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SAURABH PANDEY
CSE
(CIVIL SERVICES EXAMINATION)
FROM BASICS TO UPSC BRILLIANCE

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For IAS/Civil Service Exams
Coverage of all important Articles of UPSC CSE

December 2023

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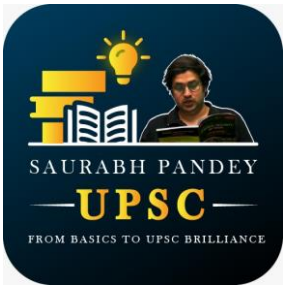

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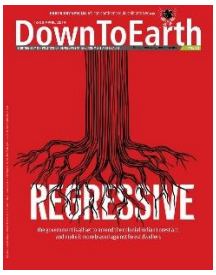

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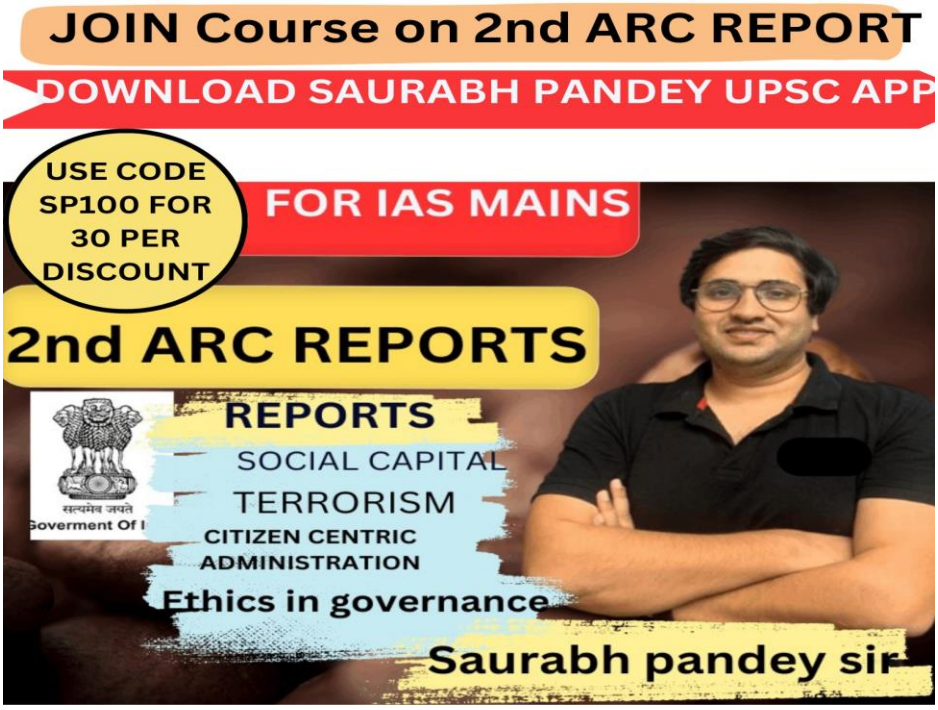

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KIRALI AI CHIP

Kirali AI chip is the state’s first silicon -proven AI chip designed by Digital University Kerala,that offers speed .

किराली एआई चिप डिजिटल यूनिवर्सिटी केरल द्वारा डिजाइन की गई राज्य की पहली सिलिकॉन-सिद्ध एआई चिप है, जो गति प्रदान करती है।

किराली एआई चिप के बारे में

- यह नवोन्मेषी चिप तकनीक न्यूनतम बिजली की खपत करते हुए विभिन्न अनुप्रयोगों के लिए उच्च प्रदर्शन प्रदान करने के लिए एज इंटेलिजेंस का उपयोग करती है।
- यह तेजी से लोडिंग संचालन की अनुमति देता है, जो न्यूनतम शक्ति और विलंबता के साथ संवेदी सर्किट से जानकारी के पूर्ण भंडारण और प्रसंस्करण की सुविधा प्रदान करता है।
- इससे कॉडकंप्यूटेशंस की अधिक कुशल ऑफलोडिंग होती है।

About Kirali AI Chip

- This innovative chip technology utilizes edge intelligence to deliver high performance for various applications while consuming minimal powers.
- It allows for faster loading operations,which facilitate the complete storage and processing of information from sensory circuits with minimum power and latency.
- This leads to more efficient offloading of coudcomputations.

PRADHAN MANTRI SURYODAYA YOJANA

PM Narendra Modi launched (PMSY) WHICH will provide rooftop solar panels for consumers.

WHO IS ELIGIBLE FOR THE SCHEME?

- Through the PMSY ,1 crore families will be given access to rooftop solar energy.
- This scheme is meant to help poor and middle income households lower their electricity bills.

प्रधान मंत्री सूर्योदय योजना

प्रधान मंत्री नरेंद्र मोदी ने (PMSY) लॉन्च किया जो उपभोक्ताओं के लिए छत पर सौर पैनल प्रदान करेगा।

योजना के लिए कौन पात्र है?

- PMSY के माध्यम से 1 करोड़ परिवारों को छत पर सौर ऊर्जा तक पहुंच प्रदान की जाएगी।
- यह योजना गरीब और मध्यम आय वाले परिवारों को उनके बिजली बिल कम करने में मदद करने के लिए है।

SECTION 420 IPC

Section 420 deals with the act of cheating and dishonestly inducing someone to deliver property or valuable securities.

Punishment:

- A person found guilty under Section 420 may be punished with imprisonment up to seven years.
- A fine may also be imposed.

ESSENTIAL INGREDIENTS FOR THE OFFENSE:

- False representation made by the accused.
- Knowledge of the falsity by the accused at the time of making the representation.
- The false representation is made with the dishonest intention of deceiving.
- The deception induces the person to deliver property or perform an action they would not have otherwise done.

धारा 420

धारा 420 धोखाधड़ी और बेईमानी से किसी को संपत्ति या मूल्यवान प्रतिभूतियां देने के लिए प्रेरित करने के कृत्य से संबंधित है।

सज़ा:

- धारा **420** के तहत दोषी पाए गए व्यक्ति को सात साल तक की सजा हो सकती है।
- जुर्माना भी लगाया जा सकता है.

अपराध के लिए आवश्यक सामग्री:

- अभियुक्त द्वारा मिथ्या प्रतिनिधित्व किया गया।
- अभ्यावेदन करते समय अभियुक्त द्वारा मिथ्यात्व का ज्ञान होना।
- झूठा प्रतिनिधित्व धोखा देने के बेईमान इरादे से किया गया है।
- धोखा व्यक्ति को संपत्ति वितरित करने या ऐसा कार्य करने के लिए प्रेरित करता है जो उन्होंने अन्यथा नहीं किया होता।

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Defence news

- **The approval, termed Acceptance of Necessity (AoN), is the first step toward procurement of any military equipment and hardware under India's defense acquisition norm. The tendering and contracting process is undertaken only after the grant of AoN.**

- **Anti-ship missiles (MRAShM) for the Navy. The MRAShM is a lightweight surface-to-surface missile which will be a primary offensive weapon aboard various Indian naval ships**

- **The Medium Range Surface to Air Missile (MRSAM) is a supersonic missile that can be launched vertically with a rapid response time and is intended to intercept various airborne threats such as guided bombs, aircraft, missiles, and helicopters.**

- **The first three of a series of eight anti-submarine warfare shallow watercrafts being built by Cochin Shipyard Ltd. for the Navy were launched on the shipyard premises on Thursday.**

- **The ships, to be named INS Mahe, INS Malvan, and INS Mangrol upon commissioning, were launched.**

MILAN EXERCISE

About MILAN

- **MILAN is a biennial multilateral naval exercise incepted by the Indian Navy in 1995 at Andaman and Nicobar Command.**

- **Since its inception, the event has been held biennially except for 2001, 2005, 2016 and 2020. While the 2001 and 2016 editions were not held due to International Fleet Reviews, the 2005 editions were rescheduled to 2006 due to the 2004 Tsunami. The 2020 edition of MILAN was postponed to 2022 due to COVID-19.**

- **Starting with the participation of only four countries, viz Indonesia, Singapore, Sri Lanka, and Thailand, in the 1995 edition, the exercise has since transitioned leaps and bounds in terms of a number of participants and complexity of exercises.**

- **Originally conceived in consonance with India's 'Look East Policy', MILAN expanded in ensuing years with the GOI's 'Act East policy' and Security and Growth for All in the Region (SAGAR) initiative, to include participation from island nations in the Western IOR as also IOR littorals.**

- **Participation increased from six regional countries to 18 countries in 2014 which included IOR littorals.**

- **With Indian Navy's engagement with Friendly Foreign Countries (FFCs) expanding over the decades, a need was felt to further consolidate the naval cooperation by enhancing the scale and complexity of the MILAN exercise and engaging both regional and extra regional navies of the world.**

- **Considering the infrastructure requirements of a large naval gathering, it was decided to shift the event to the mainland, and Visakhapatnam, being the Headquarters of Eastern Naval Command, was nominated to host the event.**

- **India is also gearing up to host its largest multilateral exercise early next year. The next edition of "Exercise Milan" is scheduled for February 2024.**

Maritime outreach

- **India has also significantly expanded assistance in capacity building to countries in the region.**

- **This includes giving platforms, regular training as well as routinely deploying Mobile Training Teams (MTT) overseas to facilitate capacity development.**

- **"Recently, MTT from Indian Naval Work up teams undertook operational sea checks of ships of two friendly countries – Sri Lanka and South Africa –**

at Trincomalee and Cape Town respectively where they worked alongside the ship's crew to achieve very high standards of operational readiness as well as safety compliance,"

XPoSat

- **The Indian Space Research Organisation has announced a plan to launch its first X-ray Polarimeter Satellite (XPoSat) to investigate the polarization of intense X-ray sources.**
- **The ISRO said that while space- based X-ray astronomy had been established in India focusing on imaging, time -domain studies, and spectroscopy, the XPoSat mission marked a major value addition. This research, supplementing traditional time and frequency domain studies, introduced a novel dimension to X-ray astronomy, generating anticipation and excitement within the scientific community.**
- **The satellite will be launched by the Polar Satellite Launch Vehicle**
- **The XPoSat is designed for observation from a low earth orbit (non-sun synchronous orbit of 650-km altitude, low inclination of approximately six degrees) and will carry two scientific payloads.**
- **With these two payloads, the mission is capable of simultaneous studies of temporal, spectral, and polarisation features of the bright X-ray sources.**
- **The mission objectives include the measurement of X-ray polarisation in the energy band of 8-30 keV emanating from X-ray sources and long-term spectral and temporal studies of cosmic X-ray sources in the energy band of 0.8-15 keV.**
- **The mission life is expected to be approximately five years.**
- **The primary payload, POLIX (Polarimeter Instrument in X-rays), is designed to measure polarimetry parameters, specifically the degree and angle of polarisation, in the medium X-ray energy range of 8-30 keV photons**

originating from astronomical sources.

- **The secondary payload is the XSPECT (X-ray Spectroscopy and Timing) payload, which will provide spectroscopic information within the energy range of 0.8-15 keV.**

Antiretroviral THERAPY

- **we have effective antiretroviral medications available to prevent multiplication of HIV. People with HIV who are on these antiretroviral medications can lead a normal, healthy lifestyle without developing opportunistic infections.**
- **Results from clinical trials recommend starting Antiretroviral Therapy (ART) soon after diagnosis. Over 90% of antiretroviral consumed globally were from India. Effective biomedical prevention tools in preexposure prophylaxis (PrEP) medications. These oral medications are very effective in preventing HIV acquisition if a person with high risk of HIV takes them correctly without fail.**
- **A long acting injectable PrEP medication called Cabotegravir has been developed. Cabotrgravir injections can be taken every 2 months instead of the daily oral pill and studies have shown higher efficacy in HIV prevention with long acting injectable PrEP.**

About retrovirus

Interesting Points about Retroviruses

- Retroviruses contain RNA as genetic material but have DNA-dependent steps in their replication.
- Replicates via reverse transcription because of the presence of reverse transcriptase enzyme.
- Integrase transfers the viral DNA into the cell nucleus and viral dsDNA is covalently and randomly integrated into the cell's genome.
- Retroviruses that can transform host cells at high rates contain gene sequences such as viral oncogenes and proto-oncogenes.
- Human retroviruses can cause immune deficiencies, cancer, and neurological diseases.

Report on air pollution

- **Outdoor air pollution from all sources accounts for 2.18 million deaths per year in India, second only to China, according to a modelling study published in The BMJ.**
- **The research found that air pollution from using fossil fuels in industry, power generation, and transportation accounts for 5.1 million extra deaths a year worldwide.**
- **This equates to 61 per cent of a total estimated 8.3 million deaths worldwide due to ambient (outdoor) air pollution from all sources in 2019, which could be avoided by replacing fossil fuels with clean, renewable energy.**

Broadcast regulation bill

- **Consolidated Legal Framework for the entire Broadcasting sector**
- **Content Evaluation Committees for adherence to Programme Code and Advertisement Code**
- **Broadcast Advisory Council to replace existing Inter Departmental Committee**
- **Penalty structure linked to financial capacity**
- **Accessibility measures for persons with disabilities**

Key Highlights:

- **1. Consolidation and Modernization: It addresses a long standing need of consolidating and updating the regulatory provisions for various broadcasting services under a single legislative framework. This move streamlines the regulatory process, making it more efficient and contemporary. It extends its regulatory purview to encompass broadcasting over-the-top (OTT) content and digital news and current affairs currently regulated through IT Act, 2000 and regulations made there under.**
- **2. Contemporary Definitions and Future-Ready Provisions: To keep pace with the evolving technologies and services, the bill introduces**

comprehensive definitions for contemporary broadcasting terms and incorporates provisions for emerging broadcasting technologies.

- **3. Strengthens the Self-Regulation Regime: It enhances self-regulation with the introduction of 'Content evaluation committees' and evolves the existing Inter-Departmental Committee into a more participative and broader 'Broadcast Advisory Council'.**

- **4. Differentiated Programme Code and Advertisement Code: It allows for a differentiated approach to Programme and Advertisement Codes across various services and require self-classification by broadcasters and robust access control measures for restricted content.**

- **5. Accessibility for Persons with Disabilities: The bill addresses the specific needs of persons with disabilities by providing for enabling provisions for issue of comprehensive accessibility guidelines.**

- **6. Statutory Penalties and Fines: The draft Bill introduces statutory penalties such as: advisory, warning, censure, or monetary penalties, for operators and broadcasters. Provision for imprisonment and/or fines remains, but only for very serious offenses, ensuring a balanced approach to regulation.**

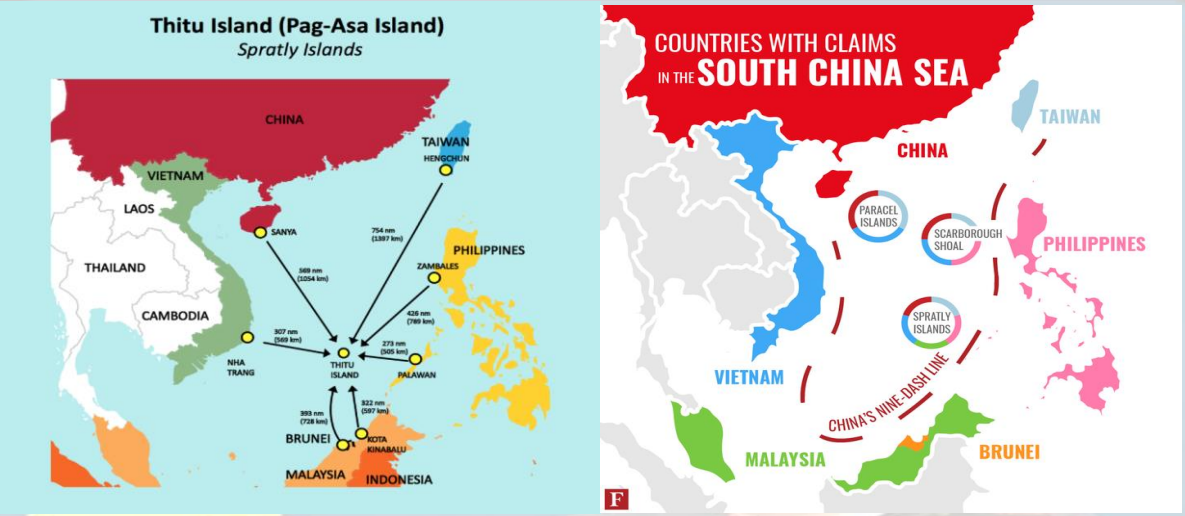
- **7. Equitable Penalties: Monetary penalties and fines are linked to the financial capacity of the entity, taking into account their investment and turnover to ensure fairness and equity.**

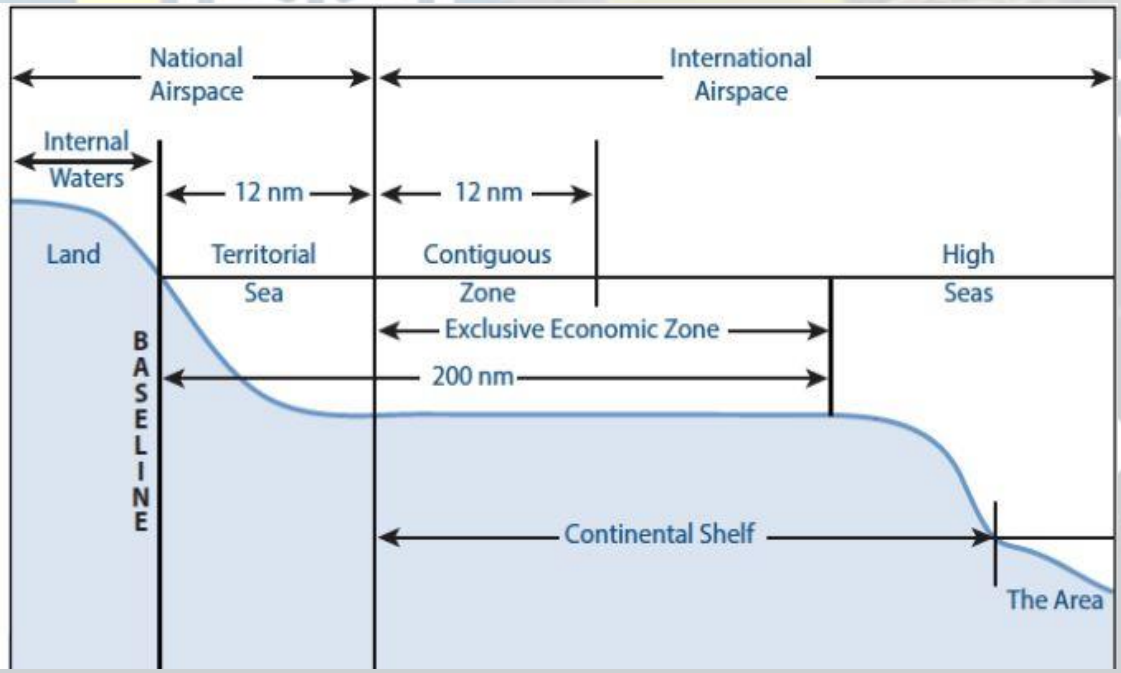
- **8. Infrastructure Sharing, Platform Services and Right of Way: The bill also includes provisions for infrastructure sharing among broadcasting network operators and carriage of platform services. Further, it streamlines the Right of Way section to address relocation and alterations more efficiently, and establishes a structured dispute resolution mechanism.**

THITU ISLAND

- **The Philippines inaugurated a new coast guard monitoring base on an island occupied by Filipino forces in the disputed South China Sea and plans to expand joint patrols with the U.S. and Australia to counter China's "pure bullying" in the strategic waterway.**

- **High- seas face -offs between Chinese and Philippine ships have intensified this year in the contested waters, fueling fears of a larger conflict that could involve the U.S.**

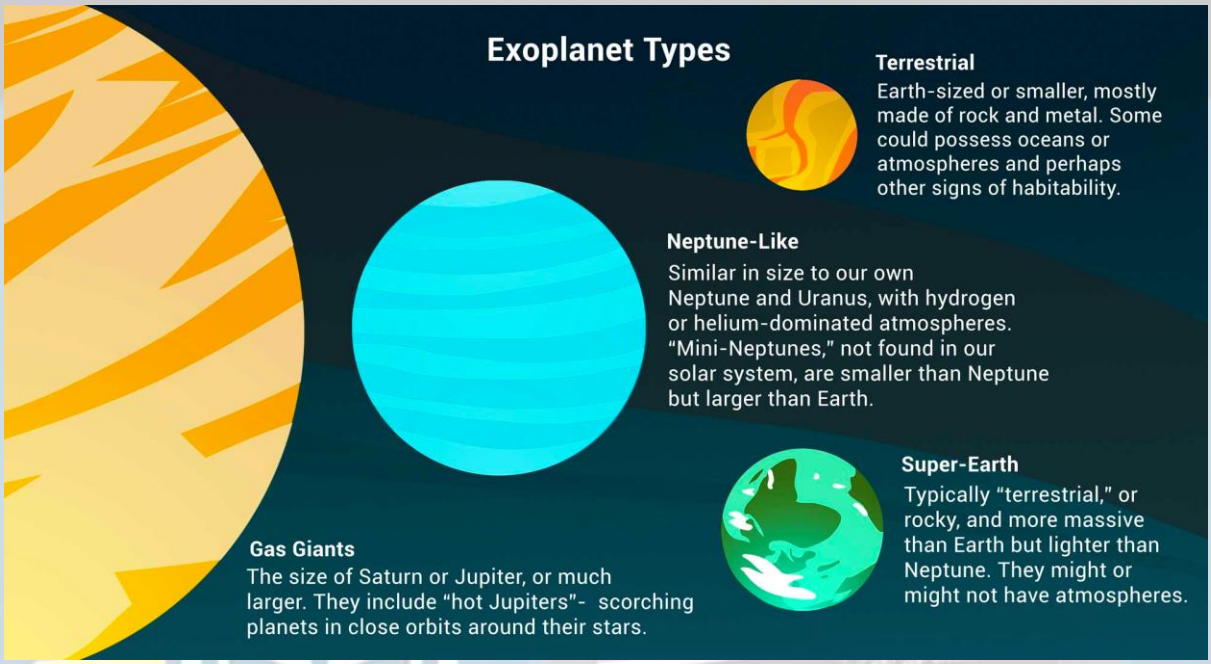




Bright star (HD 110067)

- **Six exoplanets orbiting around a nearby bright star (HD 110067) in the Coma Berenices constellation has been discovered.**

- **The planets have radii between that of Earth and Neptune**



- **Planets with radii between that of the Earth and Neptune (referred to as 'sub-Neptunes') are found in close -in orbits around more than half of all Sunlike stars, but details of their composition, formation and evolution are not well understood.**

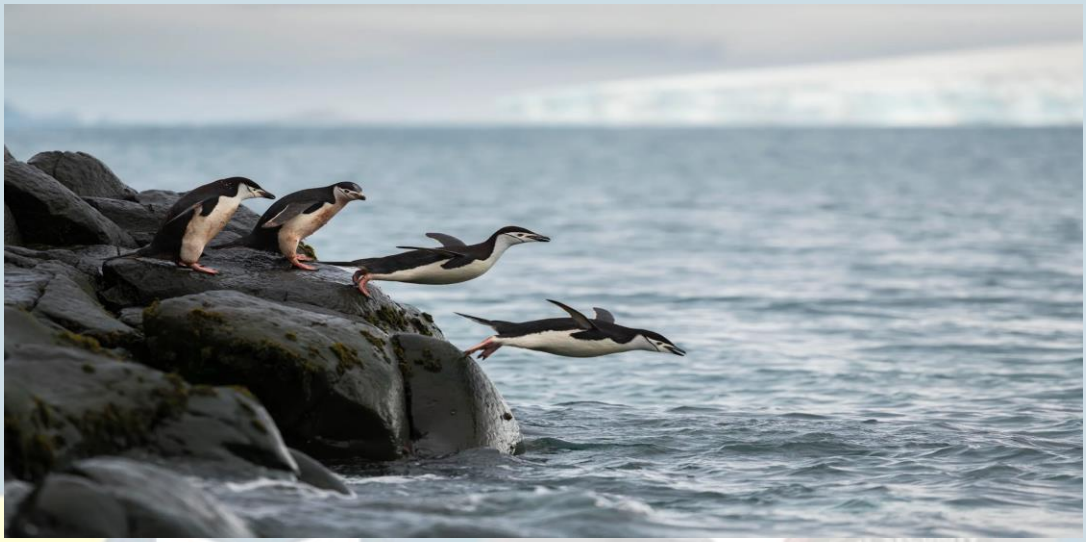
- **HD 110067 is a bright star in the Coma Berenices constellation (around 100 light-years away), which is visible from Earth's Northern Hemisphere.**

- **Observations of HD 110067 made by NASA's Transiting Exoplanet Survey Satellite (TESS) in 2020 and 2022 revealed several dips in the star's brightness, and with additional observations from the 'Characterising ExoPlanets Satellite' (CHEOPS) the signals were interpreted as six planets passing in front of the star**

- **HD 110067 is the brightest star found to host more than four transiting exoplanets to date, the authors note, and add that more planets may exist within or beyond the temperate zone, although such observations have not been made so far. They conclude that the HD 110067 system offers a chance to learn more about sub- Neptune's and how systems in this configuration**

might form.

Chinstrap penguin



- **In the wild, nesting chinstrap penguins get more than 11 hours of sleep per day but not all at once.**
- **According to a study, these birds nod off thousands of times per day, but for only four seconds at a time, cumulatively accruing their daily sleep needs while remaining continuously vigilant over their nests.**
- **The findings suggest that, given the breeding success of these penguins, the benefits of sleep can accrue incrementally and those micro sleeps can fulfil at least some of the benefits of longer sleep bouts.**
- **About chinstrap penguin**
- **The chinstrap penguin (*Pygoscelis antarcticus*) is a species of penguin that inhabits a variety of islands and shores in the Southern Pacific and the Antarctic Oceans.**
- **Its name stems from the narrow black band under its head, which makes it appear as if it were wearing a black helmet, making it easy to identify.**
- **Other common names include ringed penguin, bearded penguin, and stone cracker penguin, due to its loud, harsh call.**

- **Chinstrap penguins have a circumpolar distribution.**
- **They breed in Antarctica, Argentina, Bouvet Island, Chile, the French Southern Territories, and South Georgia and the South Sandwich Islands.**
- **Vagrant individuals have been found in New Zealand, the islands of Saint Helena and Tristan da Cunha, and South Africa**
- **The discovery of a Neptune- mass exoplanet orbiting the very low- mass M dwarf star LHS 3154 challenges theoretical models of planet formation, according to a new study.**
- **The planet, which has a mass at least 13 times that of Earth, tightly orbits a star nine times less massive than the Sun, demonstrating that small stars can sometimes host larger planets than was previously thought.**
- **Although massive planet candidates have been detected around a few very low- mass dwarfs.**

Bacillus Calmette-Guerin (BCG)

- **The 'groundbreaking Health Day at COP-28', as COP-28 president Sultan Ahmed Al Jaber put it, is expected to pose two questions: how public health can become resilient to climate change, and who will finance this transformation.**
- **India also highlighted the intricate link between climate change and public health during the health talks held under its G-20 presidency this year.**
- **"Health Day in itself doesn't necessarily mean that health will be reflected in the negotiations.**
- **"The connection between health and climate change is evident, yet it has not been a specific focus of the COP process until now.**
- **The United Nations Framework Convention on Climate Change (UNFCCC)**

recognises the health impacts of climate change.

- **The COP-28 UAE Declaration on Climate and Health includes dialogue on mitigating emissions, health sector adaptation to climate change, mainstreaming of health into climate policies and the sticky question of climate financing for health.**
- **The Declaration, however, doesn't mention fossil fuels. It recognises the need for climate mitigation, "strengthening research on the linkages between environmental and climatic factors and antimicrobial resistance";**
- **and "intensifying efforts for the early detection of zoonotic spill -overs" to prevent future pandemics.**
- **It does not mention pollution- related harms or identify 'fossil fuels' coal, oil and gas as a driver of health threats, or emphasise the need to end fossil fuel dependence.**
- **Fossil fuels are seen as the largest contributor to global climate change**
- **Changing weather patterns and rising temperatures are altering the life cycle of vector- borne diseases such as dengue and malaria, which disproportionately impact poorer, marginalised groups (the spread of dengue has increased in India over the last two decades, research shows).**
- **Then there is the matter of finance.**
- **Health crises triggered by warming climate are expected to chart a financial toll of around $2-4 billion annually by 2030.**
- **Another estimate shows that 40% of climate- related poverty would be due to direct health impacts, as people's income, productivity and health costs would soar.**
- **The Green Climate Fund, the Asian Development Bank, the Global Fund and Rockefeller Foundation pledged a new $1 billion finance pledge for climate and health.**
- **"This $1 billion sum is a tremendous addition to current levels of climate and**

health finance,".

- **"It is also key that funding for climate and health be truly new and additional, and not pulled from other key areas...that are vital to protecting health, such as water and sanitation, food security, and humanitarian action."**
- **Developing countries had earlier asserted the need for grant- based international public finance that doesn't add to their debt burden.**
- **However, the Declaration endorses climate- health funding from "domestic budgets, multilateral development banks, multilateral climate funds...", along with philanthropies and private sector actors.**

Gender neutrality and Adultery

- **Last month, the Parliamentary Standing Committee on Home Affairs, examining the three new criminal law Bills set to replace the Indian Penal Code (IPC), Code of Criminal Procedure (CrPC), and the Indian Evidence Act, recommended the criminalization of adultery on gender- neutral lines.**
- **This comes after a five- judge Constitution Bench of the Supreme Court unanimously decriminalised adultery in 2018 on several grounds including discrimination.**
- **The Committee reasoned that adultery be criminalised in a gender -neutral manner on the ground that it is crucial to safeguard the sanctity of the institution of marriage**
- **In his dissent note to the three Bills, Congress MP and former Home Minister P. Chidambaram emphasised that interference by the State in the private lives of consenting adults must be avoided.**
- **"Adultery should not be a crime.**
- **It is an offence against marriage which is a compact between two persons; if the compact is broken, the aggrieved spouse may sue for divorce or civil**

damages.

