods

- The huge size of the purse seine nets (2,000 metres in length and 200 m in depth) allows maximum catch for the purse seiners, in turn leaving behind insufficient catch for traditional fishermen.
- There are several regional organisations that either prohibit the use of large drift nets or at least call for their prohibition, such as the 1989 Tarawa Declaration of the South Pacific Forum.
- The 1989 Convention for the Prohibition of Fishing with Long Drift Nets in the South Pacific goes as far as to restrict port access for drift net fishing vessels.
- The United Nations General Assembly passed Resolutions 44/225 (1989) and 46/215 (1991) supported and strengthened this development, calling for a moratoria on all large-scale pelagic drift net fishing vessels in high seas.
- Although the conventions and the UN General Assembly resolutions are applicable to the state parties in the high seas, these are relevant in terms of preventing overfishing in general and the conservation of fishery management in the EEZ as well.

On non-selective fishing technology



- The Court's final judgement needs to look into non-selective fishing methods by purse seiners resulting in the by-catch of other marine living species (which could include, many a times, endangered species) a potential ground for trade embargo.

Guidelines for organ transplant

- In a major tweak to the organ donation policy, the government said the clause that people aged beyond 65 could not receive cadaver organ transplants had been removed.
- The government has decided to do away with the ceiling
- Now, people beyond 65 in need of an organ donation will also be eligible to get one," an official source in the Health Ministry said.
- The government has decided to do away with the clause in the National Organ and Tissue Transplant Organisation (NOTTO) guidelines as it violates the right to life, the source added.
- Also, earlier, an organ recipient could register for a prospective transplant only in the domicile State.
- The States such as Gujarat had made it mandatory for registered patients to furnish a domicile certificate to be eligible for a transplant.

Leprosy

Leprosy is a chronic infectious disease caused by a type of bacteria, Mycobacterium leprae.

- The disease predominantly affects the skin and peripheral nerves. Left untreated, the disease may cause progressive and permanent disabilities.
- The bacteria are transmitted via droplets from the nose and mouth during close and frequent contact with untreated cases.
- Leprosy is curable with multidrug therapy (MDT).
- Leprosy is reported from all the six WHO Regions; the majority of annual new case detections are from South-East Asia.

Dharma Guardian

- India-Japan joint training exercise "Dharma Guardian" will be conducted at Camp Imazu in the Shiga province of Japan
- It is the 4th edition of the joint military exercise "Dharma Guardian" between India and Japan.
- "Exercise "Dharma Guardian" will further enhance the level of defence cooperation between the Indian Army and Japanese ground self defence forces, furthering the bilateral ties between the two nations,

- The scope of this exercise covers platoon level joint training on operations in jungle and semi urban/urban terrain.
- "Troops of the Garhwal Rifles Regiment of the Indian Army and an Infantry Regiment from the Middle Army of the Japan Ground Self Defence Force (JGSDF) are participating in the exercise this year to share experiences gained during operations in order to enhance interoperability in planning & execution

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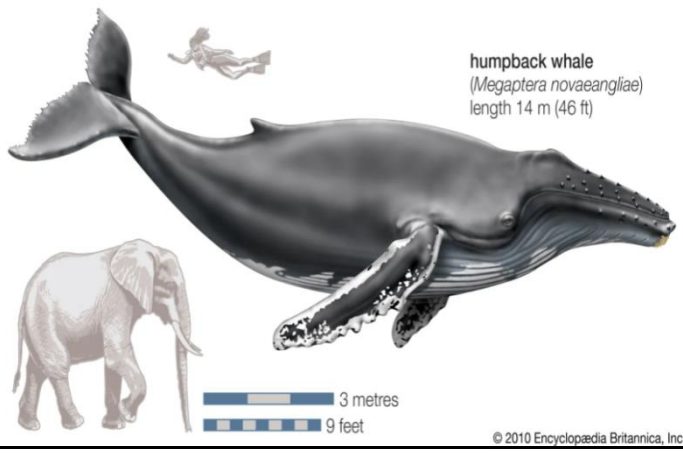
Pangolins

- Pangolins, despite being listed in Schedule I of Wildlife (Protection) Act, 1972 continue to be the world's most trafficked mammal.
- The primary demand for its scales in the making of traditional East Asian medicines has led to an estimated illegal trade worth $2.5 billion every year.
- To enforce the appropriate national and international laws and to track the decline of the species, researchers of Zoological Survey of India (ZSI), Kolkata, have now developed tools to tell apart the scales of Indian pangolin (Manis crassicaudata) and Chinese pangolin (Manis pentadactyla).
- They characterised the morphological features and investigated genetic variations between the two species by sequencing 624 scales of pangolins and comparing the sequences with all eight pangolin species.
- Based on the size, shape, weight and ridge counts on the scales, the team was able to categorise the two species.

Humpback whale



- Post -whaling increases in eastern Australian humpback whale numbers may have led to males shifting their mating tactics from singing to physically competing with other males (Communications Biology), highlighting how humpback whales have adapted their social behaviours as their populations have recovered.

- Whaling is the process of hunting of whales for their usable products such as meat and blubber, which can be turned into a type of oil that became increasingly important in the Industrial Revolution
- Male eastern Australian humpback whales may be less likely to use singing as a mating tactic when the population size is larger in order to avoid attracting males to their potential mate.

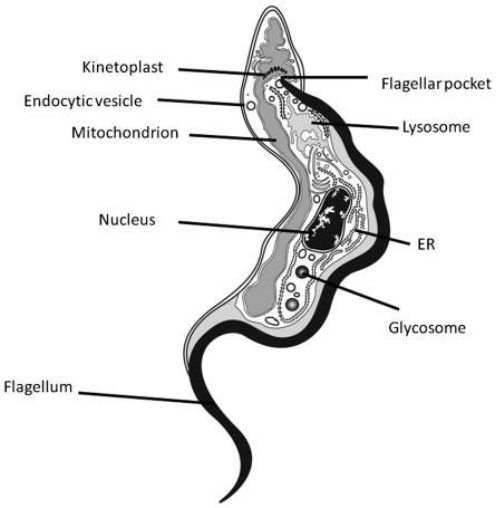
About Humpback whale

- Found in every ocean and many nearshore areas associated with coastal and marine tourism, they are the focus of whale watching operations in over many countries around the world.
- The species is known for its spectacular "surface active behaviour", which can include breaching (leaping clear of the water) and flipper and tail slapping, its occasional curiosity around tour boats, and its complex 'song', which is heard on the breeding grounds in the tropics.
- A humpback whale's blow or the splash of a breach can be seen from a distance of several kilometres, making the humpback one of the more conspicuous targets of whale watching around the world.

Tsetse flies & Trypanosome

- A new insight into how tsetse flies mate could bolster the arsenal of tools to manage the spread of disease by these insects.
- The insects produce volatile pheromones that control their mating behaviour (Science).
- The study discovered several volatile compounds that promoted rapid mating behaviour in the tsetse flies.
- Infection of female flies by trypanosomes alters both the pheromone profile and mating behaviour, and has the effect of reducing mating receptivity in females.

Trypanosome



- trypanosome, any member of a genus (*Trypanosoma*) of parasitic zooflagellate protozoans belonging to the order Kinetoplastida.
- Adult trypanosomes are mainly blood parasites of vertebrates, especially fishes, birds, and mammals.
- Most species require an intermediate host (often an insect or a leech) to complete their life cycle. Sleeping sickness (*q.v.;* also called African trypanosomiasis), for example, caused by *T. gambiense* or *T. rhodesiense,* is transmitted by tsetse flies.

Frozen water

- Ball milling "ordinary" ice at low temperatures a process that involves vigorously shaking a cryogenically- cooled container full of ice and steel balls creates an amorphous form with a density close to liquid water (Science).
- The finding suggests that water is more complex at low temperatures than previously recognised.
- Frozen water can take many forms.
- There are 20 known crystalline phases of water ice and at least two families of amorphous form.

Aubrites

Aubrites are "igneous rocks" that form in oxygen poor conditions, and thus "contain a variety of exotic minerals that are not found on Earth

- Meteors are pieces of some solid object in space that broke away, descended onto a planet or moon.
- Once they reach the surface, they are called meteorites. Aubrites are a type of meteorite.
- Scientists are not yet sure of their origin, although some signs indicate they could be from the asteroid 3103 Eger or from the planet Mercury.
- Given the unknown parent body and fragility, "Aubrite meteorites either fall rarely on earth or they might have fragmented in finer fractions before falling or [have got] lost during atmospheric ablation,
- Around 90% of the meteorite was composed of orthopyroxene.
- Pyroxenes are silicates consisting of single chains of silica tetrahedra (SiO_4); orthopyroxenes are pyroxenes with a certain structure.
- Pyroxenes such as diopside and jadeite have been used as gems.
- Spodumene was historically used as lithium ore.
- Rocks with pyroxene have also been used to make crushed stone used in construction
- The group also classified the meteorite as a monomict breccia since it consisted of several pyroxene -bearing pieces held together by a scaffold of rocky material.

Environmental surveillance

- India is the fastest growing egg producer in the world, but unlike in Europe, poultry birds here are not vaccinated against flu.
- Furthermore, the farms with a diversity of animals or in the vicinity of nearby wetlands increases the potential for the viruses to undergo reassortment that can potentially generate more virulent strains H5N1 or H7N9 which could then infect humans.
- Despite this potential, there is no active surveillance in the poultry sector
- We need an active and passive year -round surveillance network under One Health which connects monitoring of human and animals in a shared environment.
- Waste water-based epidemiology or pathogen surveillance has become an integral component of environmental surveillance providing near real-time information on health and community exposure to pathogens.
- While environmental surveillance is not a new concept and has been used widely for monitoring several pathogens, it offers an excellent tool.
- Birds infected with avian influenza virus shed large quantities of virus in their faeces, saliva and nasal secretions for about a week.
- Avian influenza viruses have been isolated from unconcentrated water in lakes in the U.S., Canada and China
- Avian influenza viruses can remain viable for extended periods of time in surface water and carcasses, suggesting that lakes and wetlands can act as environmental reservoirs at variable temperatures for several months
- Environmental surveillance is an important area that can enhance the information on prevalence diversity of avian influenza viruses in free-ranging domestic flocks or under confinement conditions where faeces or other effluent are deposited into the environment.

Virus surveillance

- Currently, virus surveillance is reactive and relies on sampling dead birds.
- Environmental surveillance would be a great non-invasive tool that can be done without disturbing the birds and can be used to obtain both host

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SAGO

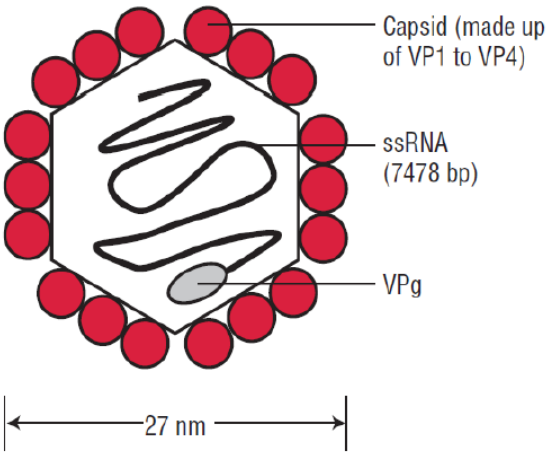
- World Health Organization (WHO) has created a new advisory group named, The International Scientific Advisory Group for Origins of Novel Pathogens, or SAGO.
- The function of SAGO will be to systematically study the emergence of future emerging pathogens

with pandemic potential, and advise the development in this regard to WHO.

- The SAGO will advise the Secretariat on technical and scientific considerations regarding emerging and re-emerging pathogens, and will be composed of experts acting in a personal capacity.
- It will be established in accordance with the WHO Regulations for Study and Scientific Groups, Collaborating Institutions and Other Mechanisms of Collaboration.

Poliovirus

What is polio?



- Poliovirus can invade the central nervous system and as it multiplies, destroy the nerve cells that activate muscles, causing irreversible paralysis in hours.
- There are three types of polio virus serotypes: types 1, 2 and 3.
- According to the India Polio Learning Exchange (along with UNICEF), of those paralysed, 5--10% die when their breathing muscles become immobilised.
- There is no cure for polio, but there are safe, effective vaccines which, given multiple times, protect a child for life.
- Polio held the world in a bind of fear until Jonas Salk developed the first polio vaccine.
- Later, Albert Sabin made a 'live' polio vaccine that could be administered orally which became the tool of the trade, especially for nations carrying out mass immunisation campaigns, including India

What was the recent global polio crisis?

- Dr. Jacob John, who co-authored Polio: The Eradication Imbroglio with Dhanya Dharmapalan, says in a paper published in Vaccines, in 2022: "Genetic variants of vaccine poliovirus type 2, imported from an unknown source, were detected in waste waters in Jerusalem, London and New York in early 2022.
- The wild poliovirus type 2 was globally eradicated in 1999, but vaccine virus type 2 continued for 16 more years; routine use of the vaccine was discontinued in 2016 and reintroduced occasionally on purpose.
- As an unintended consequence, type 2 vaccine virus variants (circulating vaccine -derived polioviruses) that mimic wild viruses' contagiousness and neurovirulence, have been emerging and spreading."
- He also posits the theory of respiratory transmission of polio, 'as was the classical teaching of polio epidemiology'.

Sickle cell anaemia

- Sickle cell anaemia (SCA), a genetic blood disorder, found mention in the Budget this year
- Finance Minister Nirmala Sitharaman said that the government will work in "mission mode" to eliminate the condition by 2047.
- India is the second- worst affected country in terms of predicted births with SCA i.e. chances of being born with the condition.

What is sickle cell anaemia?