- **To raise marriage to the level of a sacrament is outdated. In any event, a marriage concerns only two persons and not society at large.**
- **The State has no business to enter into their lives and punish the alleged wrongdoer," the note reads.**
- **A five -judge Constitution Bench of the Supreme Court led by then Chief Justice of India (CJI) Dipak Misra, and comprising current CJI D. Y. Chandrachud, and Justices A. M. Khanwilkar, R. F. Nariman, and Indu Malhotra, in Joseph Shine versus Union of India (2018), held that adultery is not a crime and struck it off the IPC.**
- **According to senior Advocate Gopal Sankaranarayanan, the problem with adultery being in the IPC was two-fold.**
- **The first is criminalising it on the basis of the institution of marriage and the second is treating women as property.**
- **Making it gender neutral would do away with the second, but still leave the first.**

Meta vs FTC

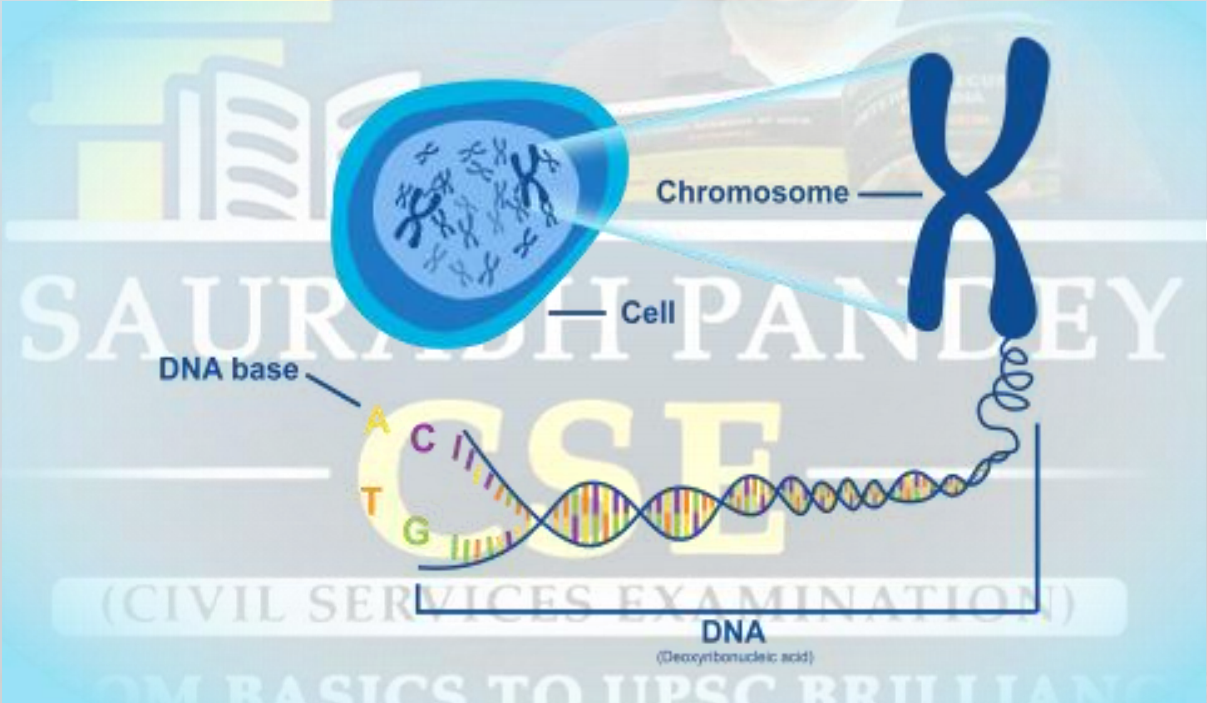
- **Usually competition regulators investigate trade practices, sue corporations, and levy penalties on them.**
- **The U.S. Federal Trade Commission (FTC) probes antitrust practices and files lawsuits against tech companies it sees as violating consumer laws.**
- **But in a shock move, Facebook -parent Meta in late November sued the FTC, claiming the regulator was making an "obvious power grab" and that its action caused the social media giant "immediate and irreparable" harm**
- **The FTC, in May, proposed changes to the three year old agreement, noting that Meta had not fully complied with the previous terms.**

- **The FTC alleged that Meta misled parents about the Messenger Kids app and misrepresented how some app developers could access private user data.**

- **As part of the latest changes proposed by the FTC, Meta would be barred from profiting off the data it collected from children (users below 18) as well as the data from its virtual reality products.**

- **Meta would also be restricted in its use of facial recognition technology, its launch of new products and features, and would have to provide even more user protections, as per the regulator.**

Genome sequencing of population



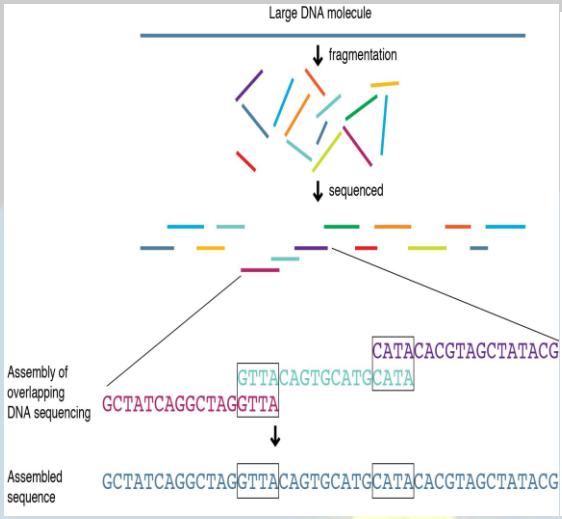
- **An early effort to use large- scale population genetic studies was initiated in Iceland by deCODE genomics in 1996, with most of the Icelandic population enrolling.**

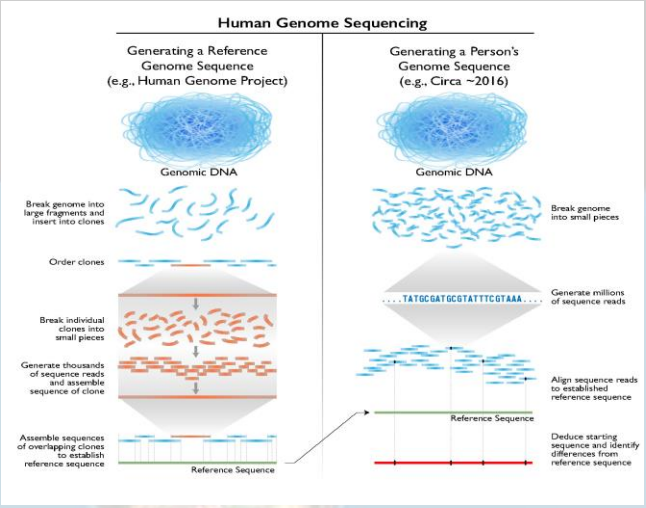
- **The initiative provided the initial impetus for programmes that wished to use population- scale genomic data for precision medicine and public health**

- **A recent initiative by the pharmaceutical companies Regeneron Genetics**

Center, AstraZeneca, Novo Nordisk, and Roche, along with the Meharry Medical College, Tennessee, plans to sequence five lakh individuals of African ancestry through the Diversity Human Genome Initiative

- **A programme for population genomes in India named IndiGen provided an early view of more than a thousand genomes from cosmopolitan areas.**
- **It yielded clues to the landscape of many treatable genetic diseases and variants of clinical significance, including the efficacy and toxicity of drugs and prevalence of rare disorders**
- **The Genome Asia project, led by multiple partners across the continent, plans to sequence a lakh whole genomes from diverse populations.**
- **A pilot programme for population genomes in India named IndiGen provided an early view of more than a thousand genomes of individuals from cosmopolitan areas in India.**
- **It also yielded some clues to the landscape of many treatable genetic diseases and variants of clinical significance, including the efficacy and toxicity of drugs and the prevalence of rare disorders.**
- **Looking to the horizon, the long- term impact of population- scale genomics extends beyond individual health, shaping our comprehension of human evolution, migration patterns, and adaptation to diverse environments.**
- **It will also contribute significantly to our knowledge of human biology.**
- **In essence, population scale genomics stands at the forefront of a genomic revolution, poised to revolutionise healthcare, illuminate our evolutionary history, and propel us towards a future in which precise, personalised approaches will influence the landscape of medical and biological understanding**





TECHNOLOGY IN USE

What is a VoIP phone?

- **A VoIP phone is a hardware- or software-based telephone designed to use voice over Internet Protocol (VoIP) technology to send and receive phone calls over an IP network.**
- **The phone converts analog telephony audio into a digital format that can be transmitted over the internet and converts incoming digital phone signals from the internet to standard telephone audio.**
- **VoIP phones, also known as *IP phones*, include features and capabilities not found in traditional analog phones.**
- **They also have additional performance requirements because phone calls are placed over the internet instead of the legacy public switched telephone network.**

Methane and climate change

- **Methane is an organic compound. Its molecule consists of carbon and four hydrogen atoms (CH4).**
- **It's in the news of late because of its character as a potent climate pollutant.**
- **While climate talks have by and large focused on carbon and carbon dioxide emissions, there is increasing acknowledgement among the world's leaders as well as philanthropists of methane effects on global warming.**
- **At the ongoing COP-28 climate talks in the United Arab Emirates, for example, a group of well- endowed philanthropic bodies, including the Sequoia Climate Foundation and the Bezos Earth Fund, announced that they would collectively invest $450 million in solutions to tackle methane emissions.**
- **Methane has a greater global warming potential (GWP) than carbon dioxide.**
- **The GWP is a measure of the warming caused by a substance relative to that due to the same mass of carbon dioxide; the GWP100 measures this over a century at a time.**
- **If carbon dioxide has a GWP100 of 1, methane is 28, nitrous oxide is 265, and sulphur hexafluoride is 23,500.**
- **However, while carbon dioxide lasts for several decades at a time in the atmosphere before breaking down, methane breaks down in a matter of years. That is, it's a short -lived climate pollutant.**

Essequibo

- **Venezuela's move to hold a referendum on whether it should exercise sovereignty over Essequibo, a vast, oil- rich disputed region that is now part**

of neighbouring Guyana, has cut open old wounds and inflamed tensions between the South American nations.

- 

- **Venezuela has always retained claims over Essequibo, which it says was stolen when the north south border was drawn by colonial powers over a century ago.**
- **In 1966, Venezuela and the U.K. entered into a temporary Geneva Agreement on the border (Guyana was a British colony) to maintain the status quo while seeking to find a practical, peaceful and satisfactory solution**

for all.

- **Guyana, the only English speaking country in Latin America, maintains that the 1899 border agreement between international arbitrators (from Britain, Russia and the U.S.) is final and approached the International Court of Justice in 2018, requesting a ruling.**

- **Venezuela on the other side has always argued that it was not part of the 1899 agreement, which it calls null and void.**

Change in agri-food system

- **Report from the United Nations Food and Agriculture Organization (FAO), published earlier this month, has laid bare the staggering hidden costs of our global agri-food systems, surpassing an astonishing $10 trillion.**

- **In middle -income countries like India, these costs constitute nearly 11% of the GDP, which manifests as higher poverty, environmental harm, and health -related impacts, including undernourishment and unhealthy dietary patterns.**

- **The report blames "unsustainable business as- usual activities and practices" for these escalating costs, pointing to a need to transform agri-food systems.**

- **One way to do so is to shift to multi-cropping systems that have the potential to protect farmers' well-being, improve nutritional outcomes for our communities, and positively impact ecological health.**

What are the impacts of intensive agriculture?

- **Impressive improvements in agricultural productivity have been achieved in India over the last five decades by mainstreaming mono-cropping systems and chemical- intensive farming practices.**

- **The Green Revolution focused on the marketing of high- yielding varieties of paddy and wheat on agricultural lands, which now constitute more than**

70% of India's agricultural production.

- **The infusion of seeds purchased from multinational corporations and fertilizers undermined seed sovereignty, dismantled Indigenous knowledge systems, and fueled a shift from diverse crop varieties and staples such as pulses and millets to monoculture plantations.**
- **This trend also compromised the nutritional needs of households and resulted in adverse ecological consequences including excessive extraction of groundwater.**
- **This privatization and deregulation of agricultural inputs also increased indebtedness among agrarian households.**

Which are the crops being favored?

- **Under the National Food Security Act 2013, 65% of households (around 800 million people) in India are legally assured a right to food at subsidized rates through the Public Distribution System and welfare programmes such as the Integrated Child Development Services and the Midday Meal Scheme.**
- **To meet this requirement, the procurement of food crops is coordinated by the Food Corporation of India (FCI), which is required to maintain a central pool of buffer stock and to procure, transport, and store food grain stocks in the country.**
- **However, this procurement policy heavily favors rice and wheat**
- **At the same time, other water -intensive cash crops like sugarcane and areca nut have also flourished under policies favoring investments in dams and canal irrigation (favorable for sugarcane) and free electricity for bore wells (favourable for areca nut).**
- **This trend threatens food security and the production of nutritional crops.**

- **The expansion of sugarcane cultivation affects biodiversity, increases the pressure on groundwater resources, and contributes to air and water pollution.**
- **And ironically, small and marginal farmers in India are among the most food and nutrition insecure**

How can crop diversification help?

- **A systemic shift in food regimes, from local to global value chains, is essential.**
- **The starting point for addressing these complex systemic issues could arise from local efforts, such as the diversification of farms.**
- **Diversified multi- cropping systems, rooted in agro-ecology principles, could be a viable solution to revitalize degraded land and soil.**
- **Practices known by various names locally, like 'akkadi saalu' in Karnataka, involve intercropping with a combination of legumes, pulses, oilseeds, trees, shrubs, and livestock.**
- **But the FAO report says that there are substantial "hidden costs" associated with the current systems which need to be factored into long- term evaluations of income.**
- **Moreover, millets, whose yield per hectare is comparable to those of rice and wheat, are also more nutritious, grow in semi-arid conditions without burdening groundwater tables, require minimal input, and provide a diversified food basket.**
- **While crop diversification will involve some loss of productivity using a narrow metric of kg/Ha, it would preserve natural capital and allow farmers to become nutritionally secure**

How can farmers transition?

- **Transition needs to be systematic, allowing farmers to adjust gradually.**

- **For instance, moving from chemical- intensive practices to non -pesticide management, then adopting natural farming practices, can reduce input costs.**
- **Farmers can diversify income through value addition, incorporating livestock and poultry**
- **A visual representation of a diversified farm involves allocating 70% for commercial crops, 20% for food and fodder, and 10% for environmental services like oilseeds (acting as trap crops).**
- **Over time, the fraction of commercial crops could be lowered to 50% and border crops could be replaced with locally-suitable tree species for fruits and fodder.**
- **Integrating livestock rearing could further improve incomes.**
- **Addressing challenges related to local seeds, institutional arrangements for market access, drudgery, and the need for farm labour is crucial when envisioning such a transition**

Cauvery delta agriculture change

- **The reference year for cultivation is 2018--2019 it emerges that the delta has declined as a hub of rice cultivation in the State, coinciding with the fall in the availability of water, caused mainly by changes in water- sharing arrangements between Karnataka, the source of the Cauvery, and Tamil Nadu.**
- **"During the 'green revolution' years of the 1970s and 1980s the region changed from a single- crop region to a double- cropped region**
- **The agriculture and irrigation policy did not address the challenges that came from a fall in water supply from the Cauvery.**
- **Neither were crops suitable for a new water regime introduced, nor were micro level irrigation systems modernized.**

- **With the droughts in the delta in 2000-2002, 2008, 2012, and 2016, and floods and devastation caused by Cyclone Gaja in 2018, it is clear that the region "needs crop regimes and agricultural policy that are suited to a region of intermittent drought and cyclonic activity.**

Michaung cyclone

Why is the cyclone named as Michaung?

- **The name of the cyclone 'Michaung' was proposed by Myanmar, which signifies resilience and fortitude.**
- **This is the sixth cyclone to develop in the Indian Ocean this year and the fourth to form in the Bay of Bengal.**
- **Earlier, the Indian Meteorological Department had predicted that Cyclone Michaung was expected to form in the southwest Bay of Bengal**

How are cyclones named?

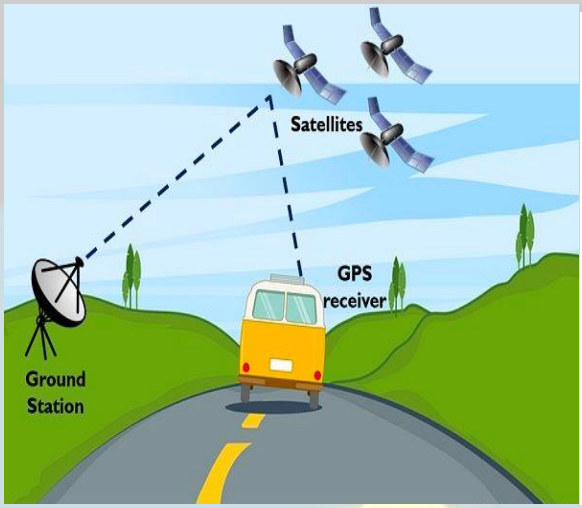
- **The World Meteorological Organisation (WMO) and member countries of the United Nations Economic and Social Commission (ESCAP) are responsible for naming each tropical cyclone.**
- **The names of cyclones depend on the regional rules.**
- **"In the Atlantic and in the Southern hemisphere (Indian Ocean and South Pacific), tropical cyclones receive names in alphabetical order, and women and men's names are alternated.**

- **In the Northern Indian Ocean, nations began utilising a new method for naming tropical cyclones in 2000; the names are listed alphabetically by country and are gender-neutral,"**

GPS Working

What is GPS?

- **The U.S. Department of Defence started the GPS programme in 1973 and launched the first satellite in 1978.**
- **The modern GPS satellite constellation consists of 24 satellites moving around the earth in six orbits. Each satellite completes two orbits in a single day.**



- **The overall programme has three main components the space segment, the control segment, and the user segment.**
- **The space segment, of course, consists of the 24 satellites. The six orbits they occupy are all 20,200 km above the earth, and each orbit has four satellites at all times**
- **The control segment consists of a global network of ground- based control stations and antennae that track the 24 satellites, make sure their performance is as expected at all times, and transmit commands.**
- **The services provided by the GPS system are designed to meet the Standard Positioning Service (SPS) performance standard, the latest edition of which was published in April 2020.**
- **The control segment ensures these commitments are kept.**
- **The master control station is located at Schriever Air Force Base, Colorado, and the alternate master control station is at the Vandenberg Air Force Base, California.**
- **The ground antennae are in Florida (Cape Canaveral), Ascension Island,**

Diego Garcia island, and Kwajalein Atoll

- **The user segment pertains to the use of GPS in various sectors and applications.**
- **The major sectors include agriculture, construction, surveying, logistics, telecommunications, power transmission, search and rescue, air travel, meteorology, seismology, and military operations.**

How does GPS work?

- **Each GPS satellite continuously broadcasts a radio signal containing information about its location in orbit, operational status, and the time at which the signal is emitted.**
- **The signals are transmitted at the L1 (1,575.42 MHz) and the L2 (1,227.6 MHz) frequencies at 50 bits/second.**
- **The signals are encoded with code- division multiple access.**
- **This allows multiple signals to be transmitted in the same channel and for a receiver to be able to disentangle them.**
- **There are two encoding types: the coarse/acquisition mode, which civilians can use to access coarse GPS data, and the precise mode, which is encrypted and is for military use. Being an electromagnetic signal, the radio waves travel at the speed of light**
- **The clocks onboard the modern- day GPS constellation are all synchronised to within just 10 nanoseconds of each other, and with reference clocks on the ground.**

Do other countries have GNSS?

- **According to the U.S. Space- Based Positioning, Navigation, and Timing Policy, the GPS system will cooperate with the operation of other GNSS. Such systems are currently operated by Australia, China, the European**

Union, India, Japan, South Korea, Russia, and the U.K. Of these, Russia's GLONASS, the E.U.'s Galileo, and China's BeiDou systems are global.

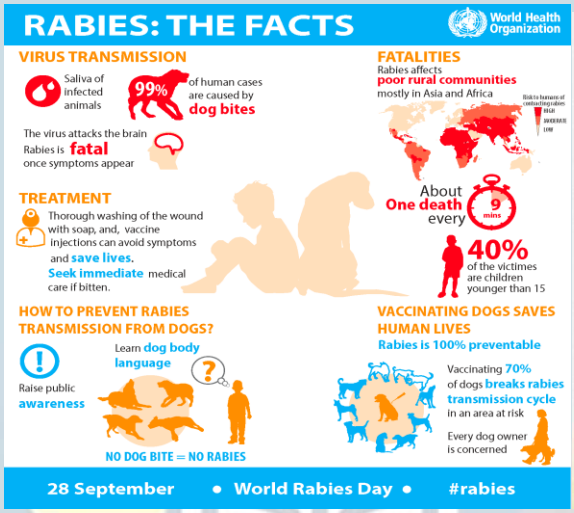
- **There is also an International Committee on GNSS, operating under the United Nations Office of Outer Space Affairs.**

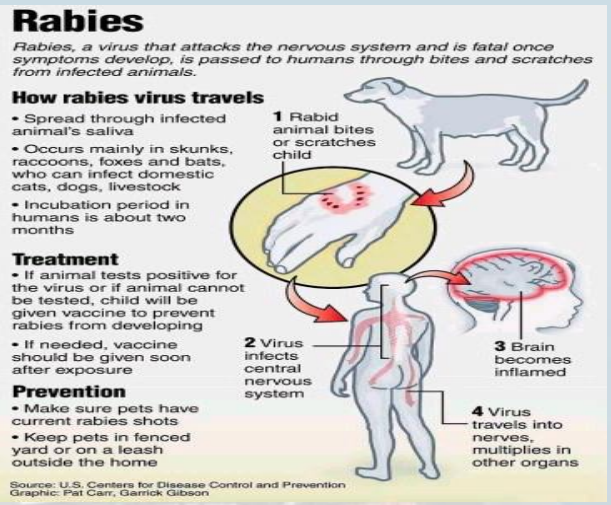
NAVIC

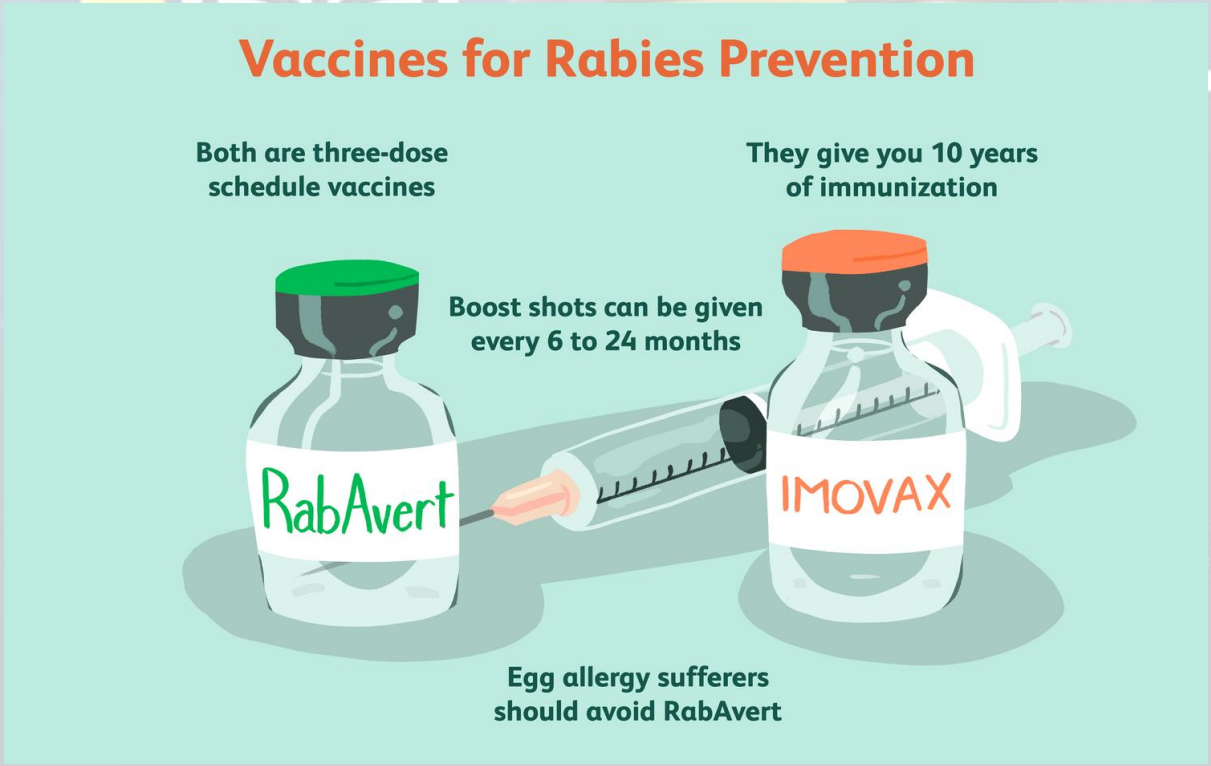
- **India mooted its own Indian Regional Navigation Satellite System in 2006, later rechristened Navigation with Indian Constellation (NavIC).**
- **Its space segment consists of seven satellites: three in geostationary orbits and four in geosynchronous orbits.**
- **As of May 2023, the minimum number of satellites (four) could facilitate ground- based navigation.**
- **The master control facilities are located in Hassan in Karnataka and Bhopal in Madhya Pradesh.**
- **The NavIC satellites use rubidium atomic clocks and transmit data in the L5 (1,176.45 MHz) and the S (2,492.028 MHz) bands, with newer satellites also transmitting in the L1 band.**
- **They include a messaging interface that can receive messages from control stations and transmit them to specific areas, like warning fishers about being close to international borders, etc.**
- **India also operates the GPS- Aided Geo Augmented Navigation (GAGAN) system, which was developed by the ISRO and the Airports Authority of India.**
- **According to the ISRO website, GAGAN's primary purpose is "safety- of-**

life civil aviation applications catering to the Indian airspace" and for providing "correction and integrity messages for GPS".

Rabies







Global stocktake

- **The 2011--2020 decade, though warmest ever recorded in history, saw the lowest number of deaths from extreme events, said a report from the World**

Meteorological Organisation

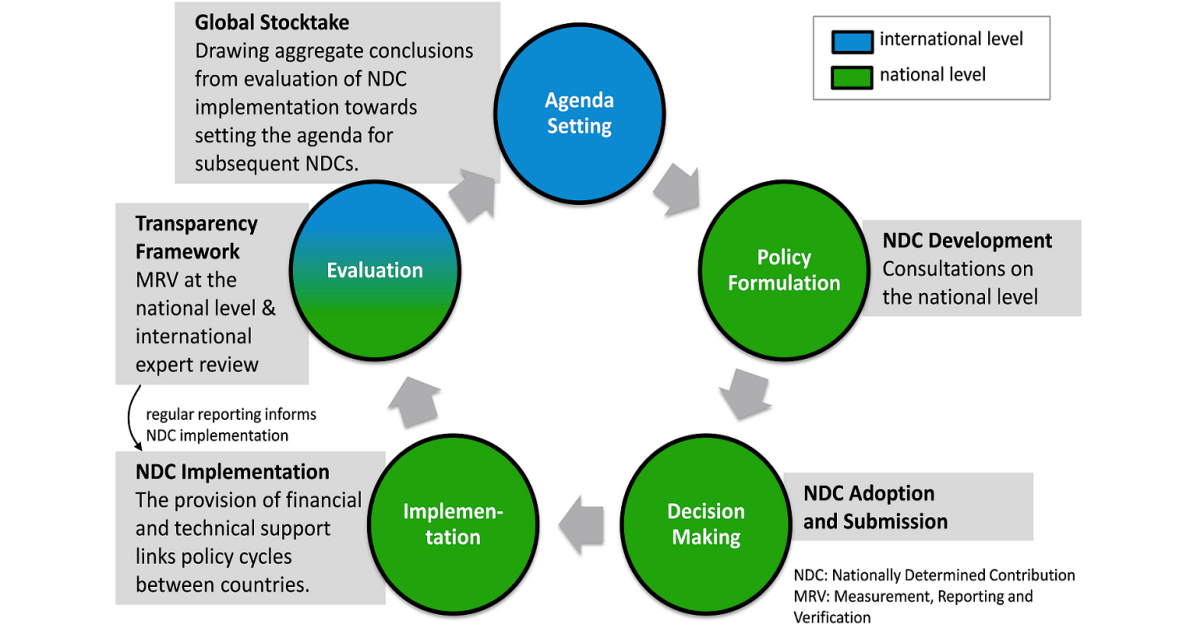
- **The agency attributed this to an improvement in the "early warning system" driven by improvements in forecasting and better disaster management.**
- **In India, for instance, improvements in forecasting cyclone formation and the time it took to reach land have led to greater preparedness and evacuation of those most at risk.**
- **The report also says that this was the first decade that the depleted ozone hole visibly showed recovery.**
- **Glaciers that were measured around the world thinned by approximately 1 metre per year on an average between 2011 and 2020.**
- **Greenland and Antarctica lost 38% more ice during the period than during the 2001-2010 period.**
- **The report also had a mention of the 2021 Uttarakhand rock- avalanche that was triggered from a breach in the Nanda Devi glacier in the Himalayas.**
- **The report further underlined that human caused climate change significantly increased the risks from extreme heat events.**
- **Heatwaves were responsible for the highest number of human casualties, while tropical cyclones caused the most economic damage.**

WMO Report

- **For the first time, a key document being negotiated at the UN's annual climate summit has underlined the need for the world to do away with all fossil fuels, in its draft text.**
- **As the first week of negotiations at COP-28 nears an end, the latest version of the Global Stocktake (GST) includes a clause committing all signatories to "an orderly and just phase out of fossil fuels"**

Global Stocktake (GST)

- It is a comprehensive assessment of the world's progress on climate action.
- It refers to a five-year review in which countries assess where they are in the fight against climate change, and what needs to be done in the next five years to make this fight more effective and potent.
- Anchored in Article 14 of the Paris Agreement, it is intended to inform Parties to the Agreement on their progress against its goals, including but not limited to limiting global temperature rise to 1.5°C.
- COP28 will witness the presentation of the findings of the first stocktake exercise.
- GST will be an opportunity to put accountability at the heart of climate negotiations.



Climate change and Health

- **Heat stress. Lung damage from wildfire smoke.**
- **The spread of disease- carrying mosquitoes into new regions as temperatures rise. These are just some ways public health has been compromised by climate change a focus for the first time ever at the annual U.N. climate summit COP28**
- **From 2030, experts expect that malnutrition, malaria and dengue, diarrhoea, and heat stress will push global death tolls up by 250,000 per year, according to the World Health Organisation (WHO).**

- **Mosquitoes that carry viruses including dengue, malaria, West Nile, and Zika are shifting into new parts of the world as warmer temperatures and heavy rains create more hospitable conditions for them to breed.**
- **Climate change is also having an unpredictable impact on malaria, with 5 million more cases registered in 2022.**
- **Similarly, after decades of progress against cholera, an intestinal infection spread by contaminated food and water, case numbers are rising again, including in countries that had all but extirpated the disease.**
- **Diarrhoea also receives a boost from climate change, via increasingly erratic rainfall. It's the world's second leading cause of death among children under 5, claiming the lives of more than half a million kids every year.**
- **Heat stress is projected to impact hundreds of millions of people as temperatures continue to climb through the next few decades.**

Trade and agriculture product and environment impact

- **Increasing demand for agricultural products is leading to significant social and environmental consequences worldwide.**
- **The expansion of international trade has created global supply chains, directly linking consumers to geographically -distant impacts, including carbon emissions, biodiversity loss, freshwater depletion, soil degradation and labour rights issues all of which have local, regional, and global relevance.**
- **Due to its vast size and consumer market, India is a global anchor of the trade in agricultural products.**

- **This has led to an increasing demand as well as supply of these products.**

- **Large land areas in India are used to service the international demand for grains, fruits, and vegetables, among other products, which puts pressure on national soil and water resources.**

- **At the same time, India's vast consumer market means that large amounts of land, even outside its borders, are used to satisfy domestic demand**

Food- based impact accounting

- **The expansion of such imports has contributed to increasing the environmental pressure in the exporting countries.**

- **Recent studies have shown that a substantial share of the total ecological impact is due to the displacement of environmental damage through international trade.**

- **The current paradigm in measuring impacts and allocating responsibility is based on a production- based accounting method: it measures impacts in the place where the products are produced.**

Consumption- based accounting

- **Consumption- based accounting accounts for impact at the point of consumption, attributing all the social and environmental impact that occurred during production and trade to the final products and to the eventual consumers.**

- **That is, the approach urges the consumer (whether social groups or countries) to accept responsibility for the embodied or 'virtual' impacts of the product that is being consumed.**

What is the supply perspective?

- **From a supply perspective, the proponents of consumption- based accounting claim that it can encourage cleaner production since producer countries are implicitly encouraged to implement strategies that lower the environmental footprint of their exports.**

Benefits of environmental action?

- **The application of this approach to estimate carbon emissions, in the form of embodied emissions, and water use, in the form of virtual water, has also been around in the scientific literature for some time, but has only recently made inroads into policymaking.**
- **For example, the European Commission recently initiated steps to ensure products consumed in the European Union have not contributed to deforestation in their country of origin.**
- **This measure is expected to significantly reduce carbon emissions from deforestation as well as biodiversity loss, since the European Union is a major consumer of agricultural and forestry products.**

Deepfake regulation

How did deepfake tech emerge?

- **Deepfakes are made using technologies such as AI and machine learning, blurring the lines between fiction and reality.**
- **Although they have benefits in education, film production, criminal forensics, and artistic expression, they can also be used to exploit people, sabotage elections and spread large-scale misinformation.**
- **While editing tools, like Photoshop, have been in use for decades, the first -ever use of deep fake technology can reportedly be traced back to a Reddit user who in 2017 had used a publicly available AI- driven software to create**

pornographic content by imposing the faces of celebrities on to the bodies of ordinary people.

- **Now, deepfakes can easily be generated by semi-skilled and unskilled individuals by morphing audio-visual clips and images.**
- **For instance, the Massachusetts Institute of Technology (MIT) created a Detect Fakes website to help people identify deepfakes by focusing on small intricate details.**
- **The use of deepfakes to perpetrate online gendered violence has also been a rising concern.**
- **A 2019 study conducted by AI firm Deep trace found that a staggering 96% of deep fakes were pornographic, and 99% of them involved women.**
- **Highlighting how deepfakes are being weaponized against women,**

What are the laws against the misuse of deepfakes?

- **India lacks specific laws to address deepfakes and AI-related crimes, but provisions under a plethora of legislations could offer both civil and criminal relief.**
- **For instance, Section 66E of the Information Technology Act, 2000 (IT Act) is applicable in cases of deepfake crimes that involve the capture, publication, or transmission of a person's images in mass media thereby violating their privacy.**
- **Such an offence is punishable with up to three years of imprisonment or a fine of two lakhs.**
- **Further, Sections 67, 67A, and 67B of the IT Act can be used to prosecute individuals for publishing or transmitting deep fakes that are obscene or contain sexually explicit acts.**
- **The IT Rules, also prohibit hosting 'any content that impersonates another**

person' and require social media platforms to quickly take down 'artificially morphed images' of individuals when alerted.