- Haemoglobin which is tasked with carrying oxygen to all parts of the body, has four protein subunits two alpha and two beta.
- In some people, mutations in the gene that creates the beta subunits impact the shape of the blood cell and distorts it to look like a sickle.
- A round red blood cell can move easily through blood vessels because of its shape but sickle red blood cells end up slowing, and even blocking, the blood flow.
- Moreover, sickle cells die early, resulting in a shortage of red blood cells that deprive the body of oxygen.
- These obstructions and shortages may cause chronic anaemia, pain, fatigue, acute chest syndrome, stroke, and a host of other serious health complications.
- Without treatment, quality of life is compromised and severe cases can become fatal in the initial years of life

Does SCA only affect some?

- Research and screening programmes have found that the prevalence of haemoglobinopathies — disorders of the blood is more common among tribal populations than non tribal communities in India.
- Research has shown that SCA is prevalent in communities residing in areas where malaria is endemic.
- Around the middle 1940s, doctors found that those with sickle red blood cells were more likely to survive malaria.
- Those with the trait in some African countries were found to be potentially resistant to lethal forms of malaria and had a survival advantage.
- The sickle cell trait thus gave an evolutionary advantage, offering immunity to some people during malaria epidemics.
- In India, States and UTs with tribal populations contribute a significant malaria case load.
- Additionally, the documented prevalence of SCA is higher in communities that practice endogamy, as the chances of having two parents with sickle cell trait is higher.

Can it be treated?

- Sickle cell anaemia is a genetic disorder, making complete "elimination" a challenge that requires

major scientific breakthrough.

- The only cure comes in the form of gene therapy and stem cell transplants both costly and still in developmental stages.
- Blood transfusion, wherein red blood cells are removed from donated blood and given to a patient, is also a trusted treatment in the absence of permanent cures.
- But challenges include a scarcity of donors, fears around safe supply of blood, risk of infection etc.
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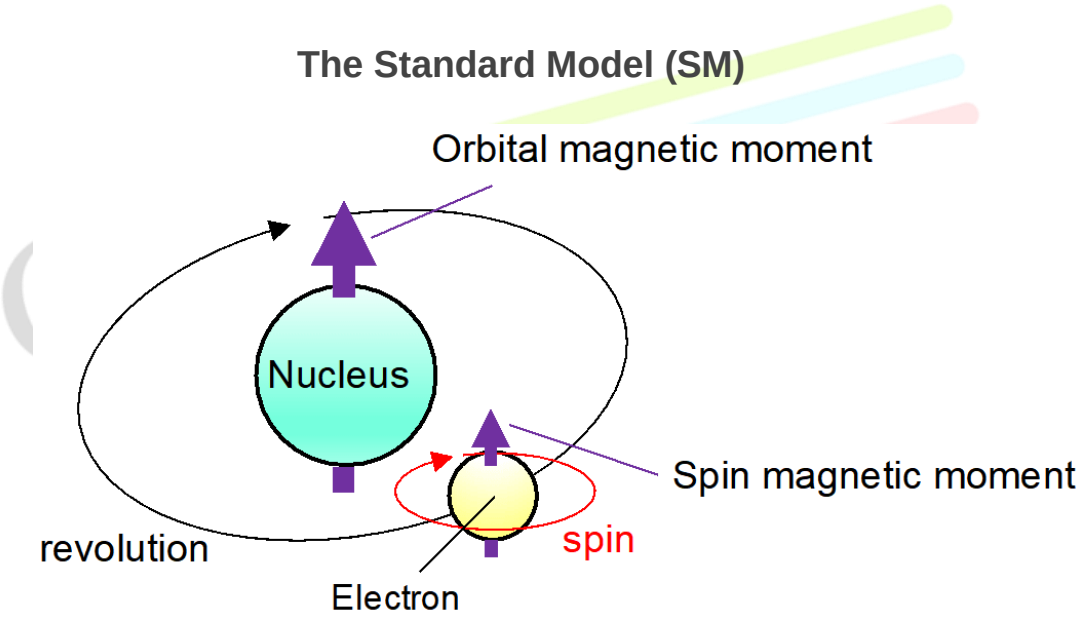

- In an astonishing feat of metrology, physicists recently reported measuring the electron's magnetic moment with a precision of 0.13 parts per trillion (ppt).
- The resulting measurement is 2.2 times more accurate than the previous best, recorded 14 years ago
- The electron magnetic moment, or more specifically the electron magnetic dipole moment, is the magnetic moment of an electron resulting from its intrinsic properties of spin and electric charge

The Standard Model (SM) is the theory that describes the properties of all subatomic particles, classifies them into different groups, and determines how they're affected by three of the four fundamental forces of nature: strong- nuclear force, weak -nuclear force, and electromagnetic force (it can't explain gravity).

How does the electron's magnetic moment matter?

- The SM's most precise prediction is of the electron's magnetic moment.
- Physically, the magnetic moment describes how willing an electron is to align itself in the direction of

a magnetic field.

Implications of the result

- First, the electron and the muon are very similar particles, but the muon is around 207 times heavier.
- Multiple measurements until 2021 have found that the muon's magnetic moment disagrees with the SM prediction by about 0.00000000251.
- If this is the handiwork of beyond-SM forces acting on the particle, their effects should be visible on the electron's magnetic moment as well.
- But because the electron is lighter, the effects will be 40,000 times weaker.
- By achieving such a highly precise result, the new result suggests that the physicists couldn't find these signs

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Microbiome and autism disorder

- Autism spectrum disorder (ASD) is the term for a group of neurodevelopmental disorders
- According to the WHO, ASD affects one in 100 children.
- Children with ASD have impaired social interactions, lack verbal and nonverbal communication skills, and display restricted and repetitive behaviours.
- These characteristics can adversely affect one's cognitive abilities and, over time, diminish one's quality of life.
- A relatively under -researched aspect of ASD is the gastrointestinal problems associated with a subset of children with ASD
- The gut microbiome is believed to have a big impact on immune modulation and metabolic activities in the human body.
- Immune modulation refers, among other things, to the efforts of the immune system to ensure its response is proportionate to a threat.
- Investigations of the dynamic cross-talk between the gut microbiome and the host environment have revealed potential connections to ASD symptoms
- Dysbiosis an imbalance in the gut microbiome of children with ASD.
- They had a higher abundance of lactobacillaceae, bifidobacteriaceae, and veillonellaceae bacteria.
- The fraction of bacteria of the phylum firmicutes was found to be significantly higher in the guts of children with ASD.
- We also found an underrepresentation of certain microbes that produce short chain fatty acids (SCFA), such as faecalibacterium and roseburia, in children with ASD

- The Philippines invoked the dispute settlement mechanism of the UN Convention on the Law of the Sea (UNCLOS) in 2013 to test the legality of China's 'nine-dash line' regarding the disputed Spratlys.
- In response, the Permanent Court of Arbitration (PCA) at The Hague decreed in its July 12, 2016 judgment that the line had "no legal basis." China dismissed the judgment as "null and void."
- The award implied that China violated the Philippines Exclusive Economic Zone (EEZ).
- It noted that China had aggravated the situation by undertaking land reclamation and construction, and had harmed the environment and violated its obligation to preserve the ecosystem
- Vietnam has added six Kilo-class, Russian-origin submarines to its navy.
- France, Germany and the Netherlands, respectively, have supplied Formidable-class stealth ships to Singapore, patrol boats to Brunei Darussalam, and corvettes to Indonesia
- Japan is partially funding the upgradation of the Indonesian coast guard. Indonesia and the Philippines are in early stages of exploring procurement of the BrahMos missile from India.
- The other ASEAN countries that have shown interest are Thailand and Vietnam.
- Growing Chinese muscularity in the SCS is visible in the increased patrolling and live-fire exercising by Chinese naval vessels; ramming and sinking of fishing vessels of other claimant countries; renaming of SCS features; and building of runways, bunkers, and habitation for possible long-term stationing of personnel on the atolls claimed by China.
- Chinese exploration and drilling vessels compete aggressively with those of other littoral countries in the disputed waters
- A complicating factor for China is Russia's growing military and economic equities in the SCS.
- Russia and Vietnam have a defence cooperation relationship, which they are committed to strengthening.
- China has objected to Rosneft Vietnam BV prospecting within the Chinese defined 'nine-dash line.'
- Rosneft has also been invited by the Philippines to conduct oil prospecting in its EEZ.

India's relevant options

- India straddles, and is the fulcrum of, the region between the Suez and Shanghai, between West and East Asia, and between the Mediterranean and the SCS.
- The SCS carries merchandise to and from India.
- It follows that India has a stake in the SCS, just as China has in the Indian Ocean.
- India must continue to actively pursue its defence diplomacy outreach in the Indo-Pacific region: increase military training and conduct exercises and exchanges at a higher level of complexity, extend Humanitarian Assistance and Disaster Relief activities, share patrolling of the Malacca Strait with the littoral countries, etc.
- The Comprehensive Strategic Partnerships that India has concluded with Australia, Japan, Indonesia,

the U.S., and Vietnam could be extended to Malaysia, the Philippines, Thailand, and Singapore.

- India must also buttress the military capacity of the tri service Andaman and Nicobar Command

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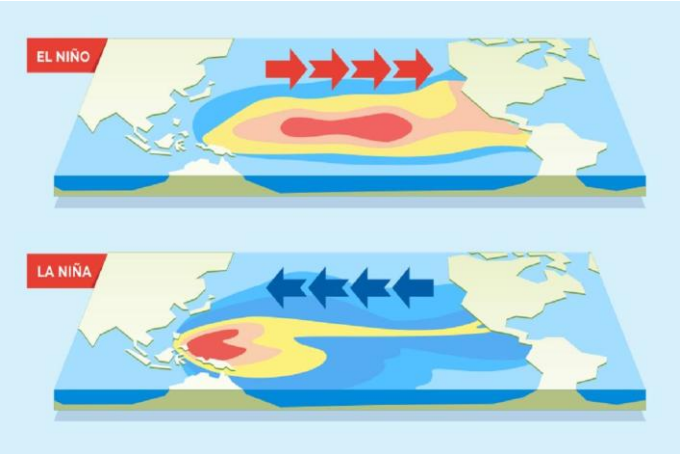
EL Nino



- India is experiencing a colder than normal winter thanks to the north- south winter flow set up by the climate phenomenon known as La Niña.
- During the El Niño, this warm water spills from the western part of the Pacific Ocean to the eastern part. Earth has had three straight La Niña years, which means the Pacific's warm- water volume is fully loaded and likely to birth an El Niño soon.
- An El Niño year creates a miniature global- warming crisis, since the warm water spreading across the tropical Pacific releases a large amount of heat

What will happen to cyclone formation and monsoons?

- A transition from a La Niña winter to an El Niño summer historically tends to produce a large monsoon deficit, on the order of 15%.
- This means pre monsoon and monsoon circulations tend to be weaker in an El Niño year.
- The vertical shear (change in the intensity of winds from the surface to the upper atmosphere) tends to be weaker as well. This in turn can favour enhanced cyclone formation
- As for monsoons if an El Niño state does emerge by summer we will likely have a deficit in 2023.
- Some research has indicated that the Indian Ocean dipole a seesawing of sea- surface temperature over the tropical Indian Ocean could compensate for the negative effects of an El Niño.

Malabar

Australia will host the Malabar multilateral naval exercise, consisting of India, Australia, Japan and the U.S., for the first time this year.

- "Malabar 2023 is scheduled to be held in August and Australia will host this edition," an official source confirmed. "The exercise is likely to be held in Perth.
- It is an annual trilateral naval exercise between the navies of India, Japan, and the USA which is held alternately in the Indian and Pacific Oceans.

- It began as a bilateral naval exercise between India and the USA in 1992 and was expanded into a trilateral format with the inclusion of Japan in 2015.

India as biodiversity champion

- The importance of our planet's biodiversity was strongly articulated at the United Nations Biodiversity Conference in Montreal, Canada.
- On December 19, 2022, 188 country representatives adopted an agreement to "halt and reverse" biodiversity loss by conserving 30% of the world's land and 30% of the world's oceans by 2030, known as the 30×30 pledge.
- India currently hosts 17% of the planet's human population and 17% of the global area in biodiversity hotspots, placing it at the helm to guide the planet in becoming biodiversity champions.

Programmes with potential

- In response to this call, the Union Budget 2023 mentioned "Green Growth" as one of the seven priorities or Saptarishis.
- The National Mission for a Green India aims to increase forest cover on degraded lands and protect existing forested lands.
- The Green Credit Programme has the objective to "incentivize environmentally sustainable and responsive actions by companies, individuals and local bodies".
- The Mangrove Initiative for Shoreline Habitats & Tangible Incomes (MISHTI) is particularly significant because of the extraordinary importance of mangroves and coastal ecosystems in mitigating climate change.
- The Prime Minister Programme for Restoration, Awareness, Nourishment, and Amelioration of Mother Earth (PM-PRANAM) for reducing inputs of synthetic fertilizers and pesticides is critical for sustaining our agriculture.
- Finally, the Amrit Dharohar scheme directly mentions our biological wealth and is expected to "encourage optimal use of wetlands, and enhance biodiversity, carbon stock, eco-tourism opportunities and income generation for local communities".
- The recent intervention by the Ministry of Environment, Forest and Climate Change to stop the draining of Haiderpur, a Ramsar wetland in Uttar Pradesh, to safeguard migratory waterfowl is encouraging.
- New missions and programmes should effectively use modern concepts of sustainability and valuation of ecosystems that consider ecological, cultural, and sociological aspects of our biological wealth
- The future of our wetland ecosystems will depend on how we are able to sustain ecological flows through reduction in water use in key sectors such as agriculture by encouraging changes to less- water intensive crops such as millets as well as investments in water recycling in urban areas using a combination of grey and blue -green infrastructure.