- **In case they fail to take down such content, they risk losing the 'safe harbour' protection a provision that protects social media companies from regulatory liability for third -party content shared by users on their platforms.**

- **Provisions of the Indian Penal Code (IPC) can also be resorted for cybercrimes associated with deepfakes Sections 509 (words, gestures, or acts intended to insult the modesty of a woman), 499 (criminal defamation), and 153 (a) and (b) (spreading hate on communal lines) among others.**

- **The Delhi Police Special Cell has reportedly registered an FIR against unknown persons by invoking Sections 465 (forgery) and 469 (forgery to harm the reputation of a party) in the Mandanna case**

What has been the Centre's response?

- **The Union Minister of Electronics and Information Technology Ashwini Vaishnaw on November 23 chaired a meeting with social media platforms, AI companies, and industry bodies where he acknowledged that "a new crisis is emerging due to deep fakes" and that "there is a very big section of society which does not have a parallel verification system" to tackle this issue.**

Flooding and after disaster challenge

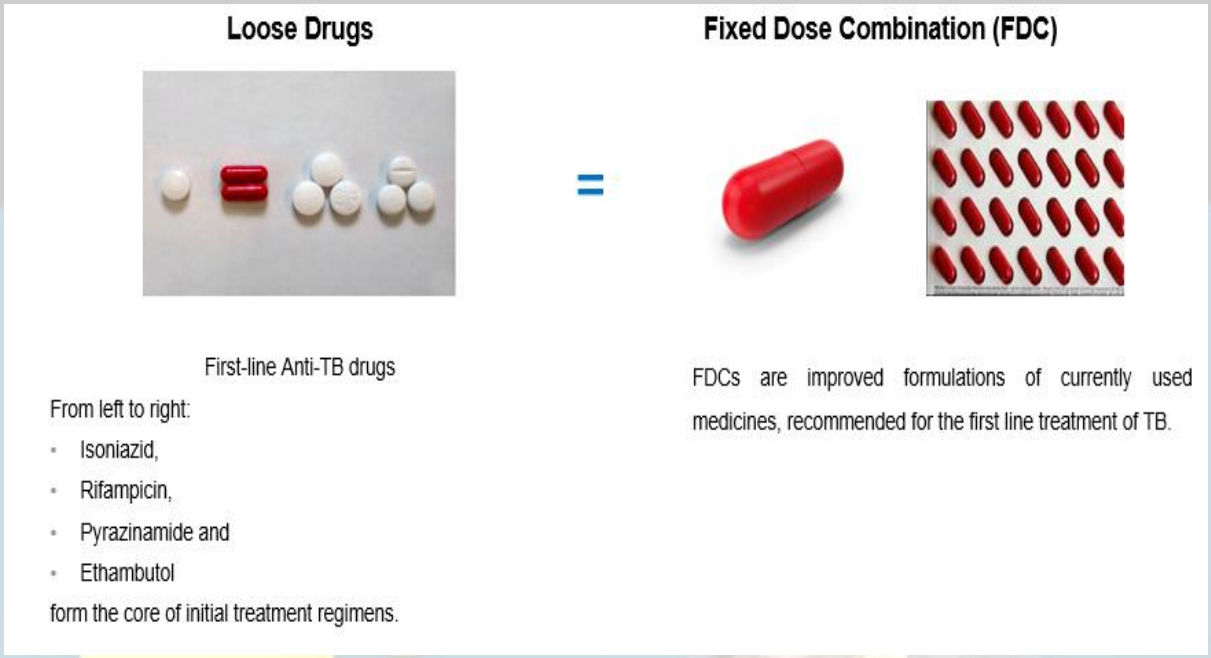
- **The Indian monsoon brings with it cyclones and flooding.**

- **Fearful and battered communities are left to cope with vector -borne diseases; an ever present threat of drowning, electrocution, snakes, poisonous insects, respiratory diseases and of late COVID-19, owing to crowding.**

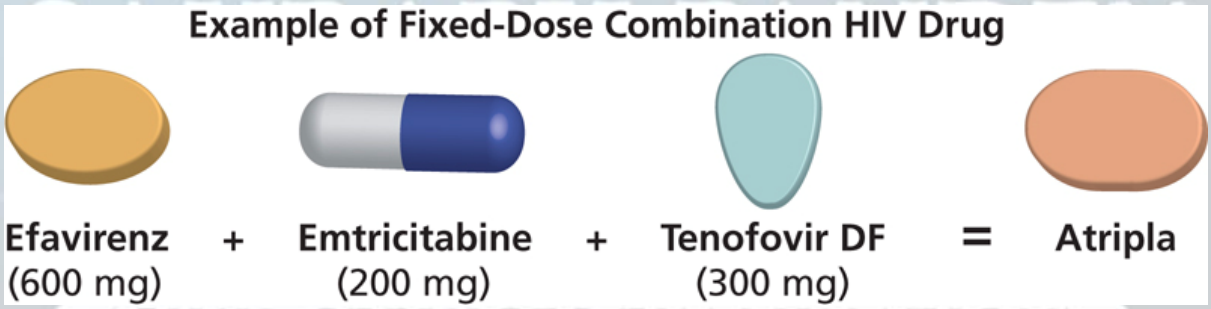
- **Floods disrupt access to food, water and safe shelter and jeopardise the community's ability to get the healthcare services they need.**
- **Contaminated water which is all around after flooding is responsible for vector- borne diseases such as cholera, typhoid, and malaria.**
- **After the cyclone and rains died down, the State government also commissioned mobile medical units.**
- **The units, which include a doctor, staff nurse, a sanitary inspector and an assistant, will function all day in the urban health centres for at least a week.**
- **Acute diarrhoeal diseases and cholera can be prevented by ensuring safe water and sanitation.**
- **Those with severe symptoms will need rapid treatment with intravenous fluids and antibiotics.**
- **In localities that have a high risk of cholera, improved sanitation and oral vaccines have helped.**

Fixed dose combinations

- **FDCs are combinations of one or more known drugs and can be useful in the treatment of some diseases since the combination can improve patient compliance.**
- **For instance, if a patient has to take three different medications for a particular treatment, she may forget to take one.**
- **But if all three medications are combined into one tablet or one syrup, the chance of her forgetting to take one or two of the drugs is reduced.**



- **For diseases such as AIDS, it is well documented that FDCs have proven to be very useful in improving patient compliance, which at the end of day improves treatment outcomes.**



Emerging issue

- **Pharmaceutical companies in India use these FDCs to escape liability under multiple laws without much concern for public health.**
- **One such law is the Drugs (Prices Control) Order (DPCO), under which the government fixes the prices of individual drugs.**
- **Since drug combinations were traditionally not covered under the DPCO, the pharmaceutical industry decided that making FDCs provided an easy**

way to escape the remit of the DPCO.

- **the fact that because of the bewildering variety of FDCs being sold in the market, there were no standards set by bodies such as the Indian Pharmacopoeia Commission for testing these drugs for quality of manufacture.**
- **The second advantage of going down the FDC route is that it gives individual companies a reason to charge higher prices for their drugs.**
- **In 1982, Parliament changed the law to give the central government the power to "prohibit" the manufacture of specific drugs that lack therapeutic value or justification.**
- **Later in that decade, in 1988, the central government amended the rules to introduce a new requirement for manufacturers of all "new drugs", including FDCs, to submit proof of safety and efficacy to the Drugs Controller General of India (DCGI) who heads the Central Drugs Standard Control Organization (CDSCO)**
- **Despite the law being crystal clear on the issue, State drug controllers have simply ignored the law to continue issuing manufacturing licences for FDCs not approved by the DCGI with impunity.**

Glacial lake outburst flooding- WMO Report

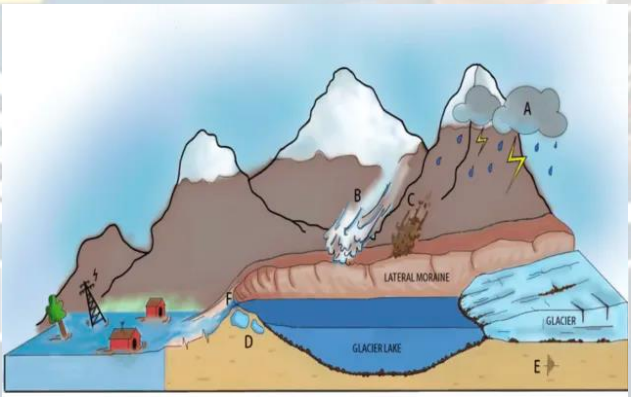


Figure-1: Illustrative graphic showing various reasons for GLOF occurrence
(A) Cloudburst (B) Snow avalanche (C) Landslide (D) Melting of ice in moraine
(E) Earthquake (F) Overflow

- **The World Meteorological Organization's recent report, "The Global Climate 2011-2020", gives a broad view of the planet's response to greenhouse gas emissions.**
- **In the section on the state of glacier health, it points out that, on average, the world's glaciers thinned by approximately a metre a year from 2011 to 2020.**
- **When compared across decades, there is significant regional variability, but the overall pattern remains that glaciers in all regions of the world are becoming smaller**
- **In Africa, glaciers on the Rwenzori Mountains and Mount Kenya are projected to disappear by 2030, and those on Kilimanjaro by 2040.**

- **The report points to the rapid growth of pro-glacial lakes and the likelihood of glacier lake outburst flood (GLOF), posing additional threats to ecosystems and livelihoods.**
- **The reports singled out how "...water from glacial melt contributed to one of the decade's worst flooding disasters, the Uttarakhand floods of June 2013".**
- **The fury of a GLOF event was brought home this year by the destruction of the Chungthang dam in Sikkim after the South Lhonak Lake flooded from a melting glacier, triggering catastrophe downstream.**
- **Earlier this year, a separate report by the International Centre for Integrated Mountain Development found that the disappearance of glaciers in the Hindu Kush Himalayas was "65% faster in the 2010s than in the previous decade".**
- **At the current rate of global greenhouse gas emissions, which is expected to see temperatures increase by 2.5°-3°C by the end of the century, the volume of glaciers is forecast to decline anywhere from 55% to 75%.**
- **This means sharp reductions in freshwater supply in the immediate vicinity of 2050.**
- **The sensitivity of glacier systems to warming underlines the need for their careful monitoring.**
- **Despite awareness of the risks posed by Himalayan glaciers there is no early warning system for the likelihood of GLOF events.**
- **Much like warnings before cyclones, floods and earthquakes, authorities must elevate threats from contracting glaciers to the same category of risk.**

- **Correspondingly, there is a need to make comprehensive risk assessments, map regions of vulnerability and commission infrastructure development with the highest standards of care.**

Honeyguide bird

- **African honeyguide birds understand and respond to the culturally distinct signals made by local human honey hunters, suggesting cultural coevolution between species.**
- **These successful calls have been maintained in these groups for generations. Systems in which humans successfully cooperate with wild animals are rare.**
- **One such involves the greater honeyguide, a small African bird known to lead humans to wild bees' nests**

- **Honeyguides (family Indicatoridae) are near passerine birds in the order Piciformes.**
- **They are also known as indicator birds or honey birds,**
- **These birds are best known for their interaction with humans. Honeyguides are noted and named for one or two species that will deliberately lead humans (but, contrary to popular claims, not honey badgers) directly to bee colonies so that they can feast on the grubs and beeswax that are left behind.**

- **Near passerines and higher land-bird assemblage are terms of traditional, pre-cladistic taxonomy that have often been given to tree-dwelling birds or those most often believed to be related to the true passerines**

Annual tree ring

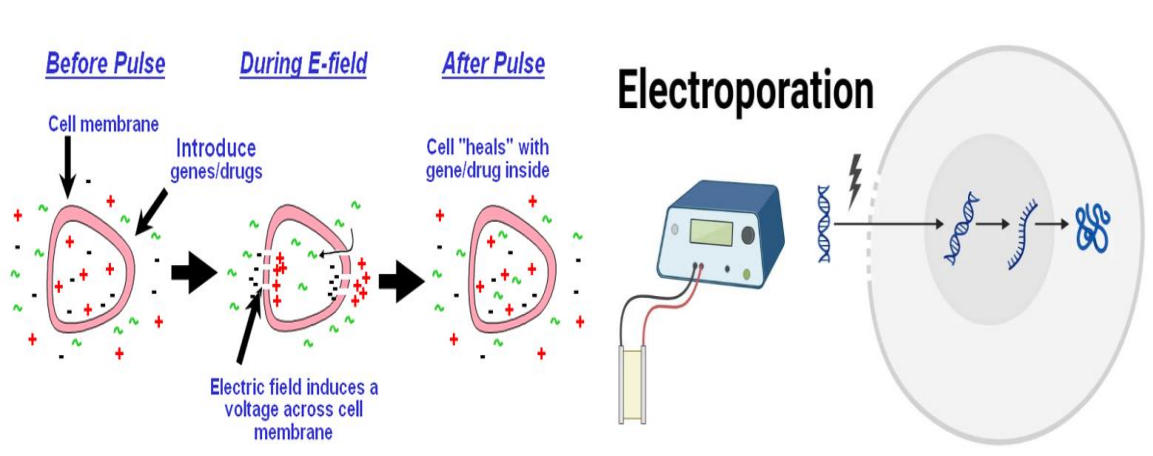
- **Annual tree- ring growth records from more than 122 species of trees show that trees growing in wetter forests are more sensitive to increasing drought.**
- **The findings suggest that land management and policy focused solely on drought effects in drier regions overestimates the resilience of forests in wetter regions.**
- **Dendrochronology (or tree-ring dating) is the scientific method of dating tree rings (also called growth rings) to the exact year they were formed in a tree**
- **Research suggests that forests will continue to shift from carbon sinks to sources as the effects of climate change increase. So there is a need to predict which forests are vulnerable to a hotter future.**

Teosinte

- **Teosinte, any of four species of tall, stout grasses in the genus *Zea* of the family Poaceae. Teosintes are native to Mexico, Guatemala, Honduras, and Nicaragua. Domesticated corn, or maize**
- **Teosinte expands outward. It's an omni-directional force starting from a pin point and then outward like an exploding star. This makes it impossible to define by a small sample**

Electroporation

- **Electroporation designates the use of short high-voltage pulses to overcome the barrier of the cell membrane.**
- **By applying an external electric field, which just surpasses the capacitance of the cell membrane, transient and reversible breakdown of the membrane can be induced**



Green turtle

- **Rising global temperatures could lead to an increase in the nesting range of green turtles in the Mediterranean Sea, as per a study in Scientific Reports.**
- **Under the worst -case climate scenario, the nesting range could increase by over 60% points, spreading west from the current area to include much of the North African, Italian, and Greek coastlines.**
- **Human caused climate change has caused sea surface temperatures to increase globally, with severe impacts on some marine life.**
- **Sea turtles are potentially particularly susceptible, as the sex of their offspring is dependent on incubation temperature**

About Green turtle

- **The green turtle is one of the largest sea turtles and the only herbivore among the different species. Green turtles are in fact named for the greenish color of their cartilage and fat, not their shells.**
- **In the Eastern Pacific, a group of green turtles that have darker shells are called black turtles by the local community. Green turtles are found mainly in tropical and subtropical waters.**
- **Like other sea turtles, they migrate long distances between feeding grounds and the beaches from where they hatched. Classified as endangered, green turtles are threatened by overharvesting of their eggs, hunting of adults, being caught in fishing gear and loss of nesting beach sites.**

Michaung intensification and MJO

- **On December 4, the cyclonic storm intensified into a super- cyclonic storm. Tropical cyclones are 'engines' that use a warm sea surface as 'fuel'.**
- **As air moves over a warm sea, it also warms and accumulates moisture, and begins to ascend.**
- **In the process, it becomes cooler, which condenses the vapour and forms clouds. Condensation releases heat, which makes the air lighter and causes it to ascend further.**
- **As it does, the surrounding air moves in underneath, creating the surface winds associated with cyclones.**
- **This (simplified) process is the reason climate change has been conducive to cyclone intensification. Large water bodies absorb most of the heat of global warming.**
- **The intensification is also greater if the cyclone spends more time over water before landfall, as Cyclone Michaung did off the Tamil Nadu coast.**

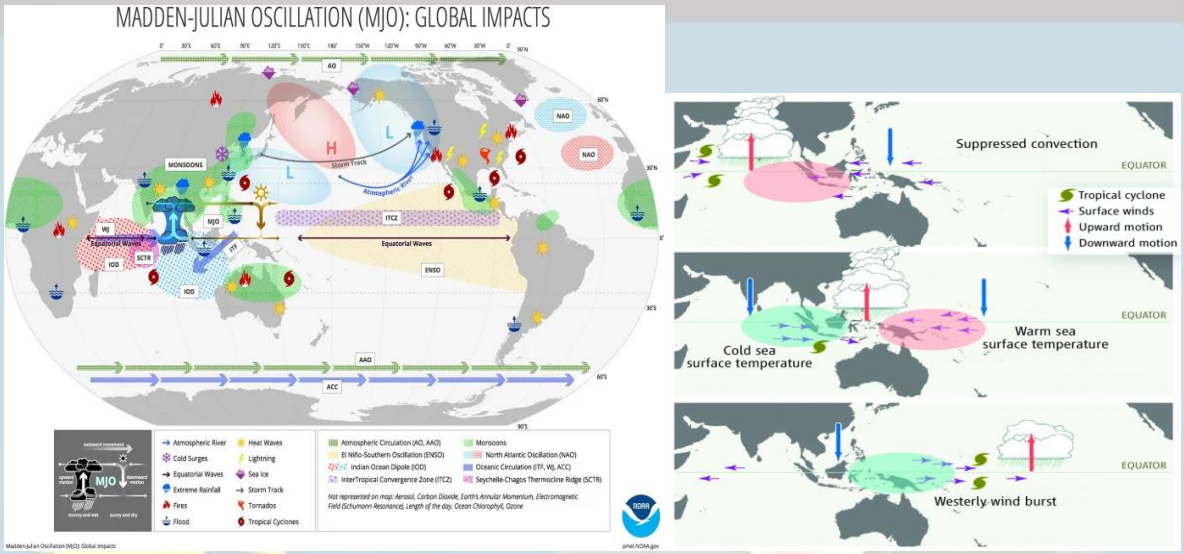
Why does intensification matter?

- **Cyclones draw heat from the sea and move it to the upper atmosphere, where winds carry it to the earth's poles.**
- **An intensifying cyclone will do this more powerfully. A study published in May 2020 found that tropical cyclones with wind speeds upward of 185 km/hr had become 15% more likely since 1979.**
- **Cyclone Michaung own intensification was also assisted by the Madden-Julian oscillation (MJO), among other factors**
- **The MJO consists of a 'pair' of weather anomalies that move eastward around the world once every one to two months.**
- **The leading side imposes dry weather while the trailing side imposes wet (rainy) weather.**
- **The advisory said that on December 3, the MJO near Cyclone Michaung maintained favourable conditions for rain formation.**
- **Cyclone intensification complicates forecast models and allows storms to make landfall with more energy, move further inland, survive longer, and bring their on-ground devastation to previously 'inaccessible' areas.**

ALL ABOUT MJO (Madden Julian oscillation (MJO))

- **Imagine ENSO as a person riding a *stationary* exercise bike in the middle of a stage all day long.**
- **His unchanging location is associated with the persistent changes in tropical rainfall and winds that we have previously described as being linked to ENSO.**
- **Now imagine another bike rider entering the stage on the left and pedaling slowly across the stage, passing the stationary bike (ENSO), and exiting the stage at the right.**

- **This bike rider we will call the MJO and he/she may cross the stage from left to right several times during the show.**



- **So, unlike ENSO, which is stationary, the MJO is an *eastward moving* disturbance of clouds, rainfall, winds, and pressure that traverses the planet in the tropics and returns to its initial starting point in 30 to 60 days, on average.**

- **This atmospheric disturbance is distinct from ENSO, which once established, is associated with persistent features that last several seasons or longer over the Pacific Ocean basin.**

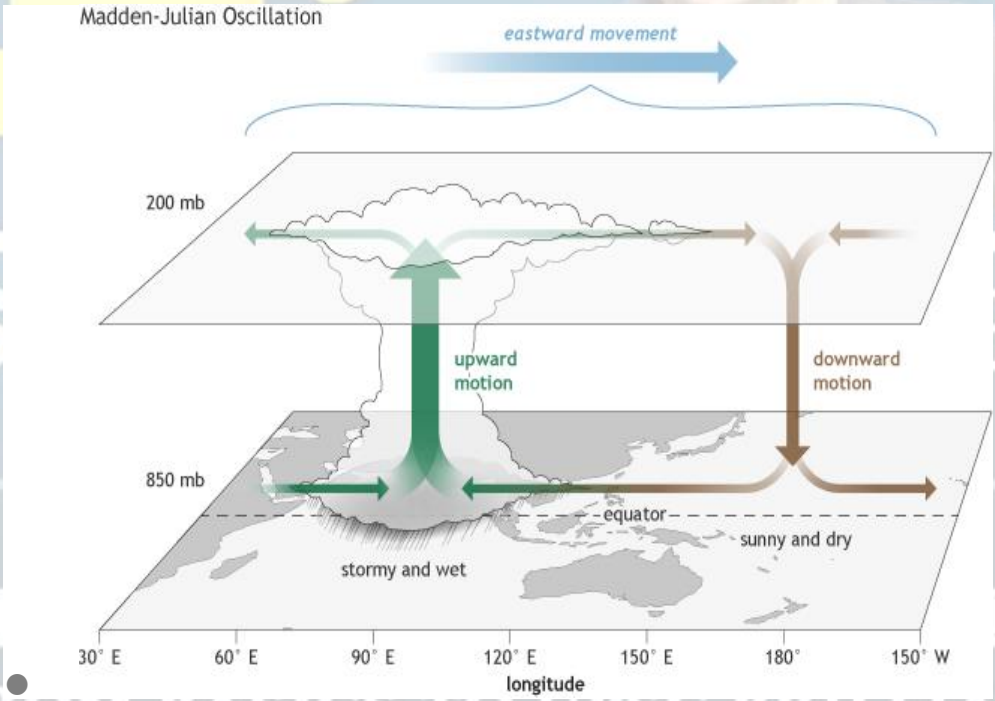
- **There can be multiple MJO events within a season, and so the MJO is best described as *intraseasonal* tropical climate variability (i.e. varies on a week-to-week basis).**

- **The MJO was first discovered in the early 1970s by Dr. Roland Madden and Dr. Paul Julian when they were studying tropical wind and pressure patterns.**

- **The MJO consists of two parts, or phases: one is the enhanced rainfall (or convective) phase and the other is the suppressed rainfall phase. Strong MJO**

activity often dissects the planet into halves: one half within the enhanced convective phase and the other half in the suppressed convective phase.

- **These two phases produce opposite changes in clouds and rainfall and this entire dipole (i.e., having two main opposing centers of action) propagates eastward.**
- **In the enhanced convective phase, winds at the surface converge, and air is pushed up throughout the atmosphere. At the top of the atmosphere, the winds reverse (i.e., diverge).**
- **Such rising air motion in the atmosphere tends to increase condensation and rainfall**



Eliza effect

What is the ELIZA effect?

- **ELIZA effect is the phenomenon in which people think computer programs or similar systems have become capable of human emotions or functions because of the way they respond to user input.**

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- **This program was credited to MIT professor Joseph Weizenbaum.**
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- 

Cauvery basin

- **Natural vegetation on nearly 12,850 sq. km of land in the Cauvery basin was lost in the 50 years from 1965 to 2016, stated a paper published by scientists and researchers at the Indian Institute of Science (IISc), Bengaluru.**
- **Karnataka has lost much more than any other State in the basin.**
- **It accounts for three- fourths of the lost cover, while Tamil Nadu's share is around one- fifth, the study added.**
- **Pointing out that natural- vegetation cover went down by around 46% all**

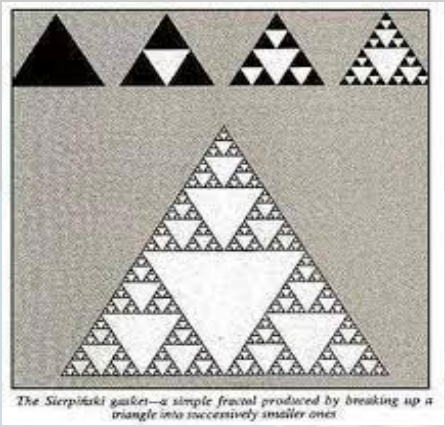
these years,

- **The quantum of reduction of dense vegetation was 35% (6,123 sq. km) and that of degraded vegetation, 63% (6,727 sq. km).**
- **Areas that suffered adverse changes in the extent of forest cover include the Brahmagiri Wildlife Sanctuary, Bandipur National Park, Nagarhole National Park and the Cauvery Wildlife Sanctuary.**
- **In respect of the Bannerghatta National Park, the moist deciduous forest area, which was about 50% in 1973, stood at 28.5% in 2015 due to "anthropogenic pressure" on the National Park and its environs**

Fractal geometry

A fractal is a never-ending pattern.

- **Fractals are infinitely complex patterns that are self-similar across different scales. They are created by repeating a simple process over and over in an ongoing feedback loop.**
- **Driven by recursion, fractals are images of dynamic systems the pictures of Chaos. Geometrically, they exist in between our familiar dimensions.**
- **Fractal patterns are extremely familiar, since nature is full of fractals. For instance: trees, rivers, coastlines, mountains, clouds, seashells, hurricanes, etc**



The Sierpiński gasket—a simple fractal produced by breaking up a triangle into successively smaller ones

- **Physicists use the fractal geometry approach to study quantum systems in dimensions like 1.55 or 1.58, or in fact anything between one and two dimensions**
- **On the macroscopic scale, fractals can be seen as irregular, complex patterns at all scales and in all views, near or far.**
- **Some remarkable examples include human fingerprints, stumps of trees, human veins, river networks as seen from above, veins in a plant leaf, the edges of a snowflake, and so on**
- **The value of fractals is that they describe a new kind of order in systems that we may have overlooked.**
- **They pave the way to potential new insights from otherwise familiar shapes like lines, planes, and points, in the unfamiliar milieu of a space with non-integer dimensions**
- **The dimensionality of a quantum system is an important thing to bear in mind when physicists study its properties.**
- **For instance, electrons in a one- dimensional system form a Luttinger liquid (not a liquid per se but a model that describes the electrons' liquid- like behaviour); in a two- dimensional system, the particles exhibit the Hall effect (the conductor develops a side -to -side voltage in the presence of a top- to-bottom electric field and a perpendicular magnetic field).**

Pinna Nobili's

- **Pinna Nobili's, whose common name is the noble pen shell or fan mussel, is a large species of Mediterranean clam, a marine bivalve mollusc in the family Pinnidae, the pen shells. It reaches up to 120 cm of shell length.**

- **It produces a rare manganese-containing porphyrin protein known as pinnaglobin**

- **A huge clam that was on the verge of extinction has made a comeback, with a surge in numbers in waters off Croatia, marine biologists say.**

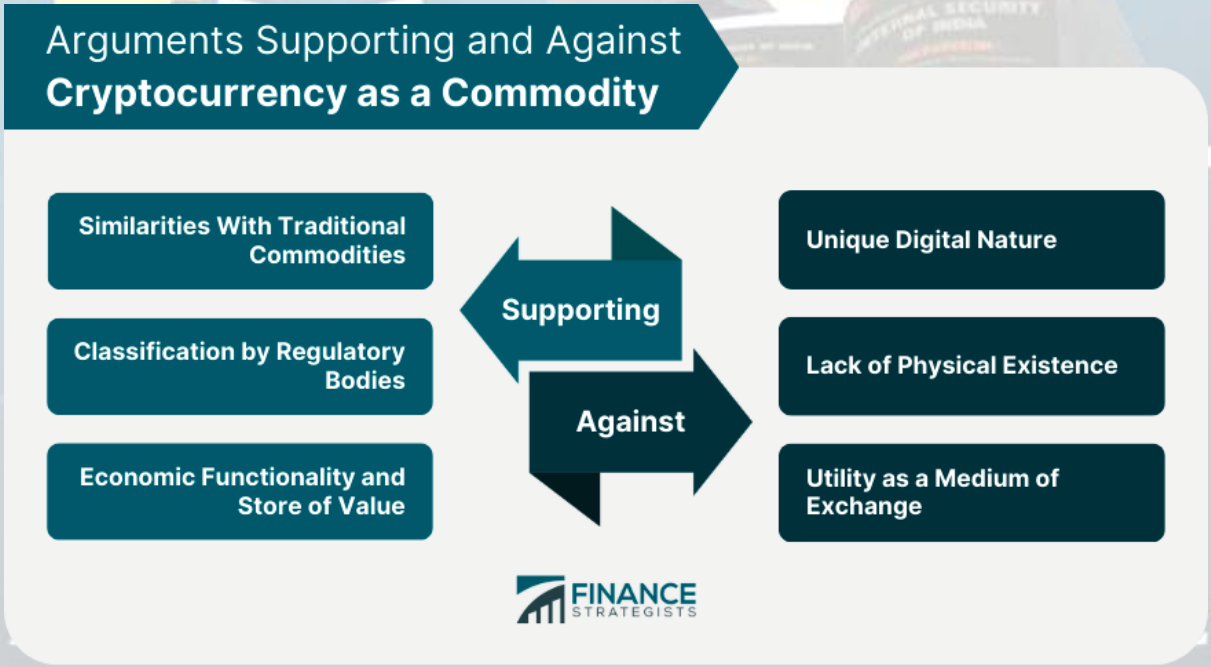
- **The clam, known as the noble pen shell or pinna Nobili's, started dying out**

as a deadly pathogen spread in parts of the Mediterranean around 2016.

- **Numbers plummeted across the region and, until recently, scientists in Croatia only knew of around 10 surviving in their corner of the Adriatic.**

FSBs On Crypto

- **The international Financial Stability Board (FSB)'s latest report on crypto asset intermediaries sought measures to enhance cross border cooperation and information sharing among local authorities.**
- **This is to effectively regulate and address gaps in multi-function crypto-asset intermediaries (MCIs) operating globally.**



- **How does the report define MCIs?**
- **The report defines MCIs as individual firms, or groups of affiliated firms that offer a range of crypto- based services, products and functions which primarily revolve around operating of the trading platform.**
- **Examples include Binance, Bitfinex and Coin base. In the traditional financial landscape, the functions are provided by separate entities, instead**

of the same entity.

- **This prevents conflict of interest and promotes market integrity, investor protection and financial stability.**
- **The primary source of revenue for these platforms are the transaction fees generated from trading- related activities, the traded security here being self-issued crypto assets.**
- **Trades from alternative platforms may also indirectly drive additional demand for other services offered by the platform. These may include prepaid debit cards and lending, among other services.**
- **This shows that the aspirations of MCIs extend beyond just trading to becoming a "one- stop shop" for crypto- based services.**
- **FSB's report observes that the magnitude of these revenue sources is unclear because of the limited publicly disclosed information.**
- **Poor risk management, the report says, "may make it easier for insiders to engage in misconduct that magnifies MCI vulnerabilities."**
- **The lack of transparency could also mean that risks from lack of effective governance or lack of profitability of the business model would be hidden until the negative shocks fully materialise.**
- **The report observes that, based on available evidence, the threat to global financial stability and to the real economy from the failure of an MCI is presently "limited."**
- **However, recent experience about failure or closure of "crypto- asset-friendly" banks reveal the prevalence of concentrated deposit exposures to**

firms whose business models rely in some form on crypto assets.

Phasing out fossil fuel

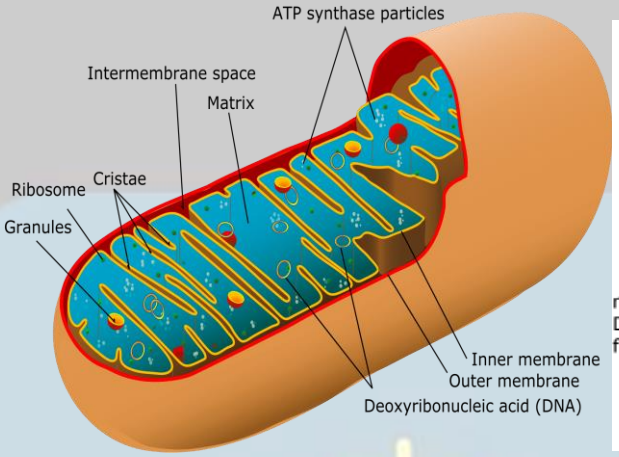
- **The text has employed stronger language against coal, with a recommendation to "rapidly phase down unabated coal," that countries such as India, Indonesia and China major consumers of coal power and developing countries at that could find objectionable.**
- **Observers of COP-28 say that even a mention of the need to do away with fossil fuels in the final text,, would be a significant step towards bringing parity between coal, oil and gas, and the need to do away with them to keep temperature increase below 1.5°C by the end of the century..**
- **On fossil fuels, the text now exhorts countries to "reduce both consumption and production of fossil fuels, in a just, orderly and equitable manner so as to achieve net zero by, before, or around 2050 in keeping with the science."**
- **Burning of fossil fuel contributes nearly 80% of the greenhouse gas emissions of which coal makes up about 40% and oil and gas collectively constitute the rest.**
- **Humanity's best chance at keeping global temperature- increase below 1.5°C is by cutting emissions down to 43% of the 2019 levels by 2030.**
- **However, the reality is that emissions are increasing year on year and despite pledges by countries to spruce up their renewable energy infrastructure**

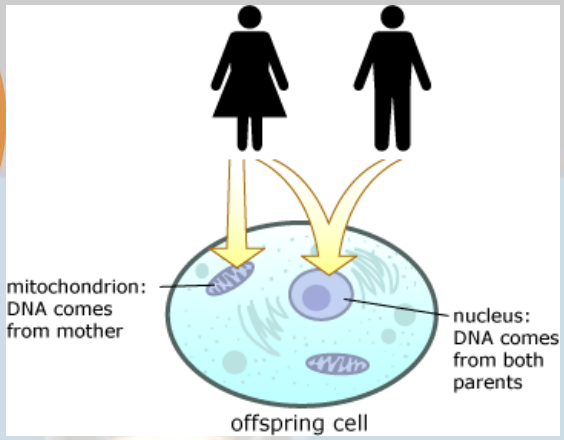
CAN

About CAN

- **Climate Action Network (CAN) is a global network of more than 1,900 civil society organisations in over 130 countries driving collective and sustainable action to fight the climate crisis and to achieve social justice.**
- **CAN convenes and coordinates civil society at the UN climate talks and other international fora**
- **All non-governmental organisations or community non-profit organisations that do not represent industry, have an interest in the promotion of sustainable development and are active in, have a focus on, or are interested in climate change issues, are eligible to become members and may apply to do so.**
- **CAN is organised into regional and national nodes. Each node is responsible for its own governance and procedures and conducts joint advocacy work within its given country or region.**

Mt cnd





- **The scientists have reported that using mitochondrial DNA, they were able to trace the baboons to the ancient city of Adulis, in present -day coastal Eritrea, and a bustling trade centre between the first and seventh centuries AD.**
- **Members of the team were able to retrieve ancient DNA from a mummified baboon found at the Gabbanatel- Qurud site**

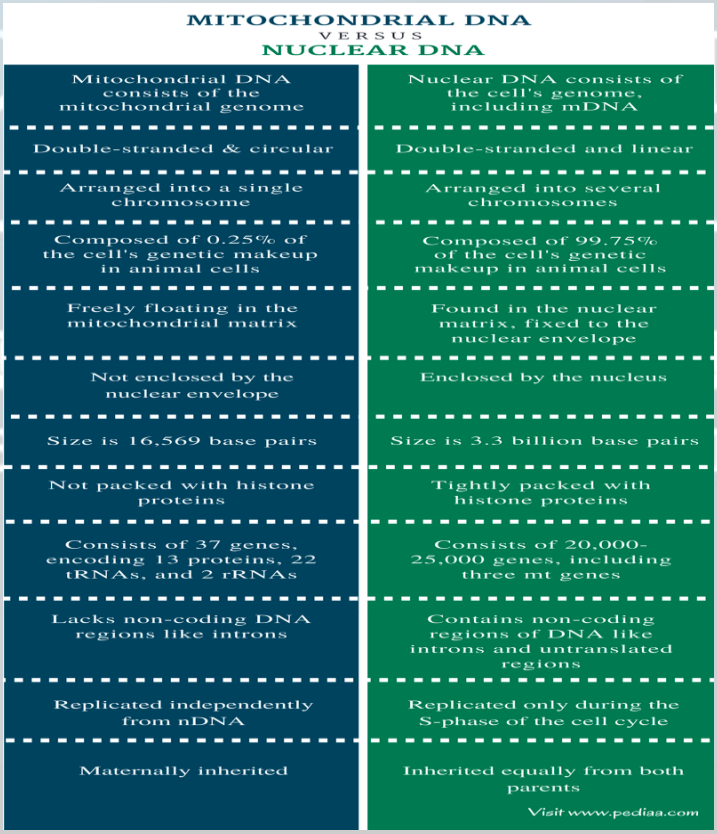
Why is a baboon mummy puzzling?

- **Ancient Egyptians did mummify animals.**
- **Mummified cats were buried with their owners in the hope of reuniting them in the afterlife.**
- **They were also given as offerings to Bastet, the goddess of fertility and war who had the head of a cat.**
- **Older studies have also reported that Egyptians removed the canine teeth of these baboons and bred them in captivity to be mummified later, as a votive gift to Thoth, the god of wisdom and the moon, often depicted as a baboon with a heavy mane.**
- **But the latter was strange because Egypt isn't a natural habitat for baboons.**

- **Papio Anubis and Papio hamadryas, the species whose mummies were found, are actually indigenous to Sub- Saharan Africa and the southwestern Arabian Peninsula**

Role of strontium

- **The concentration of strontium isotopes in soil, water, and local plants varies from place to place.**
- **When living creatures eat food and drink water, the strontium leaves a geographical impression in their teeth, bones, and hair. The same goes for the concentration of oxygen in these body parts.**
- **Mitochondrial DNA has been used to trace the ancestry of an animal to its source population with greater accuracy.**



Germany's debt trade rule

- **Germany's constitutional court on November 15 ruled unlawful a government move to reallocate €60 billion, unused from the sums**
- **Initially earmarked for the pandemic emergency, to a "climate and transformation fund" (KTF).**
- **The coalition government led by Chancellor Olaf Scholz's center-left Social**
- **Democrats (SPD) was in breach of the fiscal deficit limits enshrined in 2009 on two counts, the Karlsruhe court ruled.**
- **The first was the move to channel under utilised allocations from one sector to another and the second, the rollover of debt from one fiscal year to the next.**

What is the debt brake rule?

- **The debt brake rule, or the balanced budget rule, sets a cap on how much governments can borrow to finance various public projects.**
- **It restricts the federal government in Berlin from running a fiscal deficit in excess of 0.35% of Gross Domestic Product (GDP) and in effect prohibits the country's 16 regions from any deficit spending whatsoever.**
- **The measure was enshrined into law in 2009 by the grand coalition government of the centre- right Christian Democratic Union (CDU), its sister party in the state of Bavaria the Christian Social Union (CSU) and the SPD, through an amendment to the German constitution**

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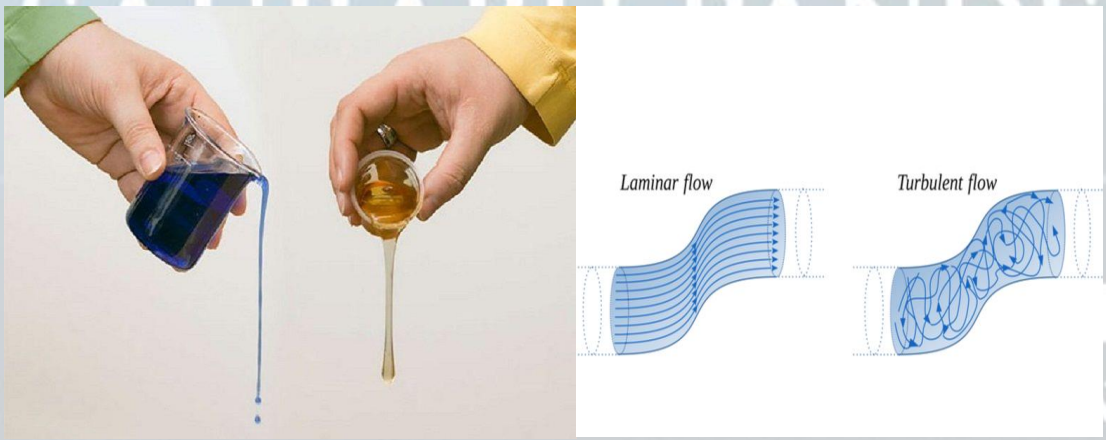
- **It accounts for three- fourths of the lost cover, while Tamil Nadu's share is around one fifth, the study added.**
- **Pointing out that natural-vegetation cover went down by around 46% all these years,**
- **The quantum of reduction of dense vegetation was 35% (6,123 sq. km) and that of degraded vegetation, 63% (6,727 sq. km).**
- **Areas that suffered adverse changes in the extent of forest cover include the Brahmagiri Wildlife Sanctuary, Bandipur National Park, Nagarhole National Park and the Cauvery Wildlife Sanctuary.**
- **In respect of the Bannerghatta National Park, the moist deciduous forest area, which was about 50% in 1973, stood at 28.5% in 2015 due to "anthropogenic pressure" on the National Park and its environs**

Navier- Stokes equations

- **The two key physical effects that determine the state of a fluid's motion are inertia the tendency of a fluid to keep moving and viscous friction, which**

tends to bring all motion to a halt.

- **The strength of inertia increases with the speed of motion, the mass of the fluid, and the distances over which the flow occurs.**
- **The strength of friction is determined by the fluid's viscosity, which is higher for honey, moderate for water, and lower for air.**
- **When viscous effects dominate, a flow is well -ordered and predictable, and disturbances quickly dampen out.**
- **There is little mixing and the fluid tends to move as if it were composed of distinct layers, which is why it's called laminar flow.**
- **But when inertia dominates, the flow is highly unstable.**
- **Without much friction, small disturbances don't die out but instead grow and spread.**



- **This is what happens to a rising plume of incense smoke: tiny fluctuations in the air are amplified within the plume, causing it to become turbulent.**
- **The balance between fluid inertia and viscosity (and other forces due to pressure differences and gravity) are precisely described by the Navier-Stokes equations, which extend Newton's law for a rigid body (like a billiard ball) to a fluid**

- In fluid mechanics, the Navier-Stokes equations are partial differential equations that express the flow of viscous fluids.
- These equations are generalizations of the equations developed by Leonhard Euler (18th century) to explain the flow of frictionless and incompressible fluids.

Ashley

- Ashley, an artificial intelligence campaign volunteer (US). Ashley is one of the first examples of how generative AI is ushering in a new era of political campaigning in which candidates use technology to engage with voters in ways increasingly difficult to track.
- To some, it is an exciting new tool for conducting high-quality conversations on a large scale
- Over the weekend, Ashley called thousands of Pennsylvania voters.
- Like a seasoned campaign volunteer, Ashley analyzes voters' profiles to tailor conversations around their key issues.
- Extreme rainfall corridor
- The Indian monsoon has well -known features, such as the onset of the monsoon, the withdrawal, the active and break periods, and the low-pressure systems (or monsoon depressions).
- Every aspect of the monsoon has been affected by global warming.
- The total seasonal rainfall has also trended downwards for more than seven decades, due to the differential heating of the land versus the ocean due to global warming.
- However, this trend has been distributed unevenly through the monsoon season as manifest in the longer duration but lower intensity of dry spells

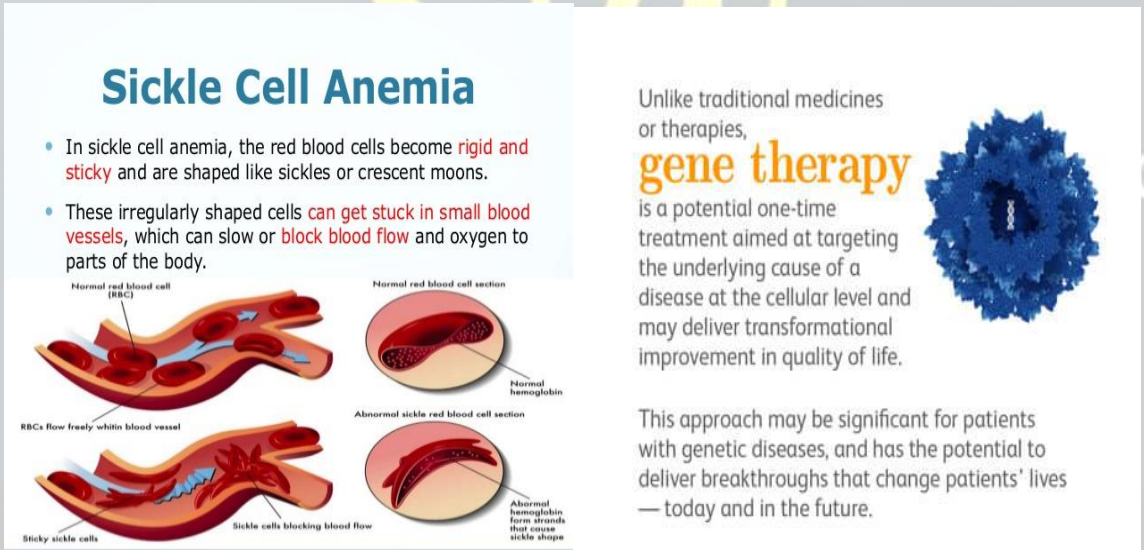
and the greater intensity of wet spell.

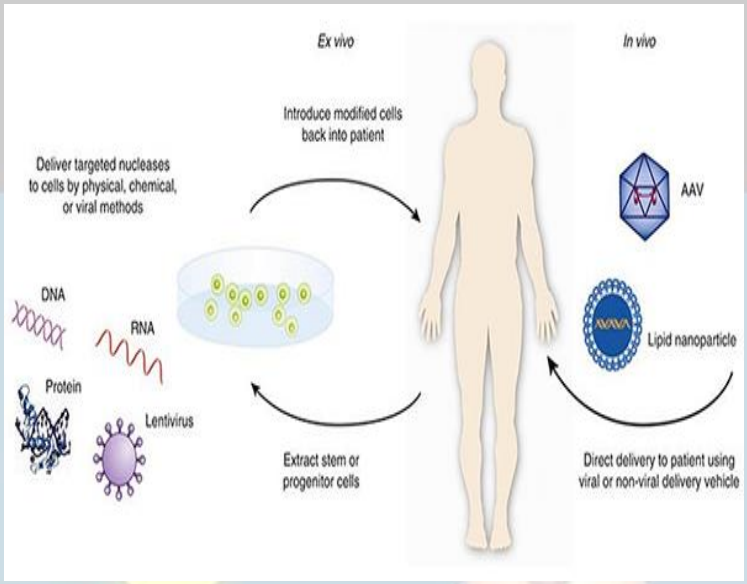
Where does extreme rain occur?

- **India's monsoon forecasts rely heavily on its relation to the El Niño and the La Niña phenomena, although this relation holds only about 60% of the time.**
- **The so -called large- scale extreme rainfall events are actually simultaneous or near -simultaneous heavy rain episodes that are strewn across a 'highway' that extends from parts of West Bengal and Odisha to parts of Gujarat and Rajasthan.**
- **The most remarkable new finding is that this corridor has remained unchanged from 1901 to 2019.**
- **In the seemingly chaotic change in all aspects of the monsoon, such a trapping of the extreme events to a relatively narrow corridor is good news for potential improvements in process understanding, which is bound to lead to better predictions of these synchronised extreme rainfall events.**

Casgevy and Lyfgenia - Gene therapy

What is gene Therapy?





- **UK drug regulator approved Casgevy, the gene therapy to treat people above 12 with sickle cell disease and beta thalassemia, the U.S. FDA has approved two gene therapies Casgevy and Lyfgenia to treat sickle cell disease in patients over 12.**

- **These landmark decisions mark the beginning of gene therapy using the CRISPR-Cas9 tool to treat diseases that could otherwise be cured only through bone marrow transplantation.**

- **While Lyfgenia uses a disabled lentivirus as a vector to introduce into the blood stem cells a new gene for haemoglobin that mimics the healthy version, Casgevy uses the gene -editing tool of CRISPR-Cas9 to disable a particular gene (BCL11A) that turns off foetal haemoglobin production in blood stem cells.**

- **While about 10% of adults continue to produce foetal haemoglobin, in others, the BCL11A gene prevents the production of foetal haemoglobin.**

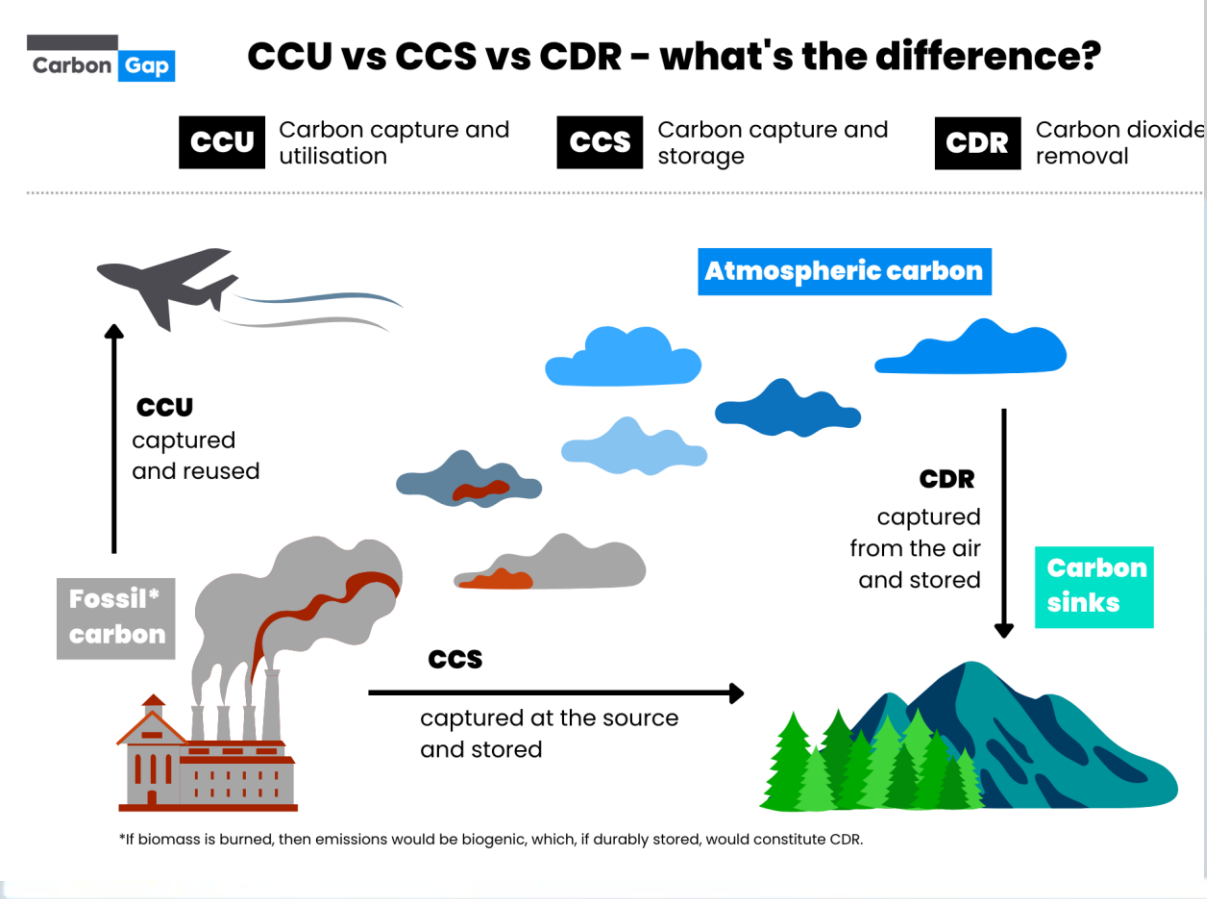
- **By disabling the BCL11A gene, foetal haemoglobin that is produced, which does not have the abnormalities of adult haemoglobin, helps treat patients with sickle- cell disease or beta thalassaemia both gene therapies use patients' own blood cells for gene editing, the number of patients who can**

potentially be treated will be huge as these treatments do not rely on matching bone marrow donors.

- **But in reality, these treatments would be exorbitantly expensive.**
- **Also, much like bone marrow transplantation, only certain hospitals will be equipped to extract a patient's blood stem cells and use the genetic editing tool to the stem cells before reinjecting them, thus limiting the number of beneficiary's carbon capture and storage (CCS) and carbon--dioxide removal (CDR) technologies.**
- **At the COP28 climate talks underway in Dubai, draft decisions thus far have referred to the abatement and removal of carbon emissions using carbon capture and storage (CCS) and carbon dioxide removal (CDR) technologies.**
- **Considering the meaning of the word 'abatement' has become an important bone of contention, understanding the meaning and limitations of CCS is important as also those of CDR.**

What are 'unabated' fossil fuels?

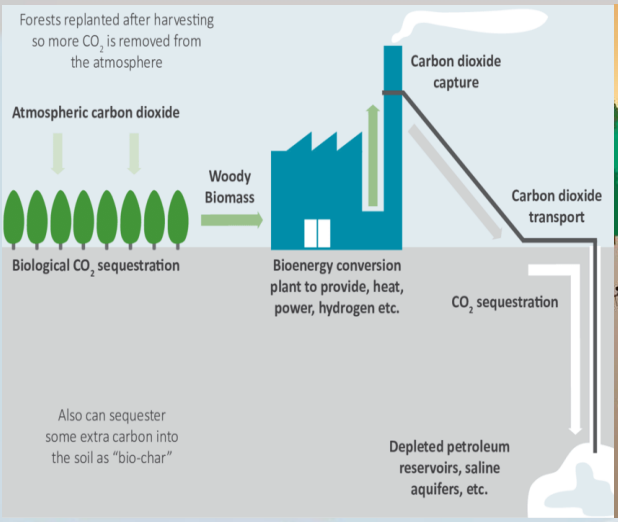
- **When it comes to fossil fuels, "unabated" means doing nothing to reduce the carbon dioxide (CO_2) and other greenhouse gases that are released from the burning of coal, oil, and natural gas.**
- **Conversely, "abated" refers to the attempts to decrease the release of polluting substances to an acceptable level. However, there isn't any clarity on what this level is and how to get there. Moreover, there is no international or agreed-upon definition of the two phrases.**

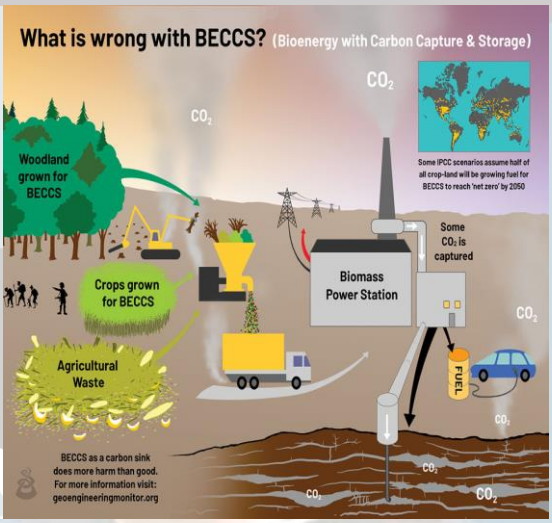


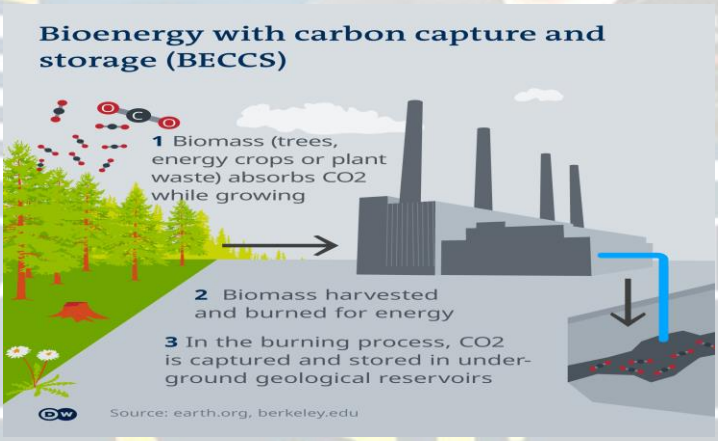
What are CCS and CDR?

- **CCS refers to technologies that can capture carbon dioxide (CO2) at a source of emissions before it is released into the atmosphere. These sources include the fossil fuel industry (where coal, oil and gas are combusted to generate power) and industrial processes like steel and cement production.**
- **CDR takes the forms of both natural means like afforestation or reforestation and technologies like direct air capture, where machines mimic trees by absorbing CO2 from their surroundings and storing it underground.**
- **There are also more complex CDR technologies like enhanced rock weathering, where rocks are broken down chemically; the resulting rock particles can remove CO2 from the atmosphere.**

- **Other technologies like bioenergy with carbon capture and storage (BECCS) capture and store CO2 from burning biomass, like wood.**







- **At COP28, the term "unabated fossil fuels" has come to mean the combustion of these fuels without using CCS technologies to capture their emissions.**
- **Draft decision texts point to a need to "phase out" such unabated fossil fuels.**
- **On the other hand, removal technologies have been referenced in the context of the need to scale zero and low- emission technologies and support forest restoration as a means to promote emission removals.**

How well does CDR work?

- **CDR methods like afforestation, reforestation, BECCS, and direct air capture are constrained by their need for land. Land also invokes equity**

concerns.

- **Land in the Global South is often considered to be 'viable' and/or 'cost-effective' for planting trees and deploying other large -scale CDR methods.**
- **As a result, such CDR projects can adversely affect land rights of indigenous communities and biodiversity and compete with other forms of land-use, like agriculture that is crucial for ensuring food security**
- **Pitfalls of CCS and CDR By removing CO2 from their environs, there are concerns that CCS and CDR create more 'room' to emit the greenhouse gas.**
- **(In some cases, CCS has also been used to inject captured CO2 is into oil fields to extract more oil.)**
- **In future emissions scenarios that the IPCC has assessed, the world's use of coal, oil, and gas in 2050 needs to decline by about 95%, 60%, and 45% respectively (all median values) from their use in 2019 to keep the planet from warming by less than 1.5 degrees C with no or limited overshoot.**
- **But without CCS, the expected reductions are 100%, 60%, and 70% for coal, oil, and gas by 2050.**
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Fastest Solar electric boat

- **Taking ahead the cause of eco-friendly maritime transportation, Barracuda, said to be India's fastest solar -electric boat, at the yard of Navalt Solar and Electric Boats, located off Aroor in Alappuzha.**

- **Named after the swift, long fish, Barracuda was designed by Navalt and can be deployed even in the rough seas as a workboat to ferry up to 12 passengers and cargo**

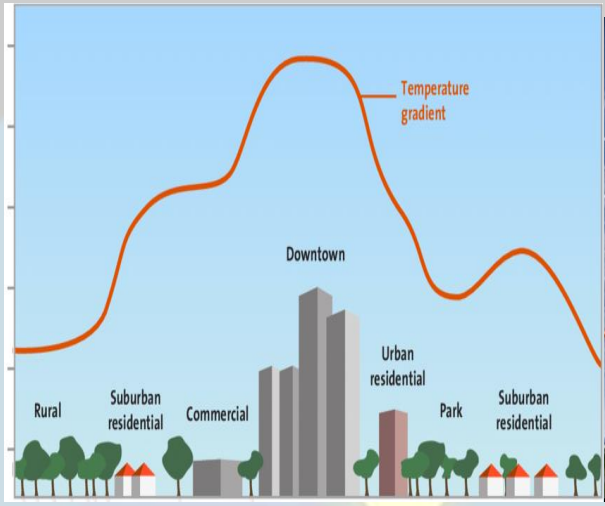
Robotyne

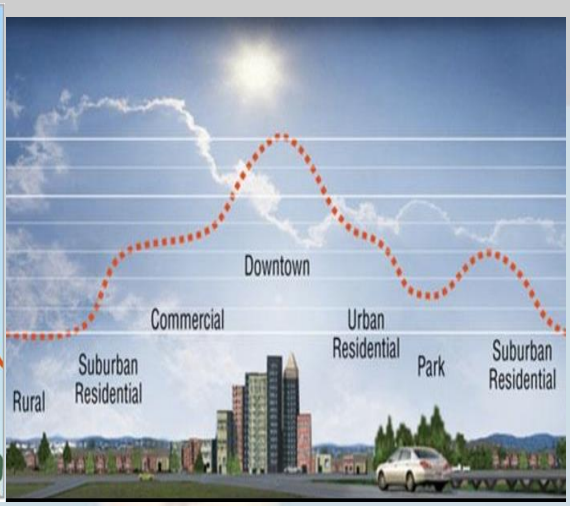
- **When Ukraine captured Robotyne in Zaporizhzhia, it was hailed as a breach of Russian defences.**
- **But Robotyne turned out to be a killing hamlet for Ukrainians.**
- **As Ukraine's counter offensive faltered, the support it enjoyed in the West, especially in the U.S. came under growing pressure.**
- **Last month there were reports in the American media that the U.S. and the EU are now encouraging Kyiv to start talks with the Russians.**
- **In his annual press conference held on Thursday, Russian President Vladimir Putin said peace with Ukraine will take place "only when we achieve our objectives**

E-cigarettes

- **E -cigarettes as consumer products are not shown to be effective for quitting tobacco use at the population level.**
- **Instead, alarming evidence has emerged on adverse population health effects, the World Health Organization said on Thursday.**
- **It added there is an urgent need to control e--cigarettes to protect children, as well as non-smokers and minimise health harms to the population**
- **The WHO said that e- cigarettes have been allowed on the open market and aggressively marketed to young people.**
- **According to data, children in the age group of 13--15 years are using e-cigarettes at rates higher than that among adults in all WHO regions.**
- **The world organisation noted that e- cigarettes with nicotine are highly addictive and are harmful to health.**
- **While long -term health effects are not fully understood, it has been established that they generate toxic substances, some of which are known to cause cancer and some that increase the risk of heart and lung disorders**