Steps Needed

- As far as the Green India Mission is concerned, implementation should focus on ecological restoration rather than tree plantation and choose sites where it can contribute to ecological connectivity in landscapes fragmented by linear infrastructure
- Finally, each of these efforts must be inclusive of local and nomadic communities where these initiatives will be implemented. Traditional knowledge and practices of these communities should be integrated into the implementation plans.
- We hope that the National Mission on Biodiversity and Human Wellbeing, already approved by the Prime Minister's Science, Technology, and Innovation Advisory Council (PM-STIAC), will be immediately launched by the government.
- This mission seeks to harness the power of interdisciplinary knowledge for greening India and its economy, to restore and enrich our natural capital for the well- being of our people, and to position India as a global leader in applied biodiversity science.

Dickinsonia

- Fossils of an extinct species of animal that scientists reported in a sensational discovery from India's Bhimbetka Rock Shelters in 2021 have been found to be belied hope
- Dickinsonia fossil' found in Bhimbetka is old beehive
- There, according to The New York Times, they spotted by chance what looked like a 44-cm-wide fossil of Dickinsonia, an animal that lived at least 538 million years ago, in a cave
- Dickinsonia is an extinct genus of basal animal that lived during the late Ediacaran period in a geographical area now divided into Australia, China, India, Russia, and Ukraine. The individual Dickinsonia typically resembles a bilaterally symmetrical ribbed oval

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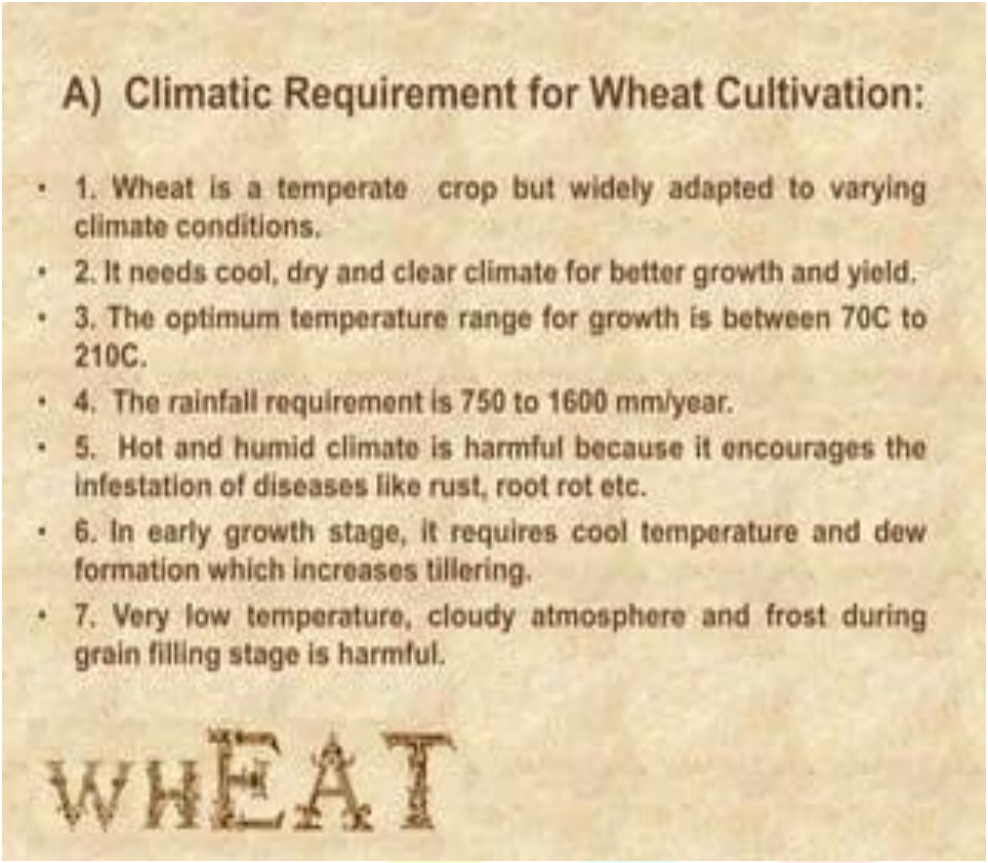
Heat and wheat production

If the prevailing high temperatures continue through March, then the rabi wheat crop will be impacted and yields will at best be on a par, or even lesser marginally, than last year's low, warns a report.

- In Uttar Pradesh, which accounts for about 30% of wheat production, the eastern part is expected to have relatively good yields due to timely sowing after the kharif paddy harvest



India's R & D

India's research and development (R&D) expenditure-GDP ratio of 0.7% is very low when compared to major economies and is much below the world average of 1.8%.

- While the corporate sector accounts for about two-thirds of gross domestic expenditure on R&D (GERD) in leading economies, its share in India is just 37%
- The National Science and Technology Management Information System (NSTMIS) of the DST is the agency that compiles GERD statistics in India.
- It is easier to gather the information on R&D by the government sector, the higher education sector and public sector enterprises.
- The challenge lies in collecting data from the private corporate sector.
- Transforming India's R&D statistics to truly reflect the R&D ecosystem calls for short -term and medium- term measures.
- In the short term, the NSTMIS should use the patents granted data, both in India and the U.S., in addition to its current method to identify R&D performing enterprises.
- While surveys can collect much more information related to innovation activities, R&D statistics should not be confined to the responses to the surveys

Cyberattacks

The first was the ransomware attack on the servers of India's premium institute, the All India Institute of Medical Sciences.

- Nearly 40 million health records were compromised and it took over two weeks for the systems to be brought online.
- Soon afterwards, a ransomware gang, BlackCat, breached the parent company of Solar Industries Limited, one of the Ministry of Defence's ammunition and explosives manufacturers, and extracted over 2 Terabyte of data

- Ransomwares have emerged as the most predominant of malicious cyberattacks.
- Here, the perpetrators demand hefty payments for the release of withheld data.
- Cyber capabilities are also playing a pivotal role, as seen in the ongoing conflict in Ukraine, where electronic systems in warheads, radars and communication devices have reportedly been rendered ineffective using hacking and GPS jamming.
- With cyber threats capable of undermining our critical infrastructure, industry and security, a comprehensive cyber security policy is the need of the hour.
- In 2022, the Indian Computer Emergency Response Team (CERT-In), which is India's cybersecurity agency, introduced a set of guidelines for organisations to comply with when connected to the digital realm.
- This included the mandatory obligation to report cyber attack incidents within hours of identifying them, and designating a points person with domain knowledge to interact with CERT-In.
- India's draft Digital Personal Protection Bill 2022 proposes a penalty of up to ₹500 crore for data breaches. Recently, India's armed forces created a Defence Cyber Agency (DCyA), capable of offensive and defensive manoeuvres.
- All Indian States have their own cyber command and control centres.
- Digital Geneva Convention, where over 30 global companies have signed a declaration to protect users and customers from cyber breaches, and collaborate with like-minded intergovernmental and state frameworks.
- With the introduction of 5G and the arrival of quantum computing, the potency of malicious software, and avenues for digital security breaches would only increase
- With most cyberattacks originating from beyond our borders, international cooperation would be critical to keep our digital space secure
- This year, cybercrimes are expected to cause damage worth an estimated $8 trillion worldwide. India

has already signed cybersecurity treaties, where the countries include the United States, Russia, the United Kingdom, South Korea and the European Union.

- Even in multinational frameworks such as the Quad and the I2U2 (which India is a member of) there are efforts to enhance cooperation in cyber incident responses, technology collaboration, capacity building, and in the improvement of cyber resilience.
- Previous years have seen the United Nations General Assembly establish two processes on the issues of security in the information and communication technologies (ICT) environment.
- One is the Open- ended Working Group (OEWG), comprising the entire UN membership, established through a resolution by Russia.
- The other is the resolution by the U.S., on the continuation of the Group of Governmental Experts (GGE), comprising 25 countries from all the major regions
- The G-20 summit this year in India, which will see participation by all the stakeholders driving the global levers of power, is a rare opportunity to bring together domestic and international engagement groups across the spectrum, and steer the direction of these consultations.

Submarine in Sunda Strait

- In line with the expanding military cooperation with South East Asian nations, an Indian Navy Kilo class conventional submarine, INS Sindhukesari, docked in Jakarta, Indonesia,
- "Highly enriching engagements with the Indonesian Navy conducted during port call, strengthening maritime partnership between India and Indonesia towards safer and secure Indo-Pacific,"
- The submarine, which was on operational deployment, travelled through the Sunda Strait and undertook the maiden docking in Indonesia for Operational Turnaround (OTR)

Great Backyard Bird Count

West Bengal reported the highest number of species of birds, followed by Uttarakhand and Arunachal Pradesh during the Great Backyard Bird Count (GBBC) 2023 across 35 States and Union Territories

- GBBC India is the Indian implementation of the global Great Backyard Bird Count, which runs for 4 days every February.

- Indian birders have participated in the GBBC since the event went worldwide in 2013. The 2022 edition of GBBC engaged over 3,782 birders who uploaded over 40,000 checklists and recorded 1,017 species
- Tamil Nadu and Kerala took the eighth and ninth spots with 349 and 325 species, respectively.
- Kerala, on the other hand, recorded the highest number of checklists of birds, the Bird Count India (BCI)
- The BCI is an informal partnership of organisations and groups working together to increase collective knowledge about bird distributions and populations.
- India was among 190 countries that participated in the GBBC 2023, an annual event that brings bird enthusiasts, students and nature enthusiasts together for counting birds they see around the places where they live

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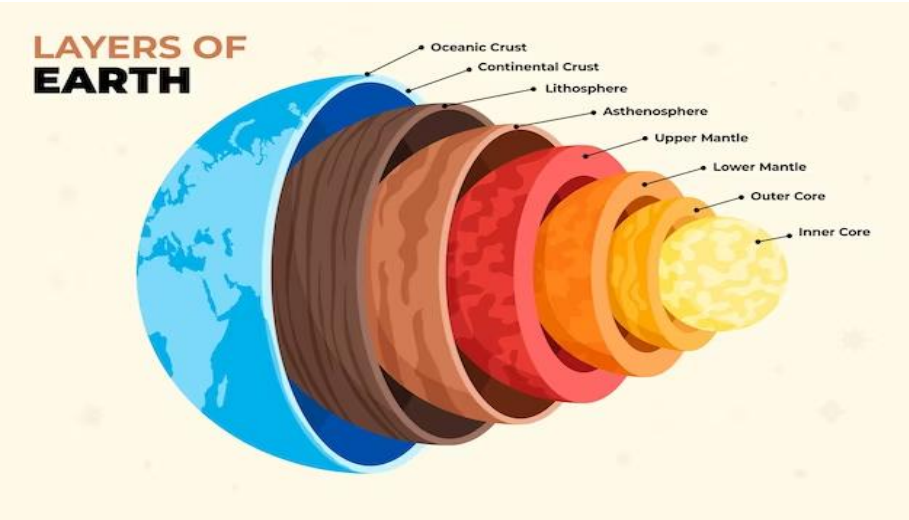
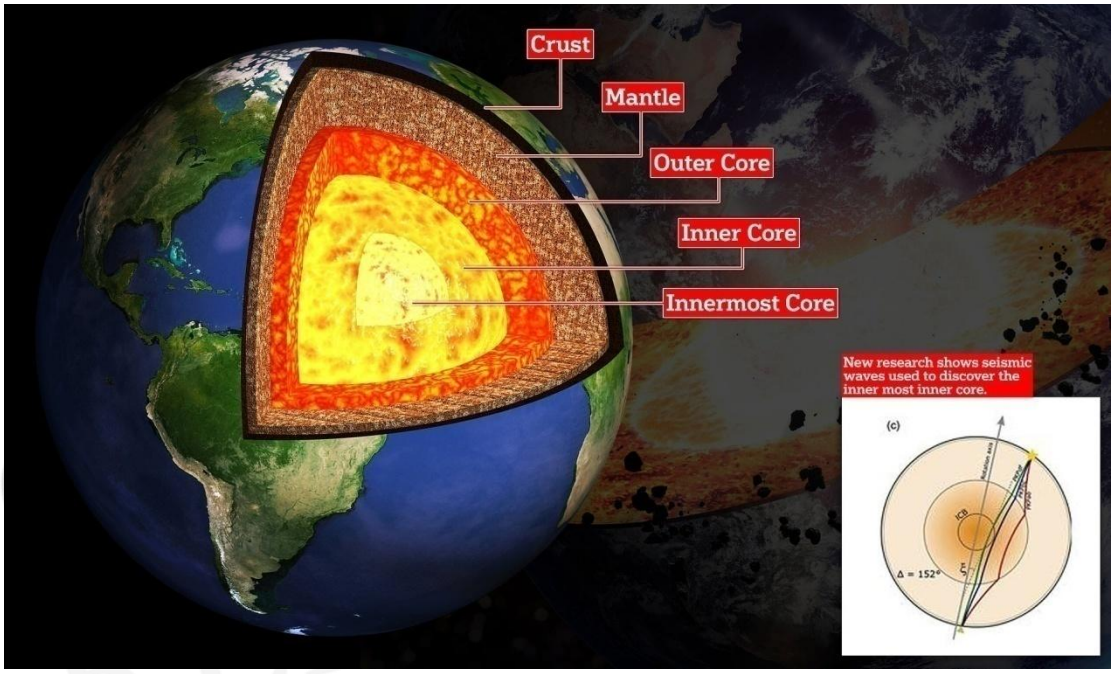
Fifth earth layer