Urbanisation and cities





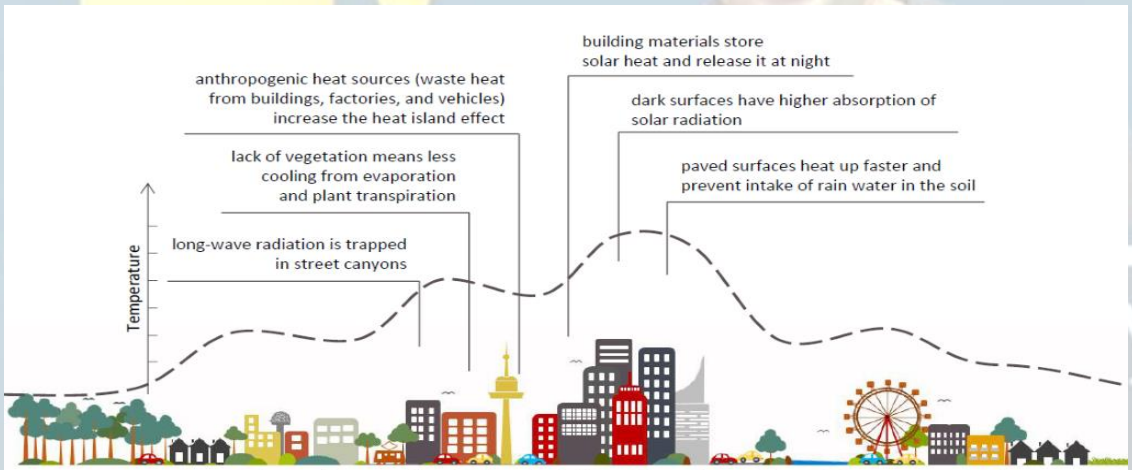
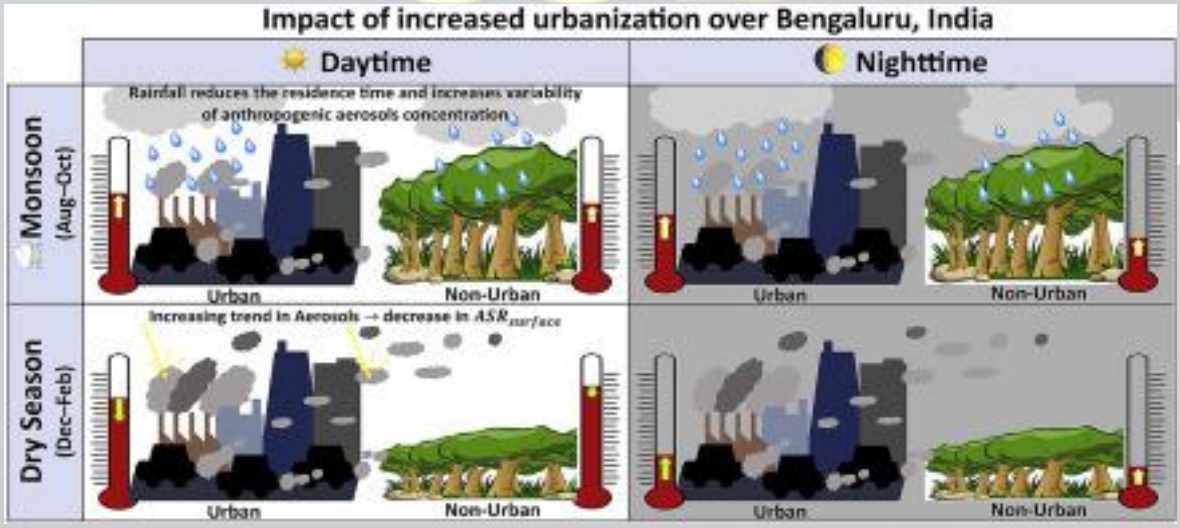
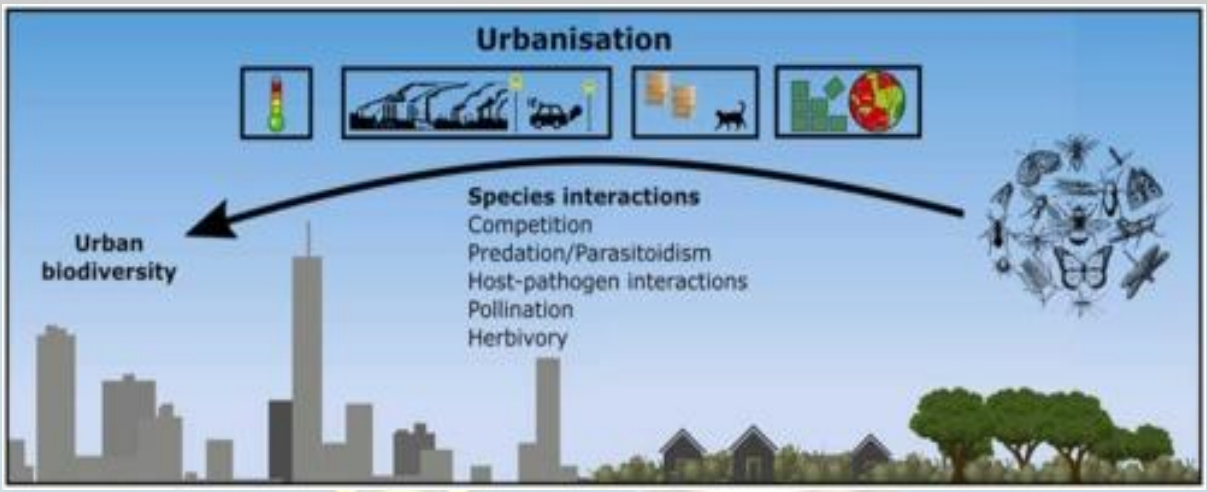
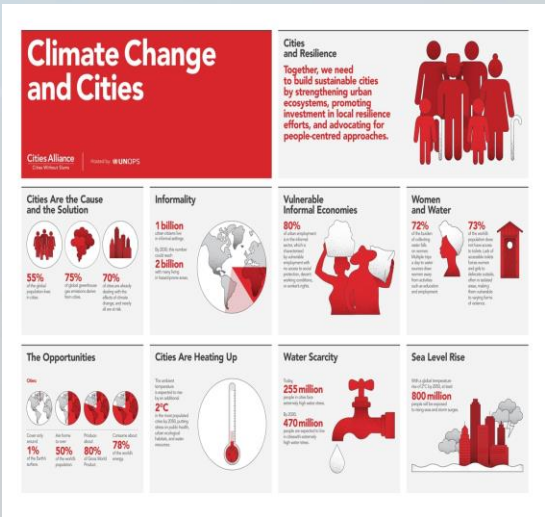


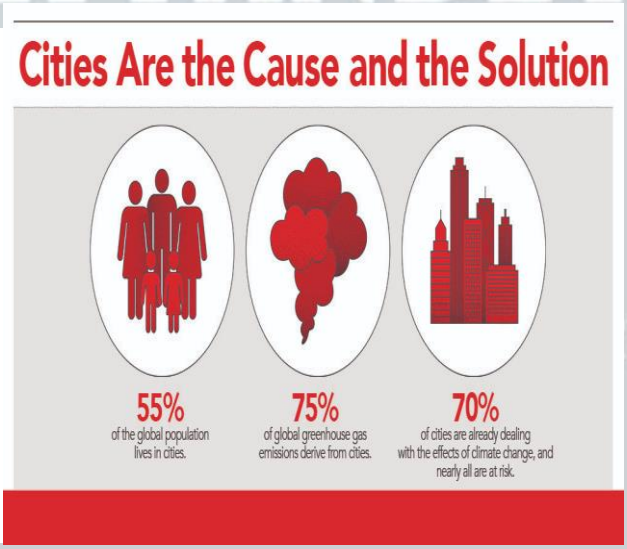
Figure 1. Schematic illustration of the urban heat island effect and factors that contribute to higher temperatures in urban areas. The heat load is typically lower in the rural surroundings than in dense built-up areas. The graphic also illustrates parks, water surfaces, forests, and open spaces that can create cooler areas within the city. Credit: ZAMG/Hollósi.

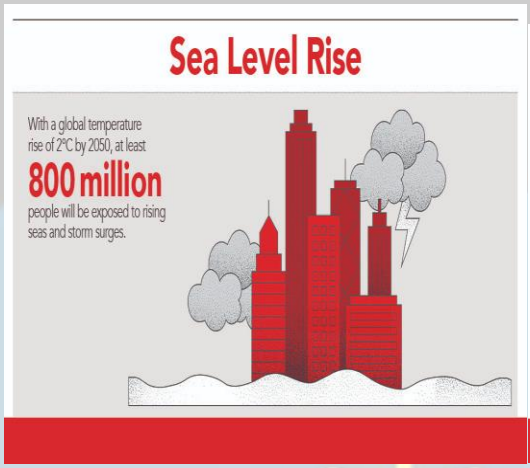


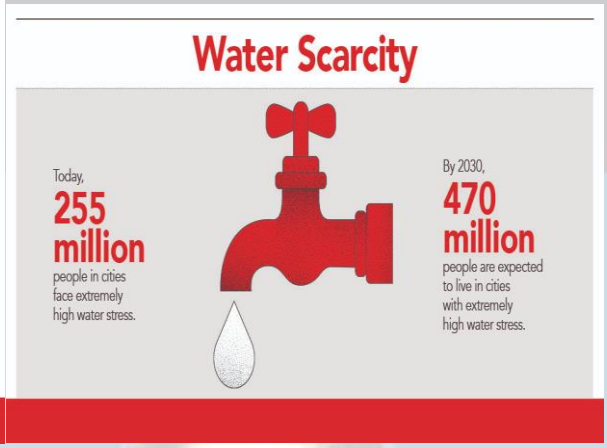


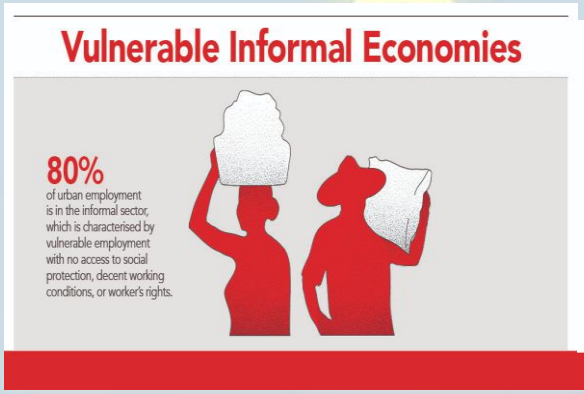
- **It is extremely critical to acknowledge the fact that the degree of urban expansion in the Chennai city has been one of the fastest in the country.**
- **And, it is important to recognise that the urban expansion process is irreversible and can be disastrous if not regulated. When the city limit was expanded from 174 sq.km to 426 sq.km, and the CMA to 1,189 sq.km, there was very little thought devoted to protecting the ecological hotspots in the expanded areas. In the process, Chennai has lost many water bodies (lakes and ponds) and much of the Pallikaranai marsh land and coastal wetlands.**

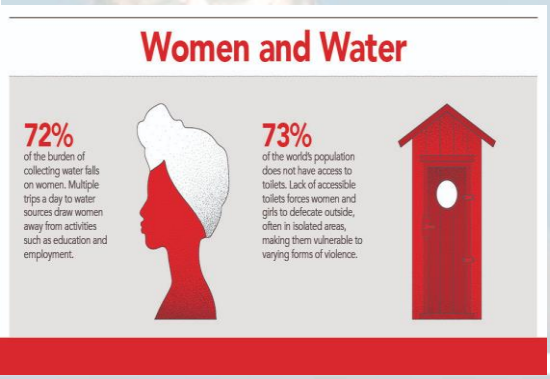


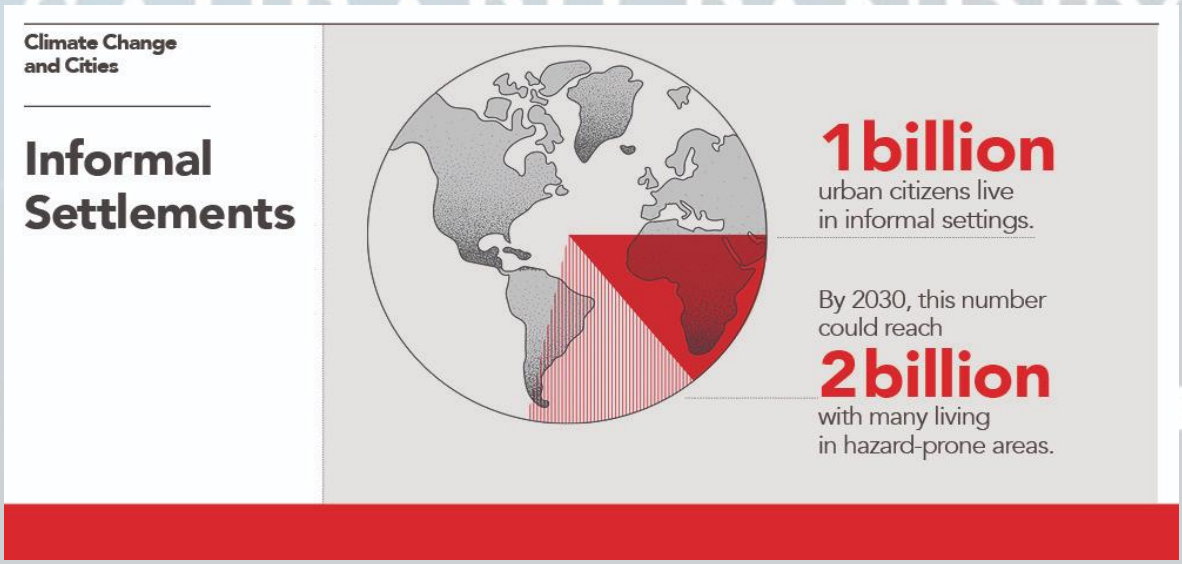










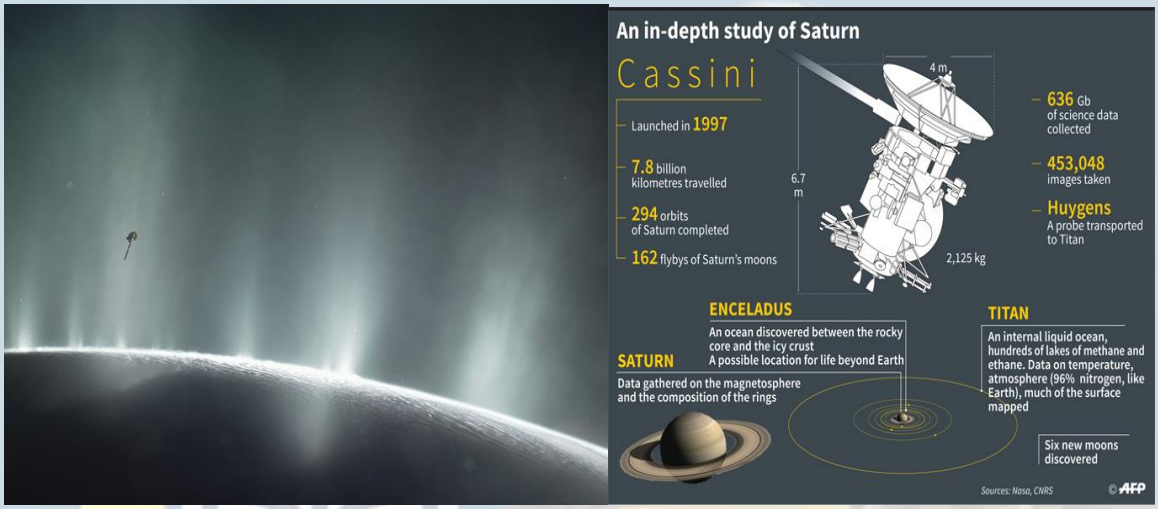


Cassini and Saturn

- **Molecules including methanol, ethane, and oxygen are present in gaseous plumes emitted from Saturn's moon Enceladus.**

- **The Cassini spacecraft first discovered large plumes of material escaping into space from Enceladus's southern hemisphere in 2005.**

- **These plumes appear to be coming from a subsurface ocean through fissures in the moon's icy surface.**



- **Composition of the plumes is the five already identified molecules along with newly identified hydrocarbons hydrogen cyanide (HCN), acetylene (C2H2), propylene (C3H6), and ethane (C2H6), and traces of an alcohol (methanol) and molecular oxygen.**

- **These compounds could potentially support extant microbial communities or drive complex organic synthesis leading to the origin of life," the authors write.**

- **The ability of these compounds to support life on Enceladus, however, depends largely on how diluted they may be in the moon's subsurface ocean, the authors note.**

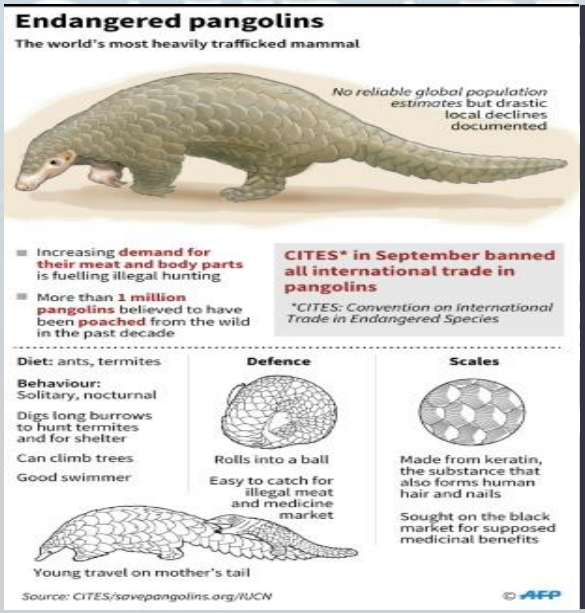
Woolly dogs

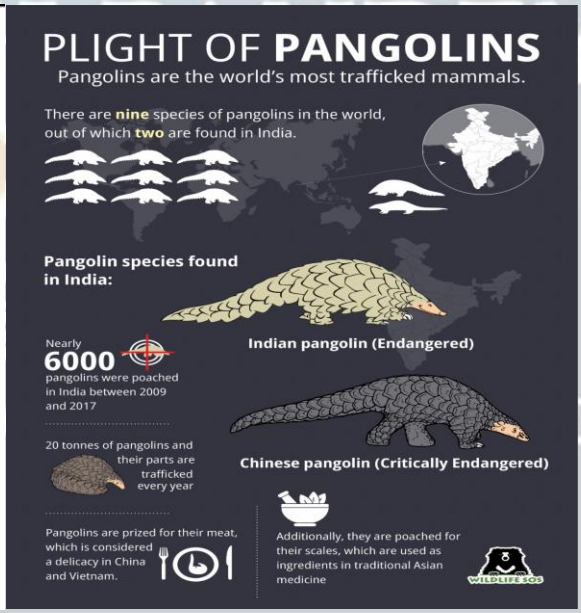
- **DNA analysis of a 19th- century dog, paired with traditional knowledge acquired through interviews, have provided new insights into the decline of Coast Salish "woolly dogs" an extinct Indigenous dog once bred for its**

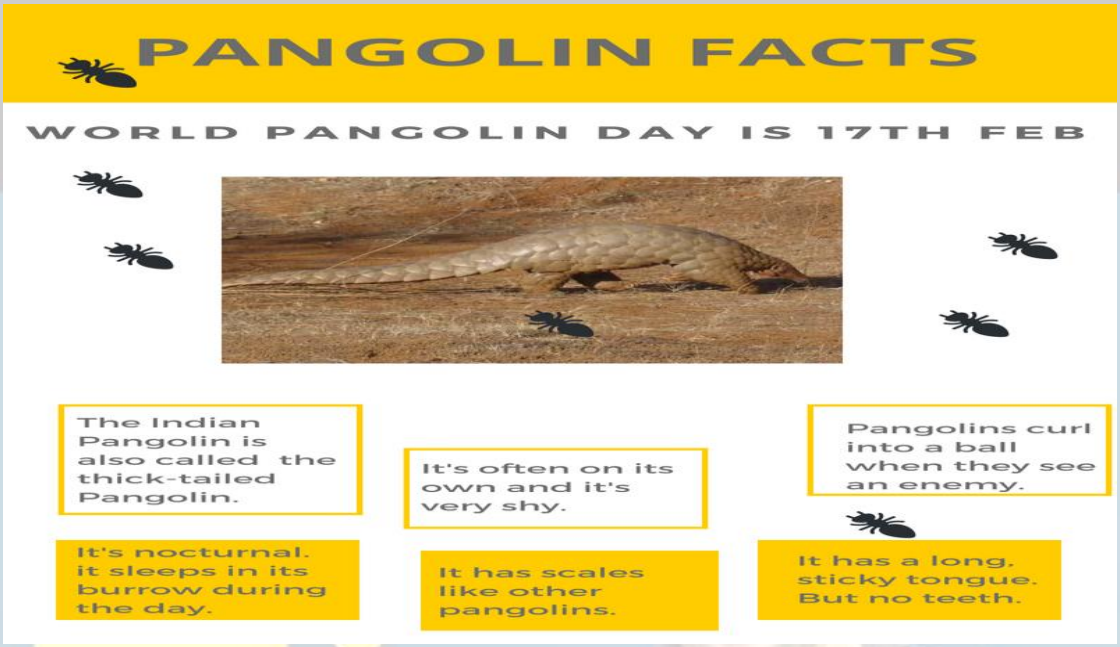
unique woolly coat.

- **Given the ubiquity of European ancestry present in many dog breeds at the time, the findings of the study suggest that the Coast Salish peoples carefully and successfully maintained the genetic integrity of the woolly dog's genetic lineage for a substantial period.**

Pangolin





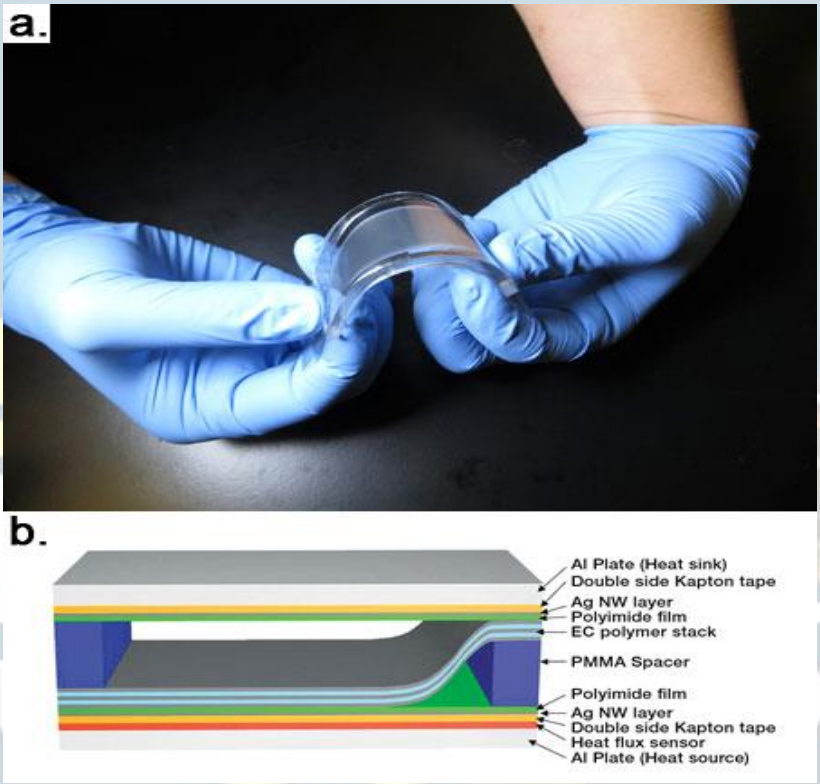


- **Based on genomic analyses, researchers reveal illegal pangolin trafficking routes from origins in Africa to markets in Asia.**
- **The approach offers new opportunities to monitor pangolin poaching in near real-time, allowing for targeted and more effective anti -trafficking measures.**
- **Pangolins are in high demand in Asia because their scales are believed, without scientific support, to have medicinal properties in traditional**

medicines, particularly in China.

- **The white bellied pangolin is the world's most trafficked mammal.**

Electro calorie device



- **The electro caloric effect (ECE) is a physical phenomenon found in materials with dipolar constituents, that is, with certain dielectric properties. It is manifested in the heating or cooling of an electro caloric material due to the applied electric field under adiabatic conditions.**

H1N2

- **Several subtypes of the influenza virus are assigned according to combinations of mutations in the proteins on the surface of the virus - hemagglutinin (H) and neuraminidase (N).**

- **The former binds to sialic acid receptors in the host. New influenza viruses can emerge through a process called reassortment where the co -infecting viruses could swap genomic fragments.**

- **Influenza A H1N2 is a subtype of influenza that is endemic in pigs and is rarely reported in humans.**
- **Swine influenza viruses normally do not infect humans, however, in rare cases, sporadic infections can occur especially with close contact with animals carrying the virus.**
- **Genome sequencing revealed that the virus belonged to a distinct clade 1B.1.1 of influenza viruses.**
- **While distinct from recent human cases of A(H1N2), its genetic makeup showed similarity to swine influenza viruses found in the UK and no other mutations of concern have been detected in this variant**
- **According to the UKHSA, the variant influenza virus presents a low risk to the general public.**
- **However, people with direct regular exposure to pigs may be at a higher risk of acquiring this virus.**
- **Influenza viruses have the potential to spill over into human populations and cause severe illnesses although the variant virus detected in the U.K. does not show any characteristics suggestive of pandemic potential**

CT SCAN

- **Ever since physicians started using computed tomography (CT) for medical imaging, its use grew rapidly.**
- **The benefits of CT imaging in clinically needed cases are well known.**
- **However, its potential for increased cancer risks and relatively high cumulative doses from multiple scans have raised concerns among the medical and scientific community.**
- **Radiation doses at moderate (over 100 mGy) to high (over 1 Gy) values are**

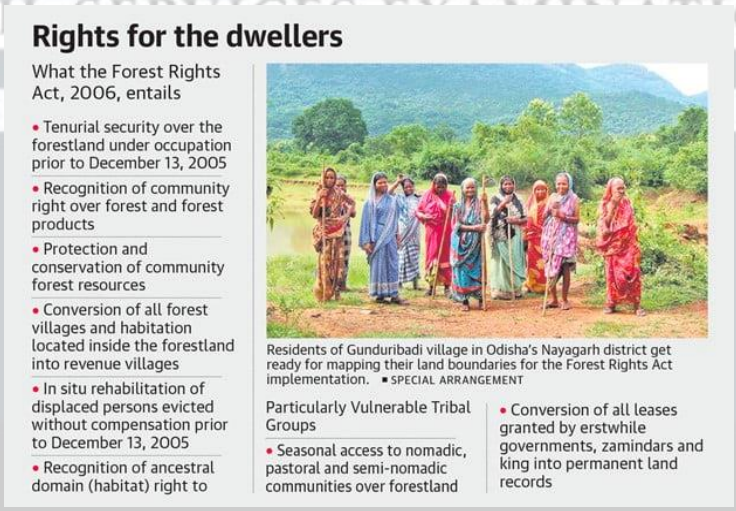
known to cause haematological malignancies (blood cancers) in both children and adults and other cancers.

- **About CT**
- **A CT (computed tomography) scan is an imaging test that helps healthcare providers detect diseases and injuries. It uses a series of X-rays and a computer to create detailed images of your bones and soft tissues.**
- **A CT scan is painless and noninvasive**

A CT scan takes pictures of Bones, Muscles, Organs, Blood vessels.

- **A CT (computed tomography) scan is a type of imaging test. Like an X-ray, it shows structures inside your body.**
- **But instead of creating a flat, 2D image, a CT scan takes dozens to hundreds of images of your body.**
- **To get these images, a CT machine takes X-ray pictures as it revolves around you.**

Forest right act 2006



- **The issue of so- called 'encroachments' is addressed through recognizing**

individual forest rights (IFRs) to continue habitation and cultivation or other activities that existed before December 2005.

- **Forest villages are to be converted into revenue villages after full rights recognition.**
- **The issue of access and control is addressed by recognizing the rights of village communities to access and use forests and to own and sell minor forest produce, and, most importantly, to manage forests within their customary boundaries, including in sanctuaries and national parks.**
- **This is the most far -reaching provision in the FRA, as it ensures decentralised forest governance, linking management authority and responsibility to community rights.**
- **Finally, the Act lays down a democratic procedure for identifying whether and where wildlife conservation may require curtailing or extinguishing community rights.**
- **Simultaneously, having community rights over a forest translates ipso facto into the community having a say in, if not veto over, any diversion of that forest and a right to compensation if diverted.**
- **This right was reaffirmed by the Supreme Court in the Niyamgiri case, and although the Forest Conservation Rules 2022 and FCA Amendment 2023 seek to bypass this right, States can still put in place such consent mechanisms.**
- **But the biggest lacuna in FRA implementation is the extremely slow and incomplete recognition of community rights to access and manage forests (loosely, community forest rights or CFRs).**
- **The (still colonially structured) forest bureaucracy is vehemently opposed to**

these rights, as it stands to lose its zamindari: our estimates show that 70%-90% of the forests in central India should be under CFRs.

- **The other departments and political representatives can only visualize forest -dwellers as 'labharthis' (beneficiaries of state largesse), not as autonomous users and managers of their own forests.**
- **Maharashtra, Odisha, and, more recently, Chhattisgarh, are the only States to recognise CFRs substantially.**
- **But only Maharashtra has enabled their activation by denationalizing minor forest produce, at least in Scheduled Areas, resulting in at least a thousand villages managing their own forests. Even here, illegal non- recognition of community rights in densely forested potential mining areas has led to protest and unrest.**

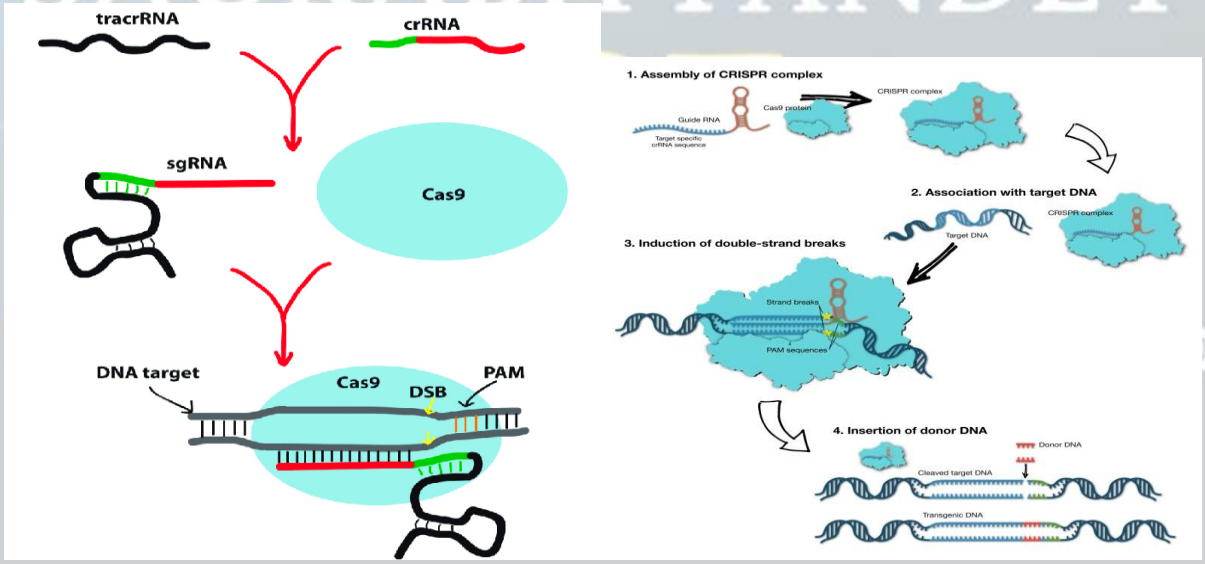
Storm Red Sea

- **Beyond the regional crisis points, depletion of security in the Red Sea will have a global impact, specifically for Asian economies such as India, Japan, South Korea, and China, drawing in their interests as well.**
- **In the Persian Gulf for example, India has operationalized military capacities under Operation Sankalp since 2019, where the Indian Navy began escorting India- flagged ships, specifically oil tankers.**
- **Japan has worked its diplomatic channels directly with Tehran while South Korea has also experienced tensions with Iran over its ships travelling through the region. A U.S. call for partners to mobilise is not irrational.**
- **Previously, the global community did rally to address the issue of piracy off**

coastal eastern Africa, specifically around the waters of Somalia.