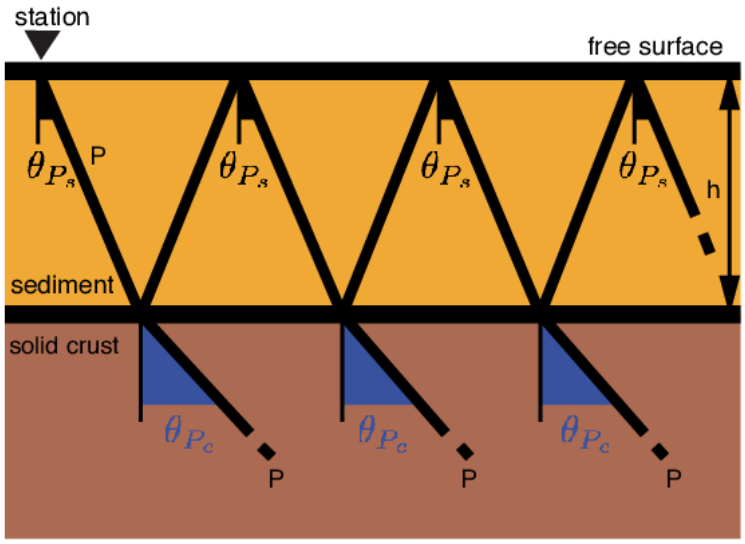
- Measurements of earthquake reverberations have revealed that our planet's inner core a solid ball of iron nickel has two distinct layers made of differently structured iron crystals.
- The way the earthquake wave oscillations are distorted as they bounce back and forth through the centre of the planet allowed researchers to figure out the core's structure.
- For a long time textbooks have taught that the Earth has four layers: the crust, the mantle, the outer core and the inner core, but a fifth layer has been suspected for more than a decade but proved near impossible to detect.
- The finding will help to understand how the core formed millions of years ago and what role it might have had in shaping the magnetic field.





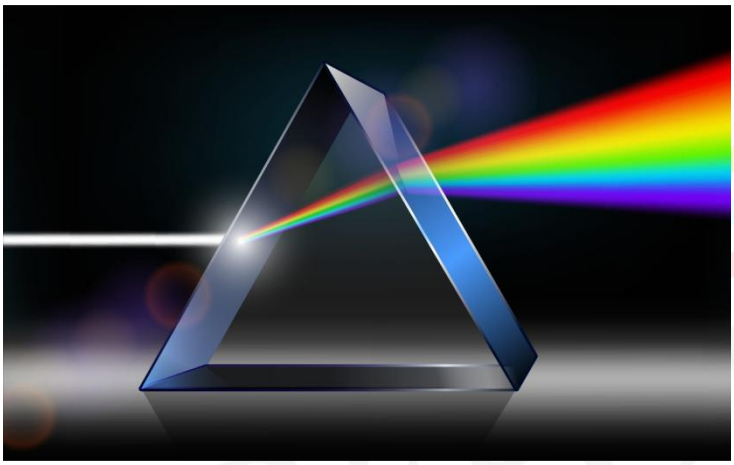
What is reverberation?

Persistence of sound (after the source stops producing sound) due to the repeated reflection is called reverberation.



James Webb telescope

- Observations by the James Webb Space Telescope (JWST) offer insights into early galaxy formation.
- The telescope made observations of a population of candidate massive galaxies that formed around 500-700 million years after the Big Bang (Nature).
- These galaxies are more massive than have been expected for this early point in time.
- If verified with spectroscopy, these findings provide evidence to suggest that galaxies grew quicker than expected early in the history of the Universe
- The James Webb Space Telescope (JWST) is a space telescope designed primarily to conduct infrared astronomy.
- The U.S. National Aeronautics and Space Administration (NASA) led development of the telescope[1] in collaboration with the European Space Agency (ESA), and the Canadian Space Agency (CSA).



- The JWST was launched 25 December 2021 on an ESA Ariane 5 rocket from Kourou, French Guianaand is intended to succeed the Hubble Space Telescope as NASA's flagship mission in astrophysics.
- The telescope is named after James E. Webb, who was the administrator of NASA from 1961 to 1968 during the Mercury, Gemini, and much of the Apollo programs.
- It provides improved infrared resolution and sensitivity over Hubble, viewing objects up to 100 times fainter than the faintest detectable by Hubble.
- Spectroscopy is the study of the absorption and emission of light and other radiation by matter.
- It involves the splitting of light (or more precisely electromagnetic radiation) into its constituent wavelengths (a spectrum), which is done in much the same way as a prism splits light into a rainbow of colours.

Hummingbird

- Natives of the American continent.
- The bee hummingbird is barely 5 cm long and weighs 2 grams.
- They can beat their wings up to 50 times per second, creating a hum that defines them.
- They can hover majestically as they sip nectar from a flower, and even fly backward.

- Tubular flowers that are bright red or orange (such as lantana and rhododendron) are preferred

- An examination of their wings reveals very long hand bones but very short arm bones that are connected to the body through exceptionally flexible ball- and- socket joints.
- These joints allow the wings to rotate after each half stroke, permitting manoeuvrability and backward flight.
- India has its sunbirds which, though unrelated to hummingbirds, share many common features through convergent evolution
- The energy demands of hovering are very high. Relative to their body mass, hummingbirds have the highest metabolic rate (calories burnt per minute) among vertebrates.
- Most of this energy comes from nectar.
- Rapid sugar uptake by their digestive system ensures that they utilise energy from nectar ingested just a few minutes ago.
- Recent genome studies have shown that during evolution, the gene for a key enzyme involved in gluconeogenesis was lost around the time when hovering appeared.
- Removing this gene from bird cell lines grown in the laboratory leads to an increase in energy efficiency of these cells
- Like parrots and some songbirds, hummingbirds are capable of vocal mimicry.
- When hummingbird pairs are reared in isolation, the two birds produce a song that is subtly different from the standard song of their species.

What is convergent evolution?

Convergent evolution is a concept in evolutionary biology that refers to the kind of evolution wherein, for instance, a pair of phylogenetically independent organisms evolve anatomically different structure, trait, or morphological feature that has the same function.

- The word "*analogous*" is used to describe such structures of two evolutionary unrelated species and yet they have similar or corresponding functions.
- Analogous structures do not share the same embryonic origin and they differ anatomically.

Fear conditioning

- Brain -imaging studies in humans have shown that the neuronal activities of the anterior cingulate

cortex (ACC) and the amygdala change during observation of others experiencing fear or others' fearful facial expressions.

- It was also known that another region of the brain basolateral amygdala (BLA) is essential for observational fear.
- ACC is considered an important region of the brain for the convergence of sensory and emotional information

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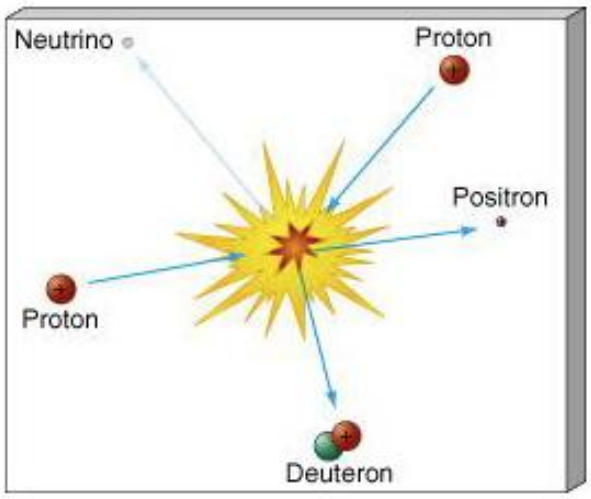
Neutrinos

- Neutrinos are the second most abundant particles in the cosmos



- A neutrino is a subatomic particle that is very similar to an electron, but has no electrical charge and a very small mass, which might even be zero
- Every elementary particle has an anti-particle. If the two meet, they will destroy each other in a flash of energy. The electron's anti-particle is the positron.
- They can be distinguished because they have opposite charges.
- Similarly, neutrinos have anti-neutrinos. However, neither is electrically charged, nor possesses any other properties to really differentiate between them
- But physicists working with the Kamioka Liquid Scintillator Antineutrino Detector (KamLAND) in Japan recently reported that after analysing two years' data, they could not find signs that neutrinos could be their own anti-particles.
- KamLAND looks for an event called neutrinoless double beta decay.
- In normal double beta -decay, two neutrons in an atom turn into two protons by emitting two electrons and two anti-neutrinos.
- In neutrinoless double beta -decay, the anti-neutrinos aren't emitted, which can happen only if anti-neutrinos are just different kinds of neutrinos.

Solar stoves

Renewable energy

- Among the government's earliest attempt to transform household energy consumption was the solar cooker of the National Physical Laboratory (NPL), fabricated in the early 1950s, in a period of great

uncertainty in food security and energy self- sufficiency.

- The oil crisis of 1973 and an emerging forest conservation movement trained government attention on stoves that used firewood and cow dung
- A 2004 report noted that cooking constituted 80% of a rural Indian household's energy consumption.
- The International Energy Agency found that 668 million people in India depended on biomass for cooking and lighting in 2013, making India the largest consumer of fuelwood While older interventions in the renewable sphere were led by the state and motley non-governmental organisations, which provided shallow fixes to deep social problems, today, the real action is elsewhere.
- Public money is now funnelled into heavily subsidised large -scale private projects that produce green energy largely for commercial use.
- for household use

Maternity Benefit Act

- In India, the Maternity Benefit Act that was enacted by Parliament in 1961 has been amended from time to time to give women better benefits; for instance, paid maternity leave has been extended from the earlier 12 weeks to 26 weeks
- It is in this context that the Supreme Court of India's directive to a petitioner to approach the Union Ministry of Women and Child Development to frame a policy on menstrual pain leave has to
- Biological process must not become a "disincentive" for employers offering jobs to women.
- A petition had sought the Court's direction to States to frame rules for granting menstrual pain leave for students and working women, but there are apprehensions that these could entrench existing stigma and also result in furthering discrimination
- In India, Kerala and Bihar have menstrual pain leave; the food delivery app Zomato has also introduced it. Indonesia, Japan, South Korea, Spain and Zambia have this policy included in labour laws

What are the arguments against it?

- Not everyone not even all those who menstruate is in favour of menstrual leave. Some believe that it is not required and that it will backfire and lead to employer discrimination against women.

International steps

- Spain became the first European country to grant paid menstrual leave to workers. Workers now have the right to three days of menstrual leave expandable to five days a month.
- In Asia, Japan introduced menstrual leave as part of its labour laws in 1947, after the idea became popular with labour unions in the 1920s.
- At present, under Article 68, employers cannot ask women who experience difficult periods to work during that time.
- Indonesia too introduced a policy in 1948, amended in 2003, which states that workers experiencing menstrual pain are not obliged to work on the first two days of their cycle.
- In the Philippines, workers are permitted two days of menstrual leave a month.

- To encourage more women to join the workforce, it is imperative they have access to higher education and more opportunities. Sometimes, girls have to drop out from school simply because there are no toilets.
- In a world that should strive to become a better place for all, it is the responsibility of the wider society and governments to ensure that no section is left behind

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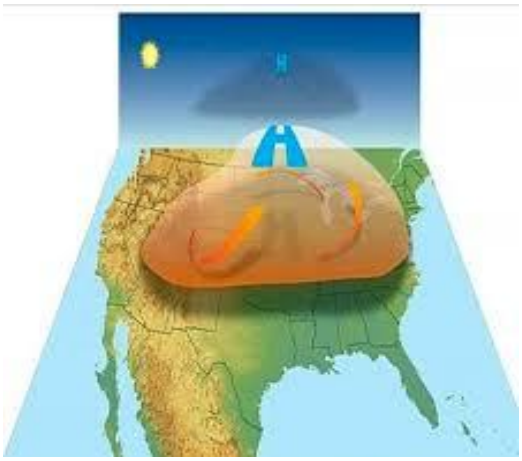
Heat waves

- Last week, the India Meteorological Department (IMD) warned that the maximum temperatures over northwest, west, and central India would be 3-5°C higher

What is heat waves?



- According to the IMD, a region has a heat wave if its ambient temperature deviates by at least 4.5--6.4°C from the long-term average.
- There is also a heat wave if the maximum temperature crosses 45°C (or 37°C at a hill -station
- The long- term extended further south into peninsular India due to a northsouth pressure pattern set up by the La Niña, a world -affecting weather phenomenon in which a band of cool water spreads east-west across the equatorial Pacific Ocean.
- The last three years have been La Niña years, which has served as a precursor to 2023 likely being an El Niño year

How do heat waves occur?

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- The last three years have been La Niña years, which has served as a precursor to 2023 likely being an El Niño year
- First of all, in spring, India typically has air flowing in from the west-northwest. This direction of air-flow is bad news for India for several reasons.
- In the context of climate change, West Asia is warming faster than other regions in latitudes similarly close to the equator, and serves as a source of the warm air that blows into India.
- Likewise, air flowing in from the northwest rolls in over the mountains of Afghanistan and Pakistan, so some of the compression also happens on the leeward side of these mountains, entering India with a bristling warmth.
- Any time winds flow from the west to the east, we need to remember that the winds are blowing faster than the planet itself, which is also rotating from west to east.
- Finally, the so-called lapse rate, the rate at which temperatures cool from the surface to the upper atmosphere is declining under global warming.
- In other words, global warming tends to warm the upper atmosphere faster than the air near the surface.
- This in turn means that the sinking air is warmer due to global warming, and thus produces heat waves as it sinks and compresses.
- The other factors that affect the formation of heat waves are the age of the air mass and how far it has travelled.
- The north western heatwaves are typically formed with air masses that come from 800-1,600 km away and are around two days old.
- Heat waves over peninsular India on the other hand arrive from the oceans, which are closer (around 200-400 km) and are barely a day old. As a result, they are on average less intense