- **In 2012, India joined China, Japan, and South Korea for coordinated joint patrols in the Gulf of Aden. All states took point by rotation in leading these patrols**
- **Through the current churn in the global geopolitical order, there is one major trend that states must factor into their calculus: that non-- state militant actors are strengthening in agency, both politically and militarily, and often as part of state- promoted designs to secure short- term gains for long- term strategic victories.**
- **These are the fundamentals at play in an area such as the Red Sea which, in capitals such as New Delhi, do not enjoy the luxury of space in security debates.**

(CRISPR) and therapeutic



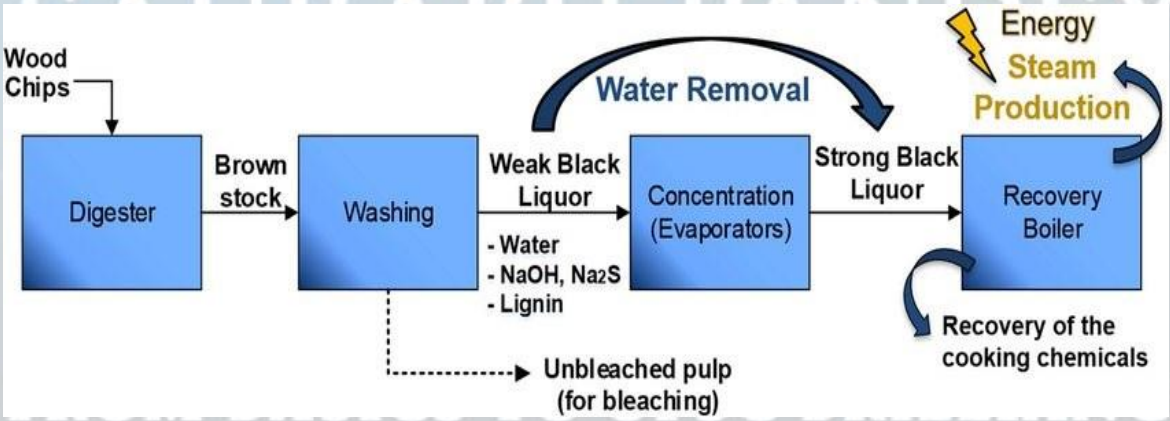
- **The world of medicine is currently abuzz with news of regulatory agencies' approval for two highly anticipated CRISPR- based therapies for sickle- cell disease and β-thalassaemia in the U.K. and the U.S.**

Long and short of CRISPR

- **Clustered regularly interspaced short palindromic repeats (CRISPR) are DNA elements that Spanish researchers discovered in archaea in 1993, and named and described later in a number of bacterial genomes.**
- **These elements contain pieces of genetic material derived from viruses that infect bacteria (for example, bacteriophages) and a set of proteins called Cas, or CRISPR- associated.**
- **the researchers demonstrated the utility of the CRISPR-Cas9 system as a programmable 'molecular scissor' that could cut in DNA at a chosen spot with unparalleled accuracy. The specific spot could be picked by modifying the crRNA accordingly.**
- **the national regulator in the U.K., the Medicines and Healthcare Products Regulatory Agency (MHRA), approved the use of a CRISPR- based method called exagamglogene autotemcel sold under the brand 'Casgevy' to treat sickle- cell disease and transfusion- dependent β-thalassemia.**
- **In Casgevy, a patient's blood stem cells are extracted, their genes modified to remove the defect that produces the sickling and regrafted back.**
- **These cells then proliferate to produce normal red blood cells.**
- **One fascinating approach is called base editing, where scientists edit genomes at the resolution of a single nucleotide (DNA is a polymer consisting of multiple nucleotides chained together).**
- **Yet another emerging technique is prime editing, where researchers use a search- and- replace strategy to directly write or insert specific sequences into an existing genome with high accuracy.**

Kraft process

- **The kraft process is a technique that accepts wood chips as input to produce cellulose fibres, which are then used to make paper and other materials used in everyday objects.**
- **Paper is most commonly produced by the kraft process today.**
- **The process is chemical in nature.**
- **The chips are treated with water, sodium hydroxide, and sodium sulphides the last two forming a highly alkaline mixture called white liquor at a relatively high temperature.**
- **This breaks the bonds between lignin (an organic polymer and important constituent of cell walls), hemicellulose (cellulose- like fibres that are shorter), and cellulose.**



M-RNA Based medicines

- **While using mRNA as medicine is new, mRNA has been inside you for your entire life. The cells in your body create mRNAs that serve as instructions to make specific proteins you need to function.**
- **Researchers can create new mRNAs to correct those instructions when they**

aren't working

- **The "m" stands for messenger, as mRNA contains the message, or recipe, that codes for a protein.**
- **About one- third of a cell's energy is devoted to maintaining the proteins you need, so cells are well equipped to recognise, use and then destroy mRNA once it's no longer needed.**
- **The language of mRNA is made of four building blocks called nucleotides, nicknamed A, U, C and G**
- **Scientists understand how mRNAs code for proteins, they can easily create recipes for any protein.**
- **These recipes can be edited to meet the needs of the patient, whether this means providing a whole new mRNA recipe or tweaking an existing one to make a slight variation of the protein.**
- **Producing mRNA treatments is also scalable because scientists can make large amounts of mRNA in the lab.**
- **Another benefit of using mRNAs as drugs are cells' natural ability to destroy them when they aren't needed.**
- **Since mRNAs aren't permanent, doses can be easily changed to meet the changing needs of the patient.**

mRNA vaccines beyond COVID-19

- **The COVID-19 vaccines from Moderna and Pfizer- BioNTech are the first mRNA-based medicines to gain FDA approval.**
- **When these vaccines are injected into your arm, the mRNA is absorbed into some of your cells, which read the mRNA recipe and make the spike protein the virus uses to invade cells.**

- Your immune system recognises this spike protein as foreign and makes antibodies that prepare your body to attack the virus if you encounter it later.
- These mRNA vaccines demonstrate the flexibility of mRNA-based therapies.
- As the virus that causes COVID-19 mutates, new viral variants can evade existing antibodies and cause new waves of illness.
- However, scientists are able to sequence new mRNA recipes based on these variants and tweak the vaccine recipes to match them.
- Boosters containing these edited recipes teach your body to make new antibodies that target the latest versions of the viral spike protein.

mRNA as treatment for disease

- The potential for mRNA-based medicine extends beyond vaccines to prevent infectious disease.
- One example is the use of mRNA to treat cancer. Some mRNA cancer treatments work like vaccines by training your immune system to specifically target cancer cells.
- As cancer cells grow, they rapidly gain mutations in many genes.
- Cancer vaccines contain mRNA recipes based on mutations commonly found in certain types of tumours.
- When injected into the body, the mRNAs from the vaccines allow normal cells to make those mutated proteins and broadcast them to the immune system, ramping up production of antibodies.
- These antibodies bind to cancer cells and mark them for immune attack.

- **Cancer vaccines, like BioNTech's BNT-111 for melanoma, target the most common cancer mutations in the hope of helping many patients.**
- **one mRNA drug increases the formation of new blood vessels, which can improve wound healing in diabetic patients who have poor blood circulation and higher amputation risks.**
- **Another example is using mRNAs to treat propionic acidaemia, a disease where children have low levels of two liver proteins that normally prevent toxic by-products from building up in the body.**
- **The ability to easily customize and produce mRNA increases their potential as effective, personalised therapies with fewer side effects that can help many people.**

Gelephu

- **Bhutan's King, Jigme Khesar Namgyel Wangchuck, highlighted Gelephu Mindfulness City in his 116th National Day address, emphasising South**

Asia's ongoing economic transformation and the vast opportunities for the region, home to approximately two billion people.

- **The proposed land connection from Gelephu or Samdrup Jongkhar, traversing Assam and Northeast Indian states, extends to Myanmar, Thailand, Cambodia, Laos, Vietnam, Malaysia, and Singapore, forming a dynamic economic corridor that bridges South Asia to Southeast Asia.**
- **The Gelephu Special Administrative Region (SAR) is envisioned as an autonomous economic hub, endowed with the authority to shape essential laws and policies.**
- **With executive autonomy and legal independence, this SAR aims to become a distinctive economic centre, inviting foreign investment through a favourable business environment and compelling incentives.**

Cities and cop 28

- **United Nations Framework Convention on Climate Change (UNFCC) initiated the COP in 1995, 44% of people lived in cities. Currently, 55% of the global population is urban and this is expected to reach 68% by 2050.**
- **The urban world today consumes nearly 75% of primary energy and is responsible for roughly 70% of CO2 (76% of total GHG) emissions.**
- **Hence, the desired results of the Paris commitments are not possible without addressing urban issues.**
- **At this year's COP, there was a special day dedicated to a ministerial meeting on urbanisation and climate change.**
- **COP-28, argued for formally recognizing the role of subnational**

governments in global climate change negotiations, accelerating and scaling up climate action by working across all levels of governance and sectors, and providing direct financing and technical assistance to cities and regions

What can be done in the Global South?

- **The cities of the Global South are far more vulnerable than their western counterparts.**
- **The city leaders are hardly empowered, the major employment is in the informal sector, adaptation is key as most cities are vulnerable to climate induced disasters**
- **In most countries, and in India particularly, 40% of the urban population live in slums.**
- **Pollution is a major contributor in reducing life expectancies and social and economic inequities are quite inherent in their systems.**
- **So, to ensure fair participation in climate action plans and to claim loss and damage compensation, etc., there has to be a radical shift in the processes governing the cities**
- **During the preparation of Nationally Determined Contributions (NDCs) and National Adaptation Plans, cities find themselves excluded from the process of climate action plans.**
- **There is hardly any representation of city leaders and civil society groups in this process.**
- **Some cities like Chennai are spearheading their climate action plan and have decided to meet their zero emission targets by 2050, even before the Indian national government's stipulated time period of 2070.**

- **Though this may sound too ambitious, it qualifies the point that cities are at the forefront in reclaiming spaces in meeting climate action plans.**

Photoreception

- **Photoreception is activation of a biological process by light.**
- **Most organisms, including humans, respond to light. Some animals react to light waves not perceived by humans.**
- **Vertebrates have two types of photosensitive cells, rods and cones, so called because of their shape.**
- **The rods, which are long and fat, contain large amounts of visual pigment and they mediate vision under dim illumination (scotopic vision).**
- **The cone cells, which are relatively small, mediate daylight vision (photopic vision) and colour sensation.**
- **The retinas of animals active both day and night, as are those of humans, contain both rods and cones. In parts of the human retina, the rods and cones are intermingled and the nervous system provides a switching mechanism that permits adjustment for light conditions.**
- **In nocturnal animals, the optical arrangement of the eyes suggests that resolution is sacrificed for high light- gathering power**
- **In nocturnal animals, the retina is mainly made up of rod cells.**
- **Rhodopsin, a photosensitive pigment present in rods, is decolorized by photons (light particles) and slowly regenerated in the dark.**
- **This ensures better vision for them in dim light.**

Red sea and Houthi

- **U.S. Defense Secretary Lloyd Austin announced the creation of a multinational operation to safeguard commerce in the Red Sea following a**

series of missile and drone attacks by Yemen's Iran aligned Houthis

- **The situation in the Bab el- Mandeb Strait has been worrying shipping companies after several attacks by Houthi rebels on container ships.**
- **These attacks have prompted several major international companies to hold ships from venturing in the strait that separates Yemen from eastern Africa**
- **Prime Minister Narendra Modi and Israeli Prime Minister Benjamin Netanyahu held a telephone discussion on the escalating threats to maritime security in the Red Sea because of the actions of Houthi militants of Yemen.**
- **The conversation came soon after the Pentagon announced an international mission to counter the growing number of attacks against Israel- bound international traffic.**
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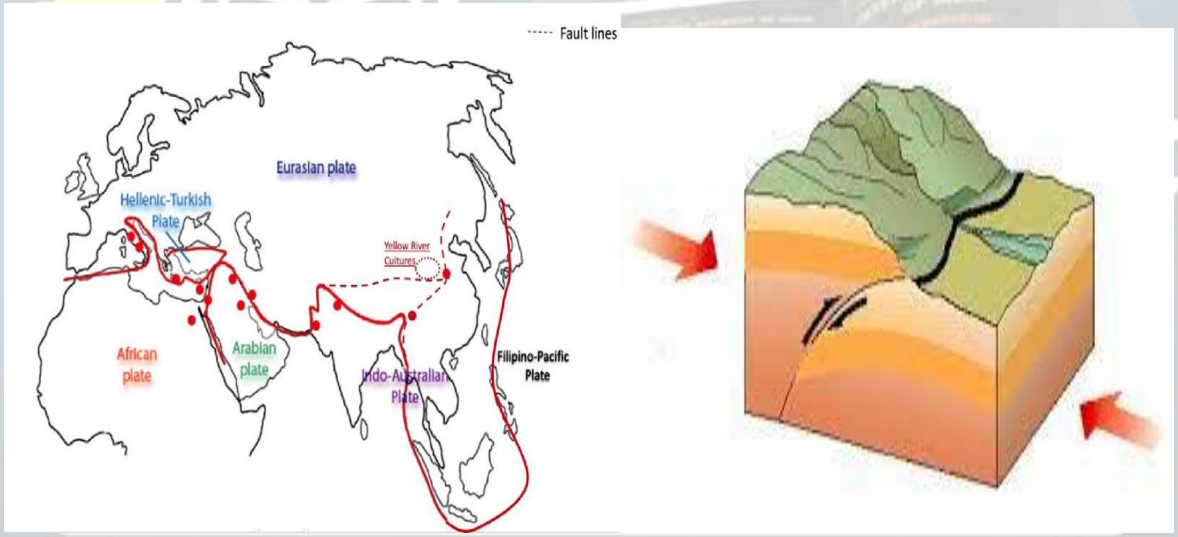
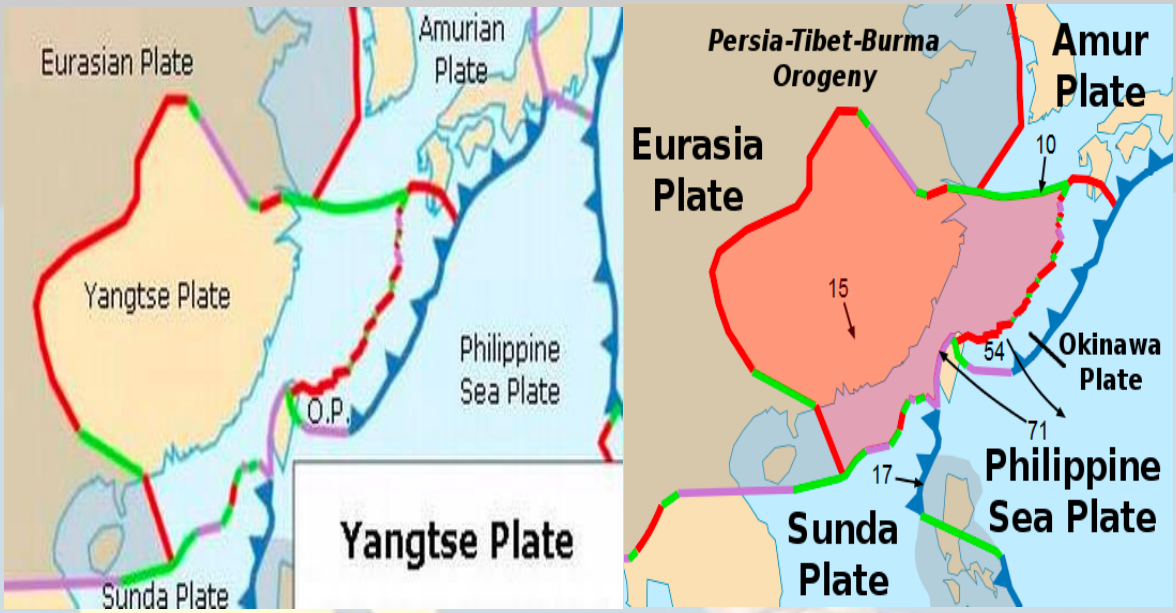
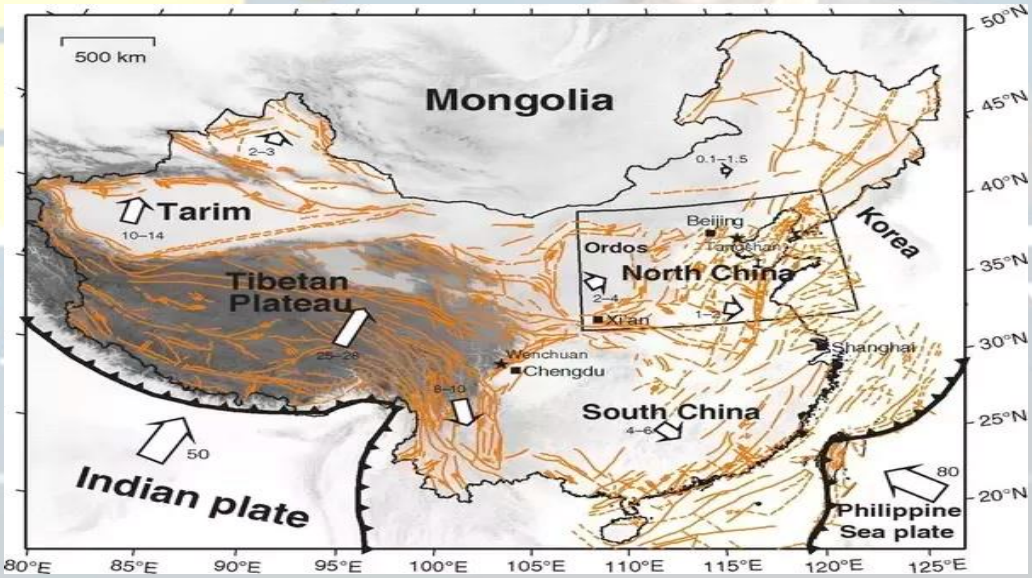
Why an earthquake in china?

A strong overnight earthquake rattled a mountainous region of northwestern China, destroying homes, leaving residents out in a below- freezing winter night and killing 126 people in the nation's deadliest quake in nine years



- 

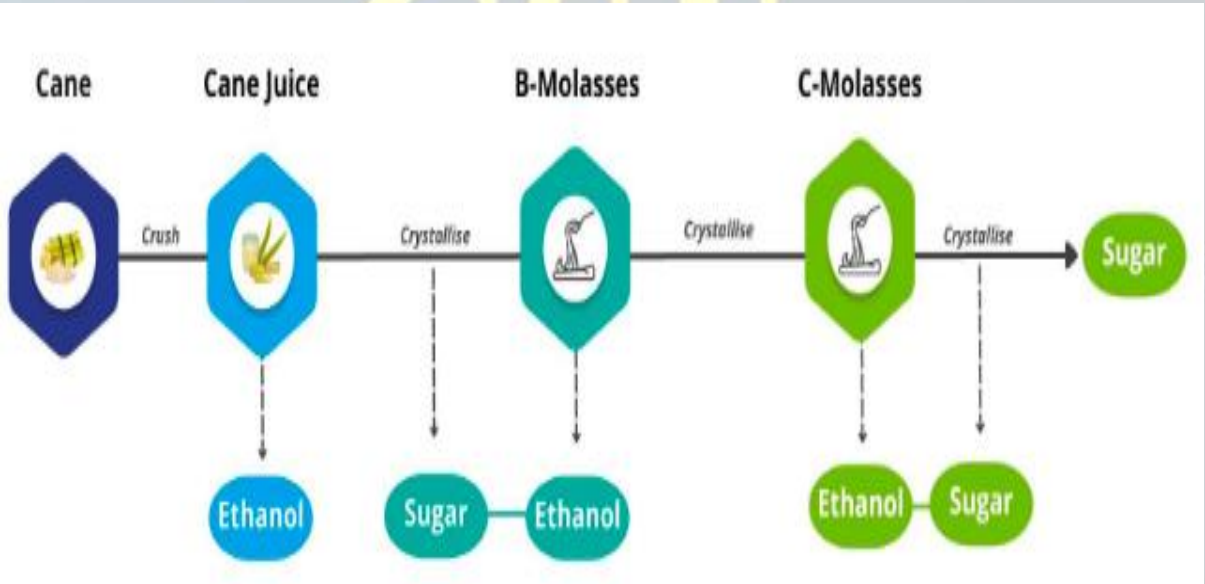
- 

Ethanol

- **As more than 100 countries at COP28 in Dubai pledged the tripling of global renewable energy capacity by 2030, India faces a tightrope walk with regard to its ethanol blending target.**

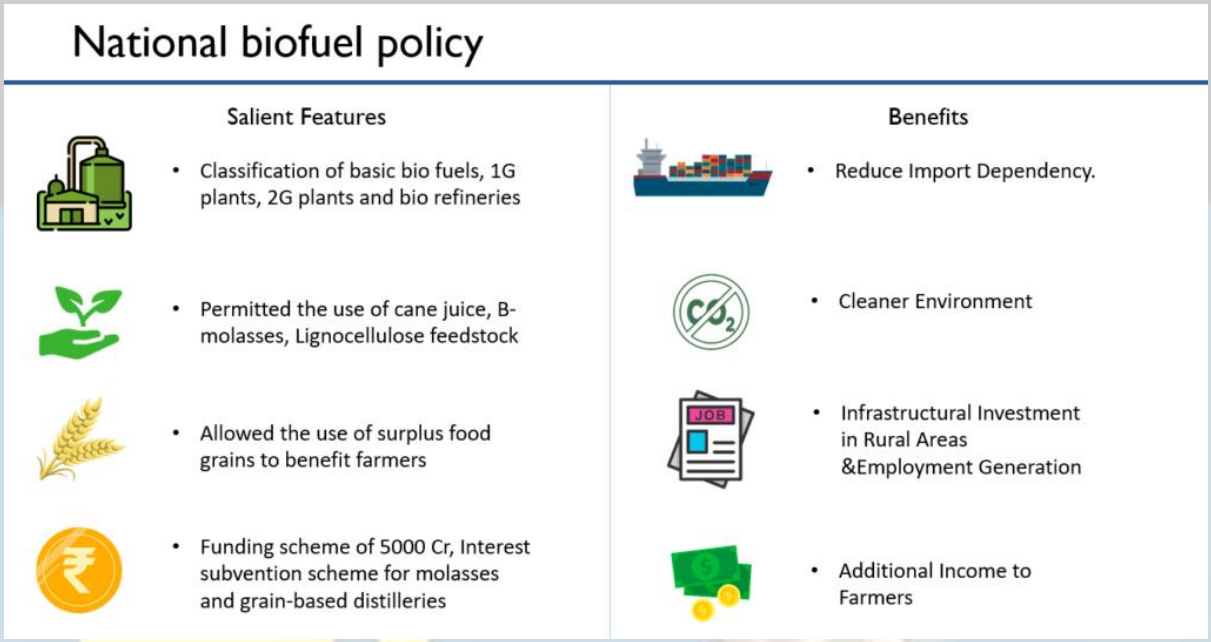
- **While ethanol blended petrol (EBP) increased from 1.6% in 2013-14 to 11.8% in 2022--23, the 20% target by 2025 has run into trouble with low sugar stocks in 2022-23 and the impending shortfall in sugarcane production this year**

- **The two major feedstock for ethanol production are sugarcane (Brazil) and corn (the U.S.).**
- **A crucial difference between the use of sugarcane and corn for producing ethanol is the degree of food-fuel conflict that emerges. In the case of sugarcane, ethanol is produced by processing the molasses (C--heavy/B--heavy) and constitutes minimal trade -off with the sugar output.**
- **The B-heavy molasses path produces less sugar compared to the C -heavy one, but both produce sugar and ethanol simultaneously from sugarcane.**



- **But using corn for producing ethanol directly reduces its use as food or livestock feed.**

- **It not only diverts grain to fuel use, but also links food prices directly with crude oil prices through the demand side.**
- **The very high crude prices that prevailed for a decade in 2004--14 pulled up ethanol and corn prices to historical highs**
- **This strong link between crude and food prices in the era of agro fuels**
- **Unlike in the U.S., sugarcane is the more obvious choice for tropical countries such as Brazil or India where cane yields are higher.**
- **This is not to argue that using sugarcane for ethanol does not have adverse impacts on environment or hunger.**
- **More land under water- intensive sugarcane cultivation can displace food production as well as degrade water tables, but these can be regulated by appropriate land-use policies.**
- **It is far more difficult to control the market dynamics, driven by easily interchangeable grain use, as illustrated by the U.S.'s corn- based ethanol experience.**
- **The future of India's renewables strategy hangs on a delicate food-fuel trade-off; and a choice between intensifying hunger and reducing fossil fuel use.**

- 

Telecommunication bill 2023

- **The Telecommunications Bill, 2023 was introduced in Lok Sabha on December 18, 2023.**
- **It seeks to regulate activities related to telecommunication. It repeals the Indian Telegraph Act, 1885, the Indian Wireless Telegraphy Act, 1933, and the Telegraph Wires (Unlawful Possession) Act, 1950. It also amends the Telecom Regulatory Authority of India (TRAI) Act, 1997.**
- **Authorization for telecom-related activities: Prior authorization from the central government will be required to: (i) provide telecommunication services, (ii) establish, operate, maintain, or expand telecommunications networks, or (iii) possess radio equipment.**
- **Assignment of spectrum: Spectrum will be assigned by auction, except for specified uses, where it will be allocated on an administrative basis.**
- **These include purposes such as: (i) national security and defence, (ii) disaster management, (iii) weather forecasting, (iv) transport, (v) satellite services**

such as DTH and satellite telephony, and (vi) BSNL, MTNL, and public broadcasting services.

- **Powers of interception and search: Messages or a class of messages between two or more persons may be intercepted, monitored, or blocked on certain grounds.**
- **Such actions must be necessary or expedient in the interest of public safety or public emergency, and must be in the interest of specified grounds which include: (i) security of the state, (ii) prevention of incitement of offences, or (iii) public order**
- **Powers to specify standards: The central government may prescribe standards and assessments for telecom equipment, infrastructure, networks, and services.**
- **Right of way: Facility providers may seek a right of way over public or private property to establish telecom infrastructure. Right of way must be provided on a non-discriminatory and non-exclusive basis to the extent possible.**
- **Protection of users: The central government may provide for measures to protect users which include: (i) prior consent to receive specified messages such as advertising messages, (ii) creation of Do Not Disturb registers, and (iii) a mechanism to allow users to report malware or specified messages.**
- **Appointments to TRAI: The Bill amends the TRAI Act to also allow individuals with: (i) at least 30 years of professional experience to serve as the chairperson, and (ii) at least 25 years of professional experience to serve as members.**
- **Digital Bharat Nidhi: The Universal Service Obligation Fund has been**

established under the 1885 Act to provide for telecom services in underserved areas. The Bill retains this provision, renames the fund as Digital Bharat Nidhi, and also allows its use for research and development.

- **Offences and penalties:** The Bill specifies various criminal and civil offenses. Providing telecom services without authorization, or gaining unauthorized access to a telecom network or data, are punishable with imprisonment of up to three years, a fine of up to two crore rupees, or both.
- **Adjudication process:** The central government will appoint an adjudicating officer to conduct inquiries and pass orders against civil offences under the Bill.
- The officer must be of the rank of joint secretary and above. Orders of the adjudicating officer may be appealed before the Designated Appeals Committee within 30 days.
- Members of this Committee will be officers of the rank of at least Additional Secretary.

Ironing effect

The iron press /Ironing effect

- The iron press is a wonderful machine.
- There are two important ingredients to this wonder: it has a heavy metal base (often some alloy of iron, thus the name) and that it heats up.
- Our clothes are made of some plant or animal fibres, like cotton, wool, etc.
- Fibres are long chain- molecules often made of carbon, oxygen, and hydrogen very similar to the glucose and sugar that we eat.
- These molecules can be really, really long.

- **If the water molecule, which is made of two hydrogen atoms and an oxygen atom, is the size of a pencil, a typical cellulose fibre, one of the primary molecules of cotton, would be about 100 metres long!**
- **These kinds of molecules are called polymers. Polymers make up many things around us, including plastic, soap, and even tomato ketchup.**
- **There are synthetic polymers (made in a lab, like plastic) and then naturally occurring ones, such as cotton.**
- **When you wash your clothes, these molecules become knotted around each other like noodles when you cook a packet,**
- **This is often because of the water molecules that become stuck between and around these molecules.**
- **When you iron your cloth, what you are really trying to do is rearrange these long molecules into neat, straight patterns.**
- **In the process, some of these water molecules escape and evaporate.**
- **Heat is nothing but energy: it causes all the atoms and molecules to vibrate a bit and that does the trick.**
- **As we know, each of these cellulose molecules is very long and they can have various twists and turns along their length, like one strand in a noodle.**

Volcanic eruption in Iceland

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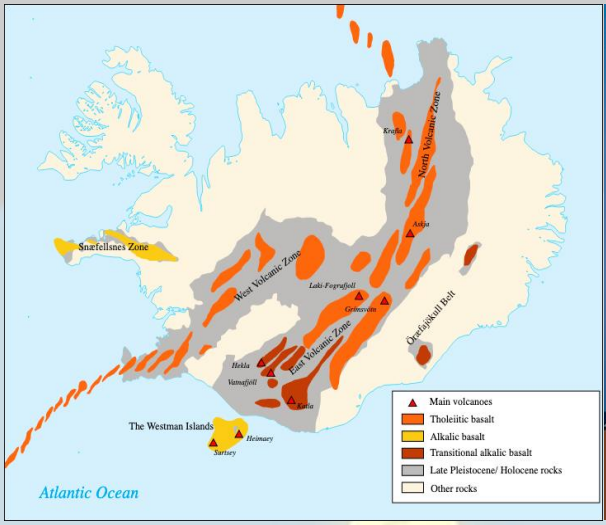
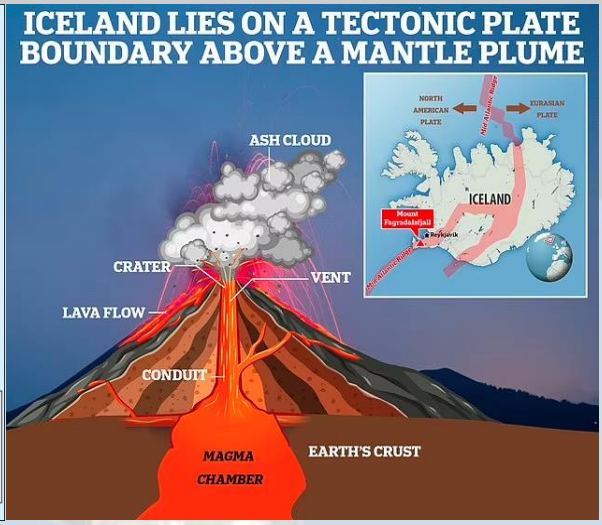
- **A volcano that had rumbled for weeks erupted in southwestern Iceland, spewing semi -molten rock into the air in a spectacular show of the earth's power in the land known for fire and ice.**
- **Iceland, which sits above a volcanic hotspot in the North Atlantic, has about 20 hours of darkness a day in December.**
- **Iceland averages an eruption every four to five years. The most disruptive in recent times was of the Eyjafjallajokull volcano, which in 2010 spewed huge clouds of ash into the atmosphere**

- 



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- **A volcanic range on the Reykjanes Peninsula, about 50 km southwest of the capital, Reykjavik, has erupted thrice since 2021, after being dormant for 800 years.**
- **The nearby Blue Lagoon geothermal spa one of Iceland's biggest tourist attractions.**

EU Bloc law

- **EU countries and lawmakers reached an agreement on Wednesday on an overhaul of the bloc's laws on handling asylum- seekers and migrants.**
- **The reform includes speedier vetting of irregular arrivals, creating border**

detention centres, accelerated deportation for rejected asylum applicants and a solidarity mechanism to take pressure off southern countries experiencing big inflows.

- **The migration issue has taken on a harder political edge in Europe in recent years with the rise of nationalist ant immigrant parties in several EU countries, including Italy, Sweden and the Netherlands.**

-

COP 28 Outcome

- **Parliament House following the attack in 2001.**
- **There are spike barriers, bollards, drop gates with the latest technology, scanners, Radio Frequency Identification (RFID) devices, anti-explosive checks, and additional manpower that form the layers of security.**
- **A phalanx of men and women from the central police forces are deployed in the outer precincts,**
- **neither door frame metal detectors nor handheld metal detectors can check for plastic or rubber, especially when hidden in one's shoes (as it was in this**

case).

- **In fact, shoes are never checked in Parliament. The United States and Europe have moved to using millimetre wave scanners. Those who are watchful move ahead with the technology of the times.**
- **The posts of the two chiefs of the Central Reserve Police Force and the Central Industrial Security Force involved with Sansad security are vacant too.**
- **The inquiry into the breach has been entrusted to the Indo- Tibetan Border Police (ITBP) chief whose force is involved in the security set-up of Parliament.**
- **In the absence of the Joint Secretary, Security, the Lok Sabha and the Rajya Sabha each have a 'Director Security' to direct security operations**
- **It is not like the Special Protection Group (SPG) manned by the best Indian Police Service officers, who are always engaged in daily operations, monitor them for improvements, and also scour for the latest technology to induct.**
- **Terms related to new variants of corona**
- **The World Health Organisation, has decided, due to its rapid spread, to classify the variant JN.1 as a separate variant of interest (VOI) from the parent lineage BA.2.86.**
- **It was previously classified as VOI as part of BA.2.86 sublineages**
- **As per WHO's updated definition of a VOI, it would be a SARS-CoV-2 variant with genetic changes that are predicted or known to affect virus characteristics such as transmissibility, virulence, antibody evasion, susceptibility to therapeutics and detectability.**
- **It has also been identified to have a growth advantage over other circulating**

variants in more than one WHO region with increasing relative prevalence alongside increasing number of cases over time, or other apparent epidemiological impacts to suggest an emerging risk to global public health.

- **"The continued growth of JN.1 suggests that it is either more transmissible or better at evading our immune systems.**

- **Terms to know**
- **Mutation: A mutation refers to a single change in a virus's genome (genetic code). Mutations happen frequently, but only sometimes change the characteristics of the virus.**

- **Lineage: A lineage is a group of closely related viruses with a common ancestor. SARS-CoV-2 has many lineages; all cause COVID-19.**

- **Sublineage: A term used to define a lineage as it relates to being a direct descendent of a parent lineage. For example, BA.2.75 is a sublineage of BA.2.**

- **Variant: A variant is a viral genome (genetic code) that may contain one or more mutations.**

- **SARS-CoV-2 Interagency Group (SIG) as a Variant of Interest (VOI), Variant of Concern (VOC), Variant of High Consequence (VOHC) or Variant Being Monitored (VBM) due to shared attributes and characteristics that may require public health action.**
- **Recombination: A process in which the genomes of two SARS-CoV-2 variants combine during the viral replication process to form a new variant that is different from both parent lineages.**

- **This may occur when a person is infected with two variants at the same time.**

- **The lineage that results from recombination is called a "recombinant."**

Pango Lineage System

- **The Pango lineage system is hierarchical—like a family tree. Lineages are**

evolutionarily descendants of a "parent" lineage. A lineage may be described as a "sublineage" when it is being discussed in relation to its parent lineage.

Next clade

- **Next clade is a tool that is used to classify SARS-CoV-2 sequences according to their genetic relatedness.**

- **Potentially important branches of the SARS-CoV-2 family tree are given names, indicating members of that branch are a "clade" and are thought to arise from a common ancestor.**

Uses four types of classifications:

- **Variant of high consequence (VOHC)**
- **Variant of concern (VOC)**
- **Variant of interest (VOI)**
- **Variants being monitored (VBM)**

What is Variants of interest?

Variants designated as VOI include variants that have:

- **reduced neutralization by antibodies generated against previous infection or vaccination.**
- **Reduced efficacy of FDA approved treatments or diagnostic tests.**
- **Predicted increase in transmissibility or disease severity.**

Possible attributes of a Variant of Interest include:

- **specific genetic markers that are predicted to affect transmission, diagnostics, therapeutics, or immune escape.**

- **Evidence that it is the cause of an increased proportion of cases or unique outbreak clusters.**

- **A VOHC has clear evidence that prevention measures or medical countermeasures (MCMs) have significantly reduced effectiveness relative to previously circulating variants.**

In addition to the possible attributes of a variant of interest, variants designated as VOC include:

- **Increase in transmissibility.**
- **more severe disease (for example, increased hospitalizations or deaths).**
- **significant reduction in neutralization by antibodies generated during previous infection or vaccination.**
- **Reduced effectiveness of treatments or vaccines, or diagnostic detection failures.**
- **Cotinine**
- **Nicotine Replacement Therapy (NRT) nicotine patches or lozenges relies on providing additional nicotine to the body. Researchers have now turned to nicotine's oxidative metabolite, cotinine.**
- **Using ascorbic acid as a potential reducing agent, they converted cotinine in smokers' plasma back to nicotine, targeting both nicotine addiction and detoxification simultaneously**
- **A team of researchers from the Faculty of Pharmacy, Sri Ramachandra Institute of Higher Education and Research, have developed a dissolvable film containing Vitamin C that a smoker places on the tongue whenever tempted to smoke.**

- **Ascorbic acid in a specified dose (Vitamin C) converts cotinine back to nicotine within the smokers' plasma, they claim.**

- **Individuals find it difficult to quit smoking because of nicotine withdrawal. Current NRT products provide additional nicotine to the body.**

- **Nicotine is metabolized into cotinine, an oxidative metabolite. Cotinine will stay in the body for six weeks (the quantity of cotinine depends on an individual's tobacco consumption).**

- **Generally, 80% of nicotine accumulates as cotinine in the body, while the remaining 20% is eliminated in urine.**

- **Cotinine can cause cancer.**

- **So, for the first time, instead of adding on to the nicotine content in the body, we have showcased that vitamin C can be utilized to recirculate cotinine.**

- **Side effects are negligible, the person does not receive additional nicotine and detoxification occurs at the end of the cycle."**

The Namdapha flying squirrel

- **Nocturnal flying squirrel has resurfaced in Arunachal Pradesh after going missing for 42 years. The Namdapha flying squirrel (Biswamoyopterus Biswas) was last described in 1981.**

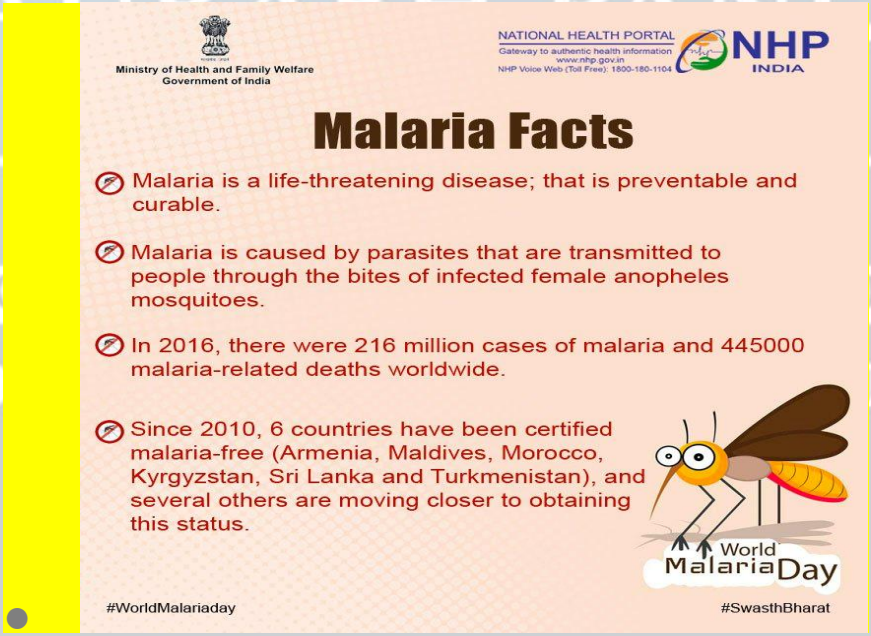
- **Namdapha Flying Squirrel**
- **SCIENTIFIC NAME:** ***BISWAMOYOPTERUS BISWASI***
- **LAST SEEN:** 1981 IN INDIA
- **YEARS LOST:** 42
- **RED LIST STATUS:** CRITICALLY ENDANGERED
- **The Namdapha flying squirrel (*Biswamoyopterus biswasi*) is an arboreal, nocturnal flying squirrel endemic to Arunachal Pradesh in northeast India, where it is known from a single specimen collected in Namdapha National Park in 1981.**
- **It was the sole member in the genus *Biswamoyopterus* until the description of the Laotian giant flying squirrel (*Biswamoyopterus laoensis*) in 2013**
- **Arboreal locomotion is the locomotion of animals in trees. In habitats in which trees are present, animals have evolved to move in them.**
- **Nocturnally is a behavior in some non-human animals characterized by being active during the night and sleeping during the day.**

R21/Matrix-M

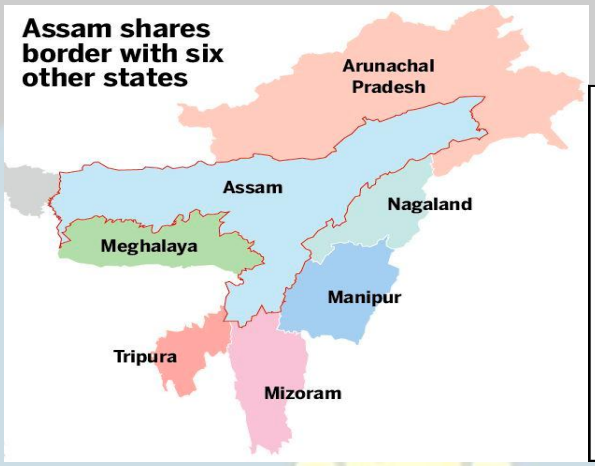
- **The World Health Organization (WHO) added the R21/Matrix-M malaria**

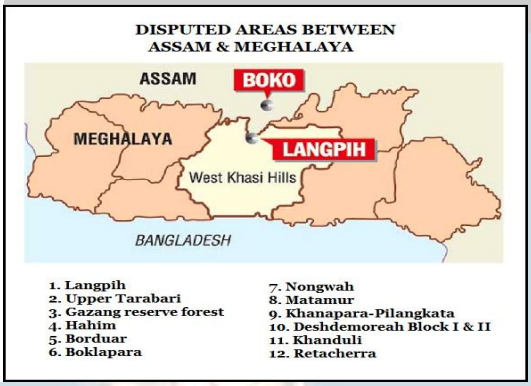
vaccine, developed by Oxford University and manufactured by Serum Institute of India, to its list of prequalified vaccines.

- **In October 2023, the WHO had recommended its use for the prevention of malaria in children.**
- **The R21 vaccine is the second malaria vaccine prequalified by the WHO.**
- **"The prequalification means larger access to vaccines as a key tool to prevent malaria in children, with it being a prerequisite for vaccine procurement by UNICEF and funding support for deployment by Gavi, the Vaccine Alliance," the WHO said in a statement**
- **Achieving WHO vaccine prequalification ensures that vaccines used in global immunisation programmes are safe and effective within their conditions of use in the targeted health systems."**



Assam - Meghalaya border dispute





WHY THE DISPUTE?

- Assam and Meghalaya share an 885-km border.
- In 1970, Meghalaya was carved out of Assam as an autonomous state.
- In 1972, Meghalaya became a full-fledged state following the Assam Reorganisation (Meghalaya) Act of 1969.
- This was the beginning of the border problem as the Meghalaya government found the Act unacceptable.
- As many as 12 land dispute points, along the border of these two states, have been a bone of contention.
- These include Langpih, Upper Tarabari, Gazang reserve forest, Hahim, Borduar, Boklapara, Nongwah, Matamur, Khanapara-Pilangkata, Deshdemoreah Block I and Block II, Khanduli and Retacherra.
- Six of these areas have found some type of resolution in recent times after a memorandum of understanding (MoU) was signed between the two states.

- **Among the 12 areas, Langpih in the West Garo Hills bordering the Kamrup district of Assam is a major flashpoint.**
- **Langpih was part of the Kamrup district during the British colonial period, but post-Independence, it became part of the Garo Hills and Meghalaya.**
- **Meghalaya claims that the border problem in Langpih has been created by Assam, which has often set up police posts there.**

RESOLVING THE ISSUE

- **In 1983, a joint official committee was formed to address the border issues.**
- **The panel recommended that the Survey of India should re-delineate the border, teaming up with both the states.**
- **An independent panel, spearheaded by Justice YV Chandrachud, was set up in 1985. Meghalaya rubbished the report.**
- **In 1991, about 100 km of the border was demarcated with the help of the Survey of India, but Meghalaya cried foul.**
- **In 2011, the Meghalaya Assembly passed a resolution for intervention of the Centre and the establishment of a boundary commission.**
- **The Centre asked the two governments to appoint nodal officers to discuss the dispute.**
- **In 2019, Meghalaya urged the Supreme Court to direct the Centre to resolve the dispute but the petition was turned down.**
- **On January 29 this year, Assam and Meghalaya signed a draft resolution. It**

was the first step towards resolving a 50-year-old dispute.

- **On March 29, a historic MoU was signed between Assam Chief Minister Himanta Biswa Sarma and his Meghalaya counterpart Conrad K Sangma in the presence of Home Minister Amit Shah in New Delhi.**
- **The agreement sought closure in six disputed sectors that were taken up for resolution in the first phase**
- **On August 22 this year, the second phase of border talks was held with the two states deciding to form three regional committees to resolve issues regarding the remaining six disputed areas.**
- **Five principles are considered while resolving the border disputes: historical facts, ethnicity, administrative convenience, willingness and sentiments of the people concerned and the contiguity of the land, preferably with natural boundaries such as rivers, streams, and rocks.**

About Rare earth elements

- **The rare earth elements (REE) are a set of seventeen metallic elements.**
- **These include the fifteen lanthanides on the periodic table plus scandium and yttrium.**
- **Rare earth elements are an essential part of many high-tech devices**
- **Rare-earth elements (REE) are necessary components of more than 200 products across a wide range of applications, especially high-tech consumer products, such as cellular telephones, computer hard drives, electric and hybrid vehicles, and flat-screen monitors and televisions.**

- **Significant defense applications include electronic displays, guidance systems, lasers, and radar and sonar systems.**

- **Although the amount of REE used in a product may not be a significant part of that product by weight, value, or volume, the REE can be necessary for the device to function.**

- **For example, magnets made of REE often represent only a small fraction of the total weight, but without them, the spindle motors and voice coils of desktops and laptops would not be possible.**

- **In 1993, 38 percent of world production of REEs was in China, 33 percent was in the United States, 12 percent was in Australia, and five percent each was in Malaysia and India.**

- **Several other countries, including Brazil, Canada, South Africa, Sri Lanka, and Thailand, made up the remainder.**

- **However, in 2008, China accounted for more than 90 percent of world production of REEs, and by 2011, China accounted for 97 percent of world production.**

- **Beginning in 1990 and beyond, supplies of REEs became an issue as the Government of China began to change the amount of the REEs that it allows to be produced and exported.**

- **The Chinese Government also began to limit the number of Chinese and Sino-foreign joint-venture companies that could export REEs from China."**

Reindeer Behaviour

- **Researchers have discovered that the more time reindeer spend ruminating, the less time they spend in non -rapid eye movement (non-REM) sleep.**

- **EEG recordings revealed that reindeer's brainwaves during rumination resemble the brain waves present during non REM sleep, and these brainwave patterns suggest that the reindeer are more "rested" after ruminating**

- **Light-dark cycles are absent in the Arctic during winter and summer, and previous studies showed that Arctic- dwelling reindeer don't display circadian behavioural rhythms during these seasons, though they tend to be more active during the daytime during the spring and autumn equinox, when light-dark cycles are present.**
- **They found that reindeer slept approximately the same amount during winter, summer, and autumn, despite the fact that they were much more active during the summer.**
- **This is in contrast to other species that change the amount they sleep in response to environmental conditions.**
- **One possible strategy is the opportunity for rest during rumination the**

re-chewing of partially digested food, which is an important component of digestion for reindeer and other ruminants.

AEROGEL

- **Aerogels are among the lightest solid materials known to man. They are created by combining a polymer with a solvent to form a gel, and then removing the liquid from the gel and replacing it with air. Aerogels are extremely porous and very low in density.**

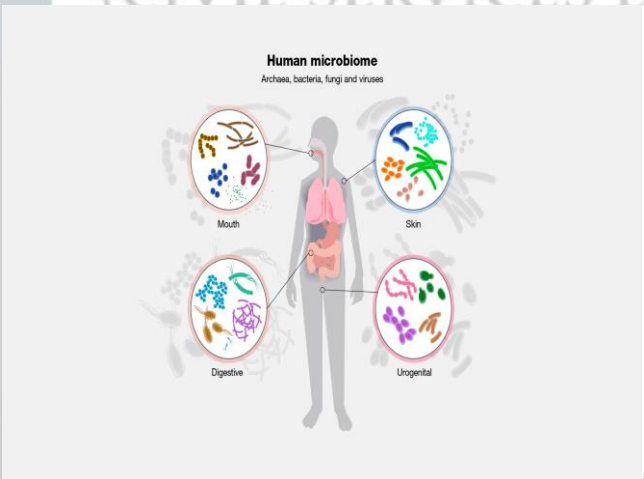
- **They are solid to the touch. This translucent material is considered one of the finest insulation materials available.**

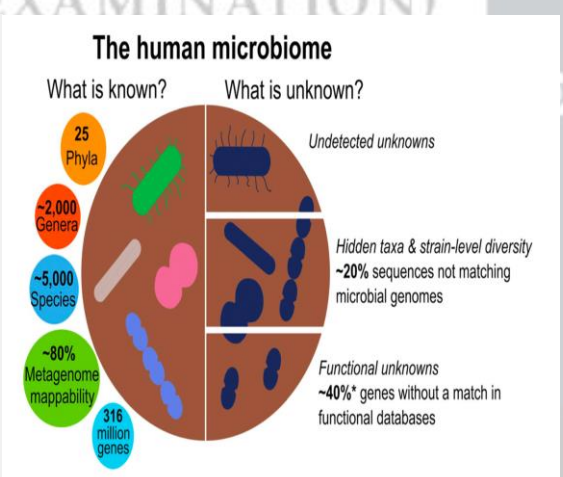
- **Although aerogels were first invented in the 1930s, NASA's Glenn Research Center in Cleveland has invented groundbreaking methods of creating new types of aerogels that could change the way we think about insulation.**

West Antarctic Ice Sheet

- **Genetic analyses of an Antarctic octopus show that the West Antarctic Ice Sheet (WAIS) collapsed during the Last Interglacial about 1,29,000 to 1,16,000 years ago when temperatures were only about 1-degree C warmer than pre industrial levels.**
- **The findings suggest that WAIS collapse and resultant sea- level rise could be caused by even the minimal temperature rises.**
- **Total WAIS collapse would have devastating global ramifications; it could raise the global sea level by roughly 3 to 5 metres.**

Microbiome





What is a microbiome?

- **A genome is the entire set of DNA instructions found in a cell.**
- **In humans, the genome consists of 23 pairs of chromosomes located in a cell's nucleus.**
- **A biome refers to the species that are present in a location.**
- **In our case, the ocular microbiome refers to the bacteria, fungi and viruses that are present in the eye.**
- **The microbes in a healthy ocular microbiome act like a barrier, preventing invasion by harmful pathogens.**
- **The ocular microbiome is also significantly different in the conjunctiva (the thin, clear membrane that protects the eye) and the cornea (the outermost clear layer that helps in focusing and refraction of the eye) of patients with infectious diseases such as fungal keratitis when compared to healthy eye microbiomes. The prevailing levels of air pollution, due to very high amounts of dust all over the country, have made many people suffer from 'pink eye' (conjunctivitis), itching and swelling of the eye, and blurry vision (when the lens is affected), or sensitivity to bright light.**

India -Maldives (hydrology)

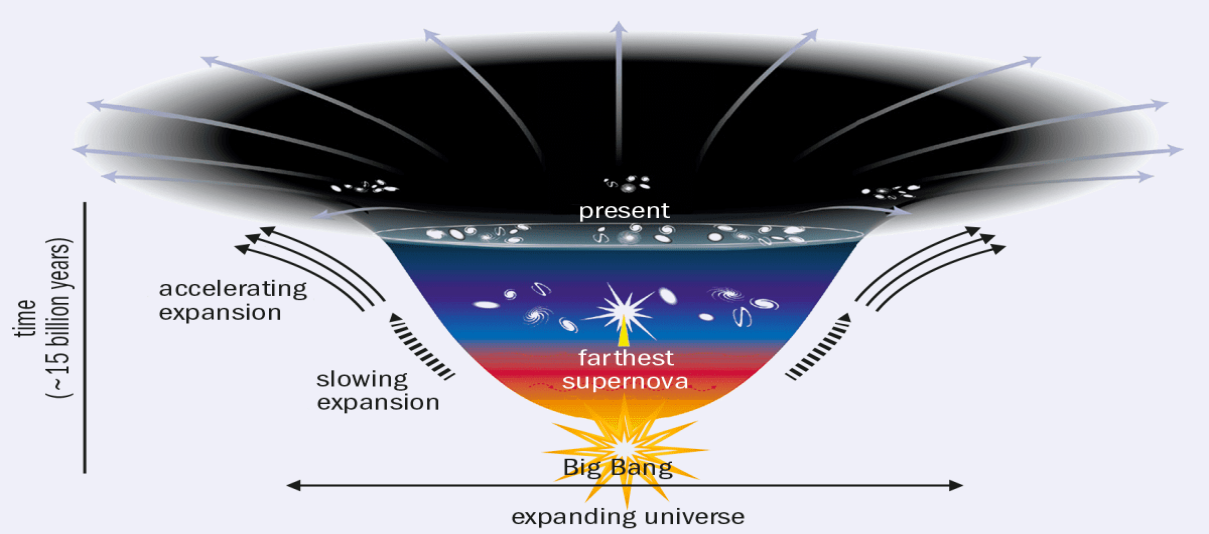
- **the Maldives Cabinet decided against renewing a Memorandum of Understanding (MoU) with India for cooperation in hydrography.**
- **The agreement, which was signed in 2019, is due to expire in 2024**

What is hydrography?

- **It is the science of studying oceans, seas, and other water bodies, by compiling and analysing data, maps, and charts.**
- **Branching off from applied sciences, it looks at measuring and describing the physical attributes of water bodies and predicting how they might change over time.**
- **While it is said to be undertaken primarily for safety of navigation, it also supports other activities, such as economic development, security and defence, scientific research, and environmental protection.**
- **Hydrographical measurements include tidal, current and wave information.**
- **Maldives is a member of the Colombo Security Conclave, an initiative aimed at enhancing Indian Ocean maritime security, that includes India, Sri Lanka, and Mauritius.**
- **However, earlier this month, the Maldives skipped the latest round of the Conclave's NSA-level meet held in Mauritius.**
- **Notably, it coincided with Maldivian Vice-president Hussain Mohamed Latheef's visit to China, to attend the China -Indian Ocean Region Forum on Development Cooperation, where he said the Maldives was "eager to explore novel avenues of collaboration and cooperation with China"**
- **The MEA's response to the termination of the Maldives's joint hydrographic initiative with India, pointed to New Delhi's belief that its neighbours should tap the "benefits" of India's expertise.**

Cosmological constant

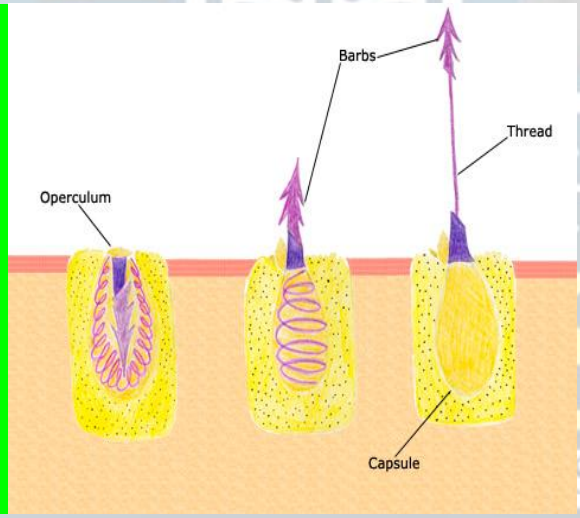
- **Space as Einstein taught us is not a state of "nothingness".**

- **It is a bendable, stretchable medium that we occupy, much like water is for fish. Add energy uniformly across a patch of space and that patch will expand**
- **Dark energy dictates the rate at which space expands.**
- **From this we can estimate how much dark energy is present in any volume of space, by considering the size and age of the universe.**
- **The universe is wider than billions of lightyears and older than 10 billion years, so the dark energy is actually as dilute as one sugar crystal in a cubic kilometre**
- 

What is Cosmological constant??

- **The cosmological constant is presumably an enigmatic form of matter or energy that acts in opposition to gravity and is considered by many physicists to be equivalent to dark energy.**
- **Nobody really knows what the cosmological constant is exactly, but it is required in cosmological equations in order to reconcile theory with our observations of the universe**

- **Nematocyst**
- **Evolution has come up with many strange ways to help animals defend themselves.**
- **One is a specialised cell called a nematocyst.**
- **Nematocysts are found in some animals, but especially jellyfish, corals, sea anemones, and hydras, that serve as potent weapons to hunt prey and fend off predators.**
- **Each nematocyst consists of a capsule containing a coiled, thread-like tubule and a bulbous structure with toxins.**



- **When stressed, the nematocyst rapidly ejects the tubule, often with an acceleration surpassing that of a bullet.**
- **Indeed, this mechanism is one of the fastest processes in the animal kingdom.**
- **Nematocysts play a crucial role in the feeding and defence strategies of cnidarians in particular.**
- **Cnidarians are animals that contain cells called cnidocytes.**

- **When potential prey comes into contact with a cnidocyte, specialised sensory structures on the cell's surface trigger the release of the nematocyst.**
- **The tubule then unfurls, piercing the prey's outer layer or injecting toxins into its body. The toxins in nematocysts also have different effects.**

Climate change and health

- **On December 3, the inaugural Health Day at COP28 highlighted the vital link between climate and health, underscoring that combating climate change is integral to advancing global health.**
- **The context to the day and the urgency to address the root cause of climate crisis fossil fuel use was set in early November with health leaders representing more than 46 million health professionals globally issuing an open letter calling on the COP28**
- **Presidency and world governments to "commit to an accelerated, just and equitable phase-out of fossil fuels as the decisive path to health for all".**
- **Over 1,900 health professionals at this year's COP propelled the momentum to prioritise human health and well-being in climate decisions, taking centre stage.**
- **The COP28 Presidency, WHO, the UAE Ministry of Health and Prevention, and a group of champion countries also hosted the first-ever climate-health ministerial, which brought together nearly 50 Ministers of Health and 110 high- level health ministerial staff.**
- **Ministers of health, environment, finance, and other related sectors set out a**

"roadmap and opportunities for action to address the rapidly growing burden of climate change on healthcare systems and capture the vast socio-economic benefits from better health and well- being through climate action".

- **An assessment of extreme weather events' brought out by Down To Earth magazine and the Centre for Science and Environment, India has seen a disaster nearly every day in the first nine months of this year — from heat and cold waves, cyclones and lightning to heavy rain, floods, and landslides.**
- **These disasters have "claimed 2,923 human lives, affected 1.84 million hectares (ha) of crop area, destroyed over 80,563 houses and killed close to 92,519 livestock".**
- **According to the Reserve Bank of India's most recent report, as much as 4.5% of the country's GDP could be jeopardised by 2030 due to the impact of extreme heat and humidity on labour hours, emphasising the economic risks associated with heat-related challenges alone.**
- **Not to miss India's notoriety on its record on rising air pollution that caused at least 1.6 million premature deaths in 2019.**
- **Major public health challenges, including malaria, malnutrition, and diarrhoea, further compound the situation.**

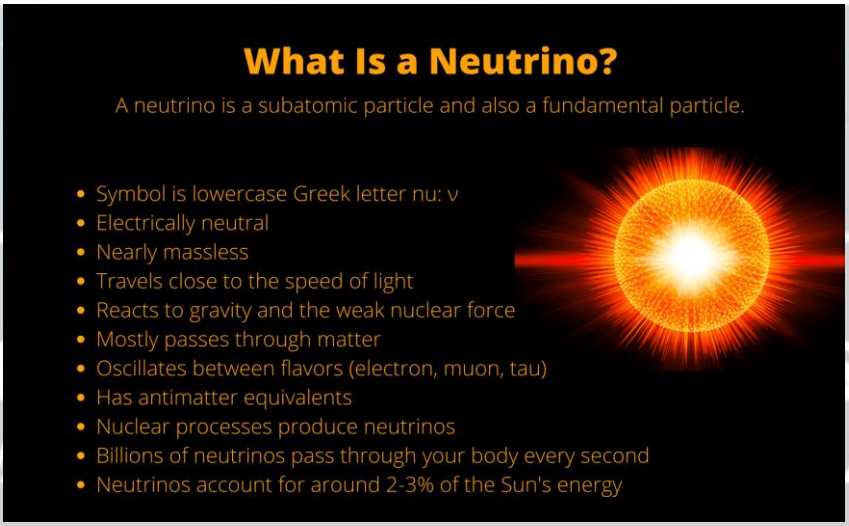
Arecibo message

- **The Arecibo message is an interstellar radio message carrying basic information about humanity and Earth that was sent to the globular cluster Messier 13 in 1974.**

- **It was meant as a demonstration of human technological achievement, rather than a real attempt to enter into a conversation with extraterrestrials. The message was broadcast into space a single time via frequency modulated radio waves at a ceremony to mark the remodeling of the Arecibo Telescope in Puerto Rico on 16 November 1974.**

- **The message was aimed at the current location of M13, about 25,000 light years from Earth, because M13 was a large and relatively close collection of stars that was available in the sky at the time and place of the ceremony**

- **Messier 13 or M13, also designated NGC 6205 and sometimes called the Great Globular Cluster in Hercules or the Hercules Globular Cluster, is a globular cluster of several hundred thousand stars in the constellation of Hercules.**



Geography of Taiwan

- **It runs through the Tropic of Cancer. Also known as Formosa. The island of Formosa (or Taiwan) was formed about 4.5 million years ago from a Geosyncline. It is part of an island arc.**
- **It was formed when the Eurasian Plate slid under an old chain of volcanic islands in the Philippine Mobile Belt.**
- **At the northern end of the island, the Philippine Mobile Belt sank under the Eurasian Plate**
- **Island arcs are those well-known series of islands with volcanoes (such as the Ring of Fire).**
- **They are usually caused by tectonic plate boundaries passing over geologic hot spots in the Earth's crust.**
- **In geology, a hotspot or hot spot is a portion of the Earth's surface which is**

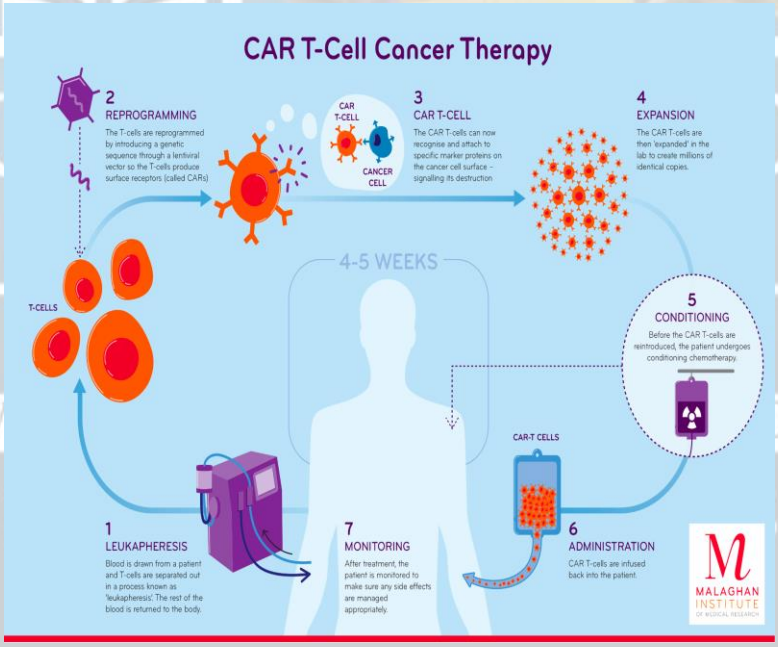
volcanic.

- **This may be caused by a rising mantle plume or some other cause.Hotspots may be far from tectonic plate boundaries.**

CAR-Therapy

- **Chimeric antigen receptor (CAR) T-cell therapy is a way to get immune cells called *T cells* (a type of white blood cell) to fight cancer by changing them in the lab so they can find and destroy cancer cells.**

- **CAR T-cell therapy is also sometimes talked about as a type of *cell-based gene therapy*, because it involves altering the genes inside T cells to help them attack the cancer.**



- **The immune system recognizes foreign substances in the body by finding proteins called *antigens* on the surface of those cells.**

- **Immune cells called *T cells* have their own proteins called *receptors* that attach to foreign antigens and help trigger other parts of the immune system**

to destroy the foreign substance.

- **The relationship between antigens and immune receptors is like a lock and key. Just as a lock can only be opened with the right key, each foreign antigen has a unique immune receptor that is able to bind to it.**
- **In CAR T-cell therapies, T cells are taken from the patient's blood and are changed in the lab by adding a gene for a receptor (called a *chimeric antigen receptor* or *CAR*), which helps the T cells attach to a specific cancer cell antigen.**
- **The CAR T cells are then given back to the patient.**
- **Since different cancers have different antigens, each CAR is made for a specific cancer's antigen**

About Rare Disease

- **Rare diseases are broadly defined as diseases that infrequently occur in a population, and three markers are used the total number of people with the disease, its prevalence, and the availability/non-availability of treatment options.**
- **WHO defines rare disease as having a frequency of less than 6.5-10 per 10,000 people. As per an estimate, there are 7,000 known rare diseases with an estimated 300 million patients in the world; 70 million are in India.**
- **According to the Organization for Rare Diseases India, these include inherited cancers, autoimmune disorders, congenital malformations, Hirschsprung's disease, Gaucher disease, cystic fibrosis, muscular dystrophies and Lysosomal Storage Disorders (LSDs)**

- **There are fundamental challenges in the research and development for the majority of rare diseases as relatively little is known about the pathophysiology or the natural history of these diseases particularly in the Indian context.**

- **Rare diseases are also difficult to research upon as the patient's pool is very small and it often results in inadequate clinical experience.**

- **Availability and accessibility to medicines are also important to reduce morbidity and mortality associated with rare disease.**

Huntington's disease

What is Huntington's disease?

- **Huntington's disease (HD) is an inherited disorder that causes nerve cells (neurons) in parts of the brain to gradually break down and die.**

- **The disease attacks areas of the brain that help to control voluntary (intentional) movement, as well as other areas.**

- **People living with HD develop uncontrollable dance-like movements (chorea) and abnormal body postures, as well as problems with behavior, emotion, thinking, and personality.**

- **For example, uncontrolled movements in the person's fingers, feet, face, or torso.**

- **These movements are signs of chorea.**

- **They can get more intense when the person is nervous or distracted; as HD progresses, the person's movements can become more extreme and obvious.**

Who is more likely to get Huntington's disease?

- **HD is an inherited disorder. It is passed from parent to child through a mutation (a change) in a particular gene.**
- **When a parent has HD, each child has a 50% chance of inheriting the copy of chromosome 4 that carries the HD mutation.**
- **If a child does not inherit the HD mutation, he or she will not develop the disease and cannot pass it on to future generations. When HD occurs without a family history, it is called sporadic HD.**
- **HD is caused by a mutation in the gene for a protein called huntingtin. The defect causes the building blocks of DNA called cytosine, adenine, and guanine (CAG) to repeat many more times than they normally do.**

Glutamine repeats

- **The patient's misfortune is that they carry a mutated version of a gene called HTT. The HTT gene codes for a protein called huntingtin, or Htt.**
- **Nerve cells in the human body require the Htt protein for their normal functioning and survival.**
- **The mutated gene, however, encodes an abnormal Htt protein that instead destroys the neurons that regulate movement, thinking, and memory.**
- **The normal HTT gene contains a stretch of DNA that specifies the number of times the amino acid glutamine is repeated in the Htt protein.**
- **This number varies from 11 to 31. In the mutant versions of the HTT gene, this stretch is expanded to encode 35 or more repeats. Researchers have even**

found variants with more than 150 repeats.

- **The team investigated 32 genes and found that excessive expression or overexpression of one, called Yod1, removed all of the disease- like effects in the flies, including the neurodegeneration, impediments to motor activity, and lower viability and longevity.**

Climate milestone in 2023

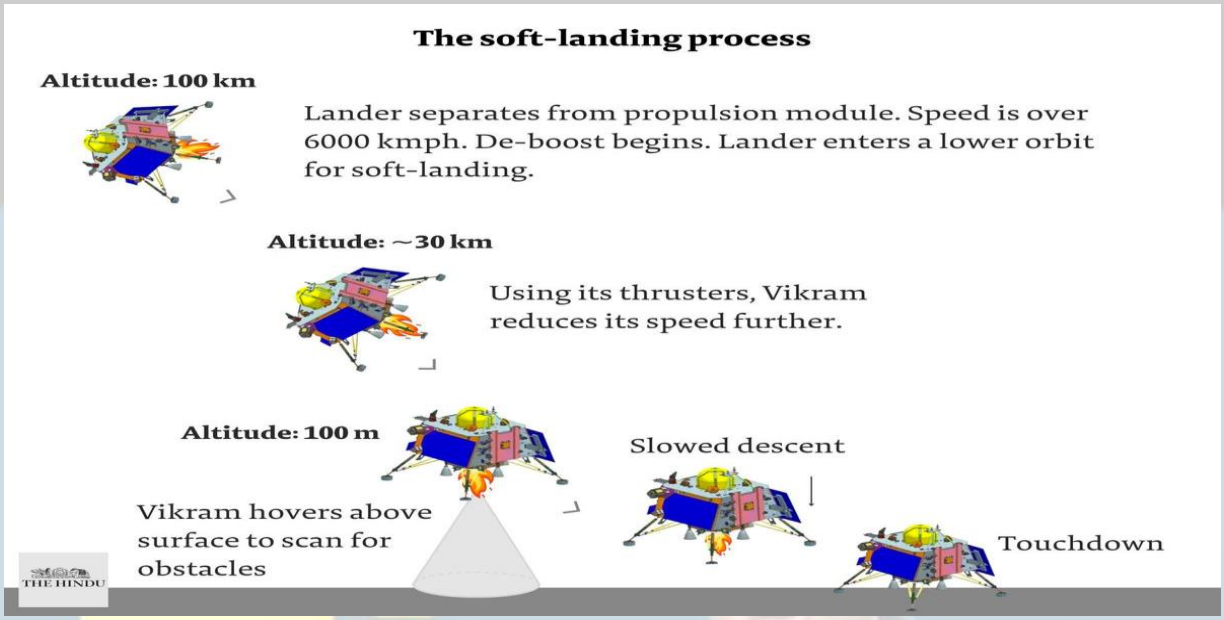
- **Hottest year: The year is all but set to be declared the hottest in history.**
- **Highest sea surface temperature ever: Marine heat waves - periods when ocean temperatures are warmer than 90% of prior observations for a given time of year - were widespread in 2023.**
- **Lowest Antarctic sea ice extent: Sea-ice extent is the area of ice covering the Antarctic Ocean at a given time.**
- **Record carbon dioxide levels: Global carbon dioxide emissions are expected to have hit a new high in 2023, up 1.1% from 2022.**
- **Loss and damage fund: The world's first loss and damage fund for the impacts of climate change was created in 2023, at the start of the COP28 climate talks in the U.A.E. in early December**

Impact of food systems:

- **For the first time in the history of climate summits, 134 countries at COP28 pledged to tackle the climate impact of the food industry. These countries represent over 5.7 billion people, 70% of the food we eat, nearly 500 million farmers, and 76% of total emissions from the global food system.**

Smart Lander for Investigating Moon (SLIM)

- **Japan's Smart Lander for Investigating Moon (SLIM) spacecraft entered into orbit around the moon after a month-long journey, and ahead of its planned moon- landing attempt on January 19. If the attempt succeeds, Japan will become only the fifth country to soft-land a robotic craft on the natural satellite, months after India succeeded with its Chandrayaan -3 mission in August**



What is SLIM?

- **SLIM is a spacecraft built and launched by the Japan Aerospace Exploration Agency (JAXA) on September 7, 2023, from the Tanegashima spaceport.**
- **It weighed only 590 kg at launch, which is almost one -seventh of Chandrayaan-3, which weighed 3,900 kg at launch. Of course, the latter mission also carried a larger suite of instruments.**
- **SLIM was launched together with XRISM, a next generation X-ray space telescope, onboard an H-2A rocket.**
- **The HAKUTO-R M1 lander, built by Japanese company ispace, crashed in late April after its engines shut down too soon during the landing.**

How did SLIM get to the moon?

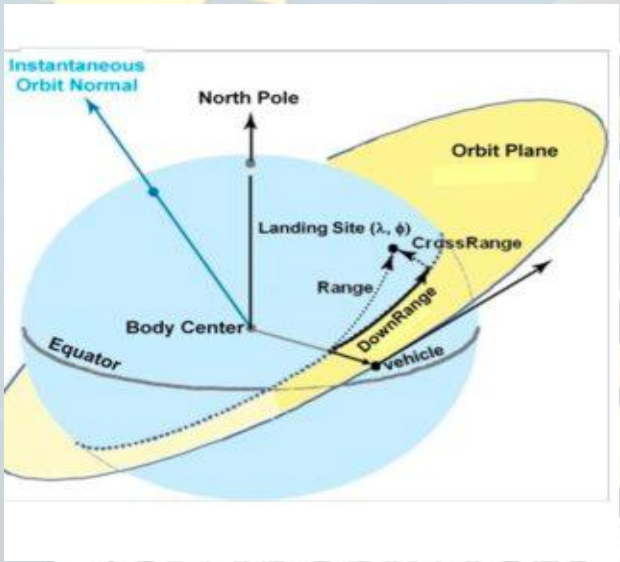
- **SLIM is lighter because it carried much less fuel. Of Chandrayaan-3's 3.9 tonnes, the propulsion module alone weighed 2.1 tonnes.**

- **This is why the mission was launched on July 14 and could reach the moon less than a month later, by following a route called the Hohmann transfer orbit.**
- **On the other hand, SLIM took four months because it followed a longer but more fuel thrifty route based on weak stability boundary theory.**
- **Once it was launched into an orbit around the earth, SLIM swung around the planet multiple times, building up its kinetic energy with each swing.**
- **Once it was travelling fast enough, it shot up towards the moon's orbit.**
- **Chandrayaan-3 followed a qualitatively similar path until this point.**
- **Once it got close to the moon, Chandrayaan-3 applied its brakes – which consume fuel in space so that it could slow down enough to be captured by the moon's weaker gravity.**
- **But once SLIM got near the moon, instead of slowing down and being captured by the moon's gravity, it allowed itself to be deflected in the moon's direction even as it shot past lunar orbit, deeper into space**
- **This deflection is the result of the combined forces exerted by the earth and the moon. Physicists worked it out in the late 1980s for another JAXA mission, called 'Hiten'.**
- **What will SLIM do on the moon?**
- **All this said SLIM's standout feature is its reputation as the "moon sniper" a title derived from what it will do on the moon on January 19: it will try to land within 100 metres of its chosen landing site.**
- **This is an unusually tight limit given the history of moon-landing missions.**

- **For example, the 'Vikram' lander of Chandrayaan-3 was designed to descend in an elliptical area that was 4 km long downrange and 2.5 km wide cross-range, and it eventually landed at a spot 350 metres away from a predetermined one.**

- **(Downrange means in the direction of the craft's motion and cross range means to either side.**

- **In effect, these distances specify how much the craft's path can deviate in these two directions.)**



Benefit for India

- **The first mission of its third phase is the Lunar Polar Exploration (LUPEX) mission, a.k.a. Chandrayaan 4.**

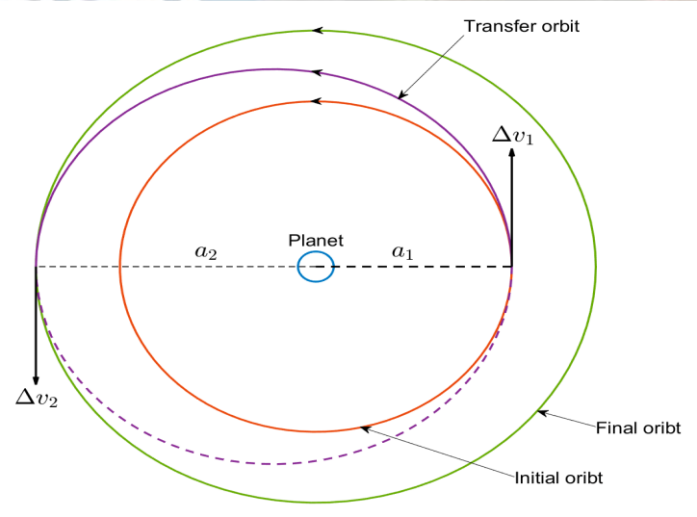
- **LUPEX will be an Indian- Japan joint enterprise (however, while JAXA has approved LUPEX, India is yet to) with an earliest launch date in 2026. It will explore an area closer to the moon's south pole than Chandrayaan-3 did and this makes all the difference.**

- **The technologies JAXA will test with SLIM, but especially a feature matching algorithm and navigation systems, will be crucial for this aspect of LUPEX.**

- **For now, JAXA is expected to provide the launch vehicle and the lunar rover while India will provide the lander module**

The Hohmann transfer orbit

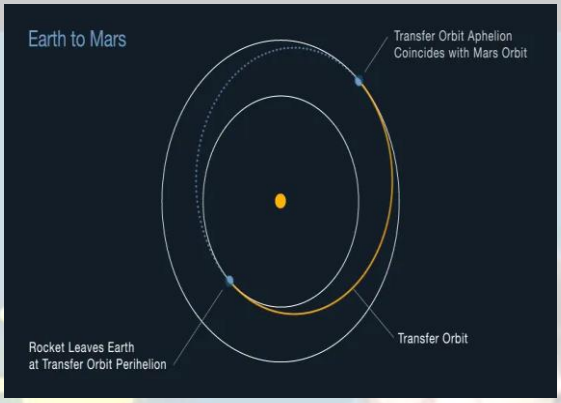
- **the Hohmann transfer orbit is an orbital maneuver used to transfer a spacecraft between two orbits of different altitudes around a central body. Examples would be used for travel between low Earth orbit and the Moon, or another solar planet or asteroid.**



Hohmann Transfer Orbits

- **To launch a spacecraft from Earth to an outer planet such as Mars using the least propellant possible, first consider that the spacecraft is already in solar orbit as it sits on the launch pad. This existing solar orbit must be adjusted to cause it to take the spacecraft to Mars: The desired orbit's perihelion (closest approach to the Sun) will be at the distance of Earth's orbit, and the aphelion (farthest distance from the Sun) will be at the distance of Mars'**

orbit. This is called a Hohmann Transfer orbit. The portion of the solar orbit that takes the spacecraft from Earth to Mars is called its trajectory.



Houthi attack and trade in Red sea

- **Liberian- flagged merchant vessel Chem Pluto heading to Mangalore port was hit by a projectile about 271 miles from Porbandar in Gujarat, just outside the Indian Exclusive Economic Zone (EEZ).**
- **This comes in the backdrop of a sharp rise in missile and drone attacks on commercial shipping in the Red Sea by Houthi rebels in Yemen in the last couple of weeks following Israel's offensive against Hamas in Gaza.**

How do these events impact India and the world?

- **Threats to shipping in the Gulf of Aden and the region are not new as seen with episodes of Somalian pirates and the global anti-piracy efforts by several countries.**
- **However, the recent events represent a serious escalation that can potentially disrupt supply chains and impact economics.**
- **The Red Sea is a key shipping artery for global commerce and the Bab el-Mandeb is a critical choke point.**
- **Following the October 7 terror attacks on Israel by Hamas and the subsequent offensive by Israeli Defence Forces, the Houthi rebels have declared they would target all maritime commerce linked to Israel.**
- **"About 12% of global trade passes through the Red Sea, which accounts for billions of dollars of goods and about 30% of the world's container shipping.**
- **Access to the Red Sea requires passage through the Bab el- Mandeb a narrow strait about 20 miles wide with Djibouti to the west and Yemen to the east,"**

- **Following the attacks, several global shipping majors have announced their decision to avoid the route and take a longer route through the Southern Indian Ocean adding to both fuel and operating costs in addition to the time.**
- **For instance, shipping industry giant Maersk had begun re-routing vessels around Africa via the Cape of Good Hope.**
- **The avoidance of the Red Sea route has substantial implications, potentially adding one to two weeks to voyages, disrupting shipping schedules, and subsequently elevating fuel and insurance costs,"**

What is being done to address this?

- **To counter the attacks and protect the free flow of commerce in the Red Sea, on December 18, U.S. Secretary of Defence Lloyd J. Austin announced the establishment of Operation Prosperity Guardian (OPS), an "important new multinational security initiative under the umbrella of the Combined Maritime Forces and the leadership of its Task Force 153, which focuses on security in the Red Sea."**
- **Since the announcement of OPS, several companies in the last few days**

announced their decisions to review the re-routing. From the Indian side, both the Navy and Coast Guard have increased their presence and surveillance in the region.

- **Since October 2008, the Indian Navy has continuously deployed at least one ship on anti-piracy patrol in the Gulf of Aden and since 2017 under Mission Based Deployments has deployed one capital warship each at all the critical maritime choke points into the IOR. Indian Navy's Information Fusion Centre for Indian Ocean Region (IFC-IOR) located in Gurugram is actively monitoring the region and coordination in the back end to facilitate communication where required, like between the Navy and the company when m. v. Ruen was hijacked recently in the Gulf of Aden.**

Variant vs strain

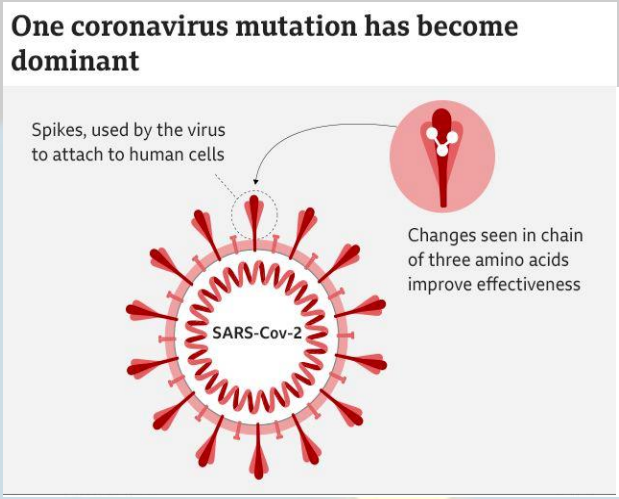
- **What causes the coronavirus to mutate, and how is its spike protein involved?**

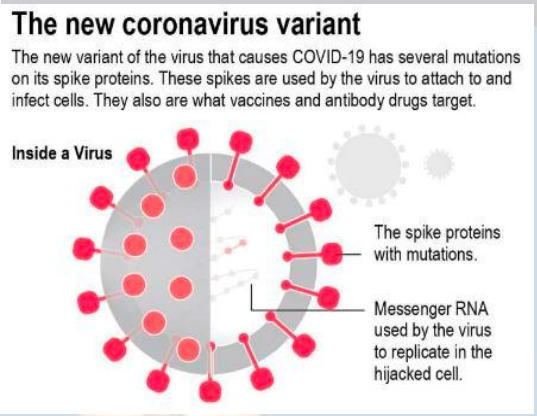
- **The spike (S) protein is one of the key biological characteristics of Sars-CoV-2.**

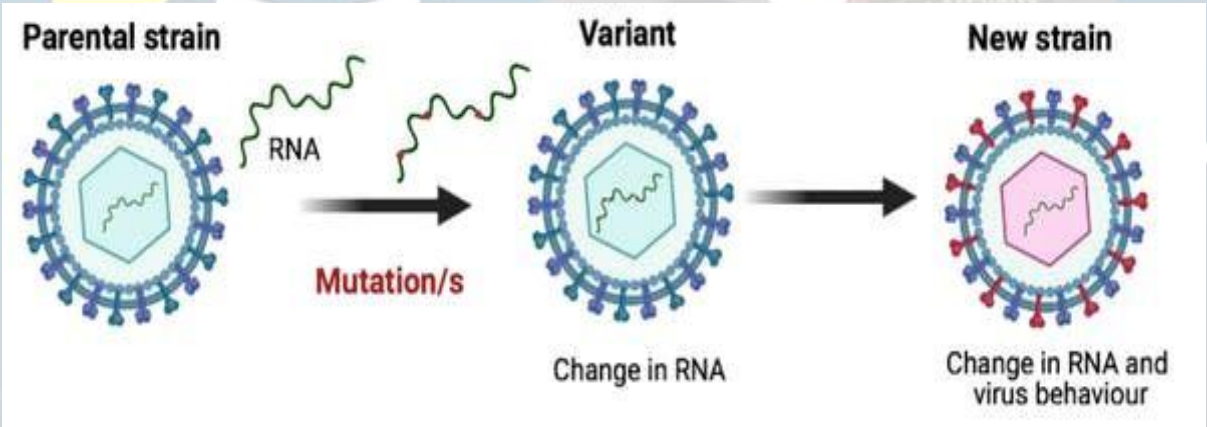
- **This protein allows the virus to penetrate into the cells of its host (human beings) and cause the infection.**

- **This means that without the S protein, the virus would not be able to infect human beings, and so, this is a protein that is of interest to scientists making**

vaccines and anti-viral drugs







Disaster relief

Disaster management

Prevention – Preparedness (Pre-disaster phase)	Response- Intervention (Disaster)	Restoration - Recovery (Post-disaster phase)
• Strengthening research capacity • Hazard - vulnerability assessment • Risk assessment • Vulnerability reduction • Compilation of regulations – codes • Spatial planning – urban planning • Institutional framework • Financial resources • Strengthening resources and means • Volunteers education and training • Education – informing general public • Communication planning – media • Compilation of operational plans • Table-top exercises • Field training exercises • Strengthening preparedness	• Decision making system – mobilization • Coordination of involved authorities • Communications • Assessment of extent of disaster impact • Search and rescue operations • First-aid treatment and medical care • Immediate care of injuries • Mitigation of damage induced by geodynamic phenomena • Evaluation of aftershock sequence and related phenomena • Informing affected population – media • Volunteers coordination and cooperation • International assistance	• Relief measures • Temporary housing • Social support • Financial assistance to the affected population • Informing affected population • Control of rumor diffusion • Reopening of public services • Management of public health issues • Psychological support of affected population • Proposals for interventions • Actions for special sectors (industry, tourism, environment) • Evaluation of actions – improvement of operational plans • Insurance against earthquakes and natural disasters

State governments design, develop and deliver disaster response and assistance programs within their own jurisdictions. In doing so, they establish the financial assistance criteria they consider appropriate for response and recovery.

Finance assistance are intended to support the provinces in:

- **Providing or reinstating the necessities of life to individuals, including help to repair and restore damaged homes; re-establishing or maintaining the viability of small businesses and working farms; repairing, rebuilding and restoring public works and the essential community services specified in these Guidelines to their pre-disaster capabilities; and funding limited mitigation measures to reduce the future vulnerability of repaired or replaced infrastructure.**

15th Finance commission

- **Disaster risk management: The Commission recommended retaining the existing cost-sharing patterns between the centre and states for disaster management funds.**

- **The cost-sharing pattern between centre and states is: (i) 90:10 for north-eastern and Himalayan states, and (ii) 75:25 for all other states. State disaster management funds will have a corpus of Rs 1.6 lakh crore (centre's share is Rs 1.2 lakh crore).**

As per Finance minister

- **The central government does not declare any natural disaster a national disaster. It is only after an assessment by its team that any natural disaster is classified as a disaster of severe nature as seen in the 2013 floods in Uttarakhand and 2018 floods in Kerala.**
- **In such a case, there is additional financial assistance from the National Disaster Response Fund (NDRF).**
- **So, there is no question of calling the floods in Tamil Nadu as a "national disaster". The central government should ensure clear guidelines when it comes to relief. It should also consider revising its position on excluding long term or permanent restoration works from the ambit of the SDRF/NDRF.**

Raj mudra of Shivaji

- **The Navy unveiled the new design of epaulettes for admirals, with the octagon in the new design drawn from the naval ensign and inspired by rajmudra of Chhatrapati Shivaji.**
- **The Navy said the new design is a "true reflection of our rich maritime**

heritage".

- **The new epaulettes have the golden Navy button top, followed by an octagon, an Indian sword and a telescope crossed, followed by stars indicating the ranks.**

Rajmudra of Shivaji

- **After the Muslim invasion of India, the Rajmudra were mostly made in Arabic, Persian or Urdu languages.**
- **But when Shivaji Maharaj founded the Hindu Empire, then after many years for the first time he made his Rajmudra which was in Sanskrit.**
- **Chhatrapati Shivaji Maharaja's Rajmudra and Sanskrit verses inscribed on Rajmudra**
- **The Sanskrit verse on the Rajmudra of Chhatrapati Shivaji**
- ***प्रतिपच्चन्द्रलेखेव वर्धिष्णुर्विश्ववन्दिता।***
- ***शाहसूनोः शिवस्यैषा मुद्रा भद्राय राजते॥***
- 

- **There are four parts in the Rajmudra.**

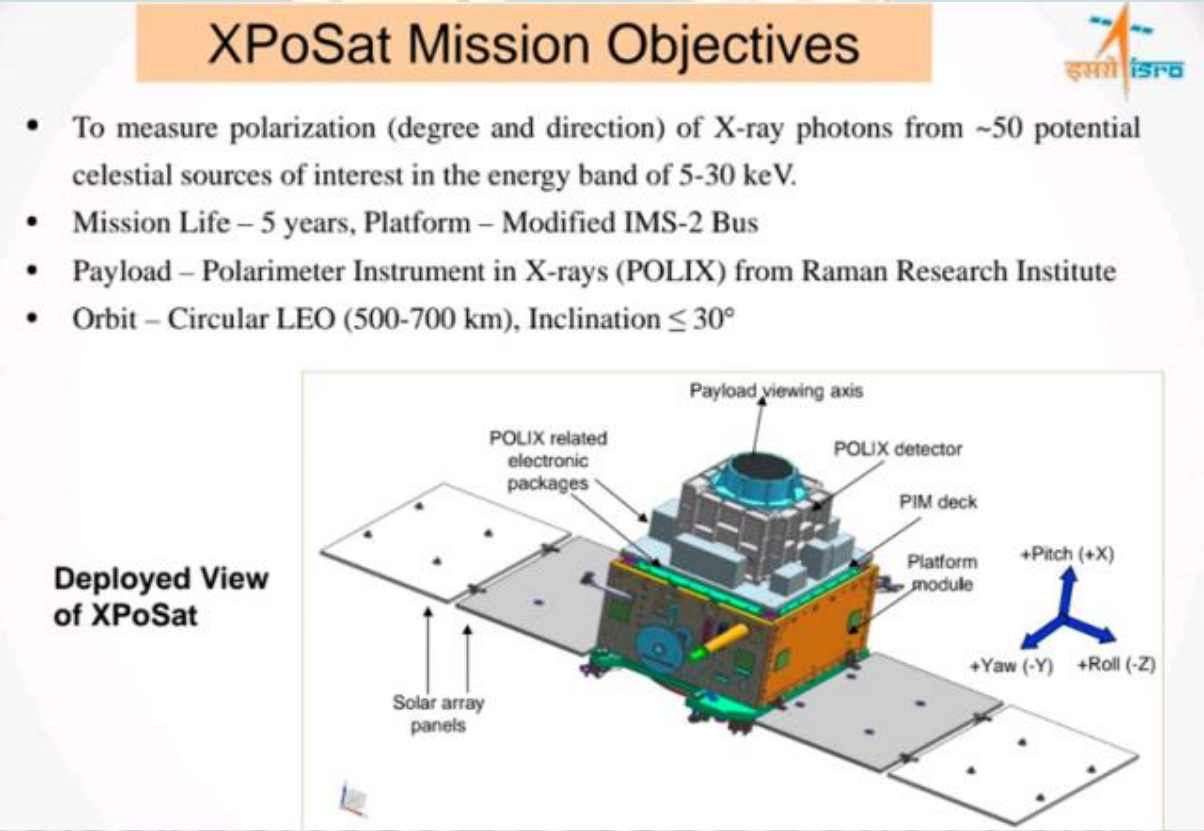
- **1. प्रतिपच्चन्द्रलेखा इव वर्धिष्णुः Pratipachchandralekha Eva Vardishnu:**
- **Ascending like the moon after new moon day**
- **2. विश्ववन्दिता Vishvavandita**
- **worshipped by the world. (That is, whom the whole world has worshipped.)**
- **3. शाहसूनोः शिवस्य Shahasuno: Shivasya**
- **Shahaji's son Shivaji's**
- **4. एषा मुद्रा भद्राय राजते Esha Mudra Bhadraya Rajate.**
- **This mudra (Rajmudra) is for welfare. (That is, for the welfare of the people.)**

  Public welfare
- **Rajmudra says – Mudra Bhadraya Rajate.**
- **That is, this Rajmudra is for public welfare.**
- **This is a very revolutionary idea. Because that was the period when the Sultans of different places used to oppress the subjects.**
- **No one else imagined that a king's kingdom should be for the welfare of the subjects.**

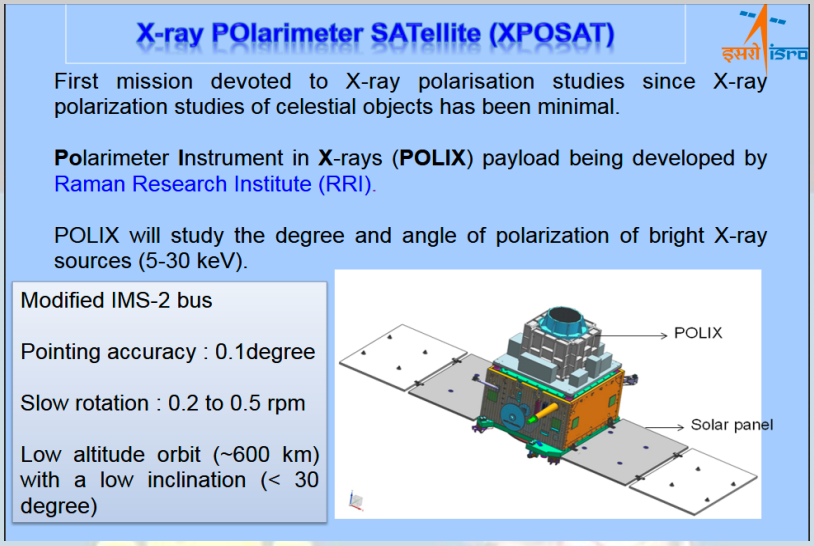
XPoSat

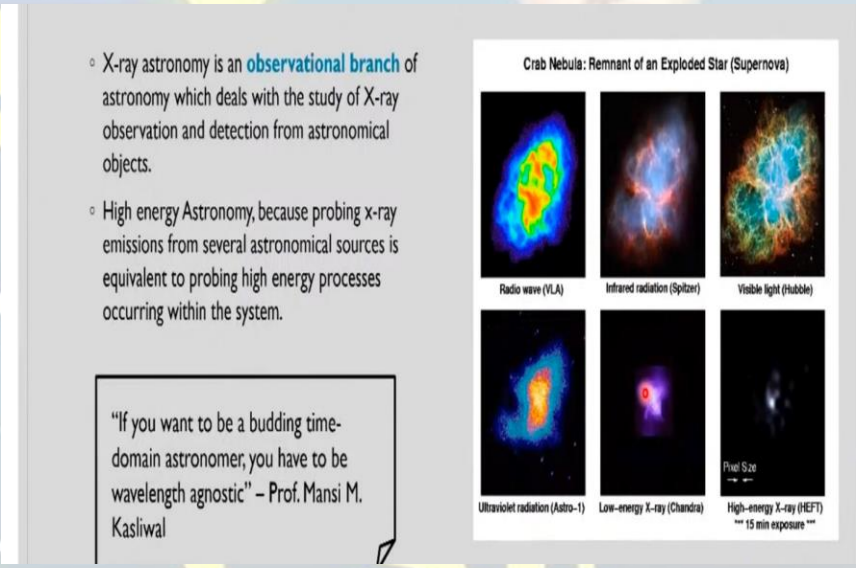
- **The Indian Space Research Organisation has announced a plan to launch its first X-ray Polarimeter Satellite (XPoSat) to investigate the polarisation of intense X-ray sources.**

- **The ISRO said that while space- based X-ray astronomy had been established in India focusing on imaging, time -domain studies, and spectroscopy, the XPoSat mission marked a major value addition.**



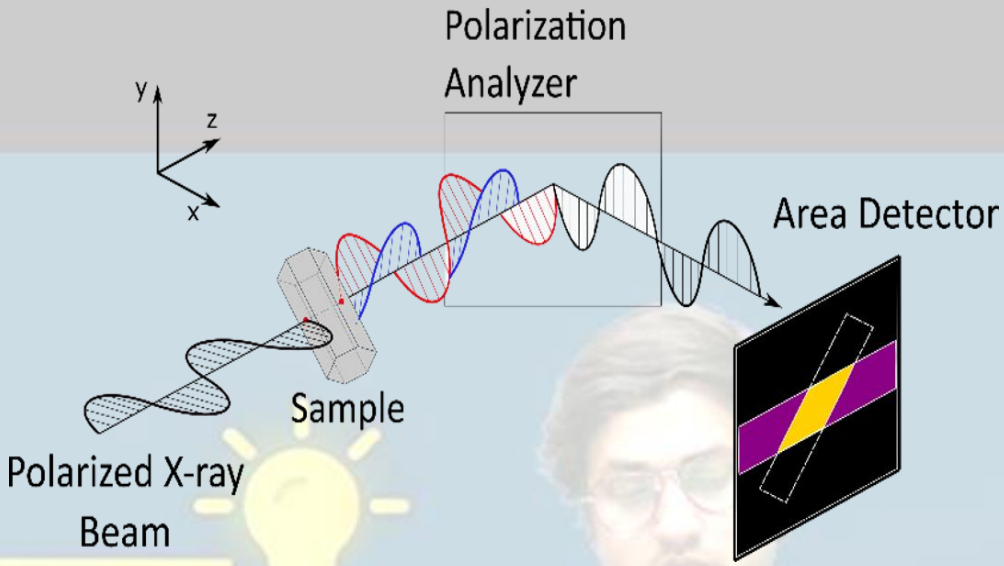
- **The satellite will be launched by the Polar Satellite Launch Vehicle**

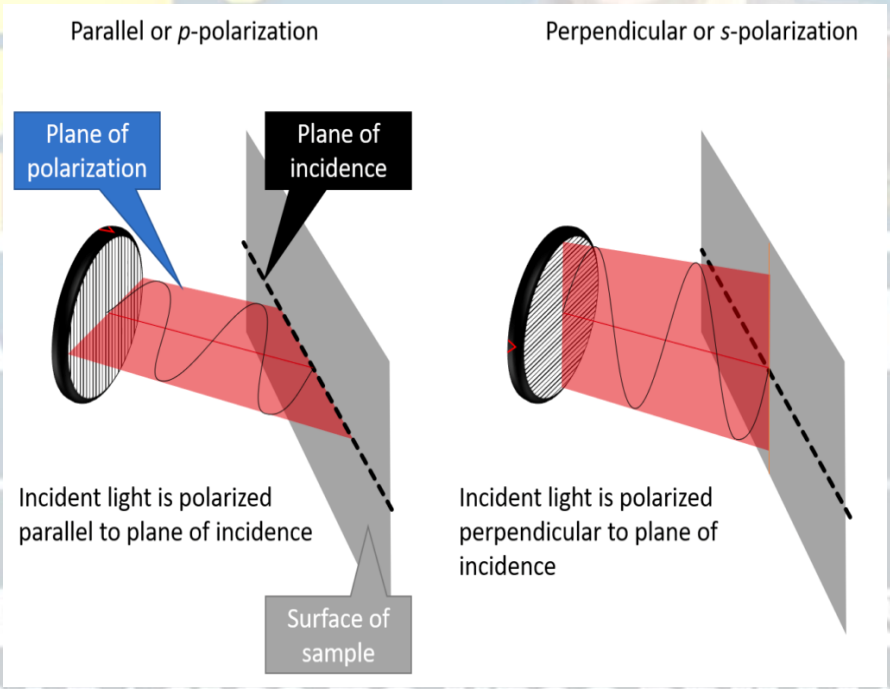




What is polarisation of light?

- Polarization: A light wave that is vibrating in more than one plane is referred to as unpolarized light.
- Polarized light waves are light waves in which the vibrations occur in a single plane.
- The process of tiant forming unpolarized light into polarized light is known as polarization.





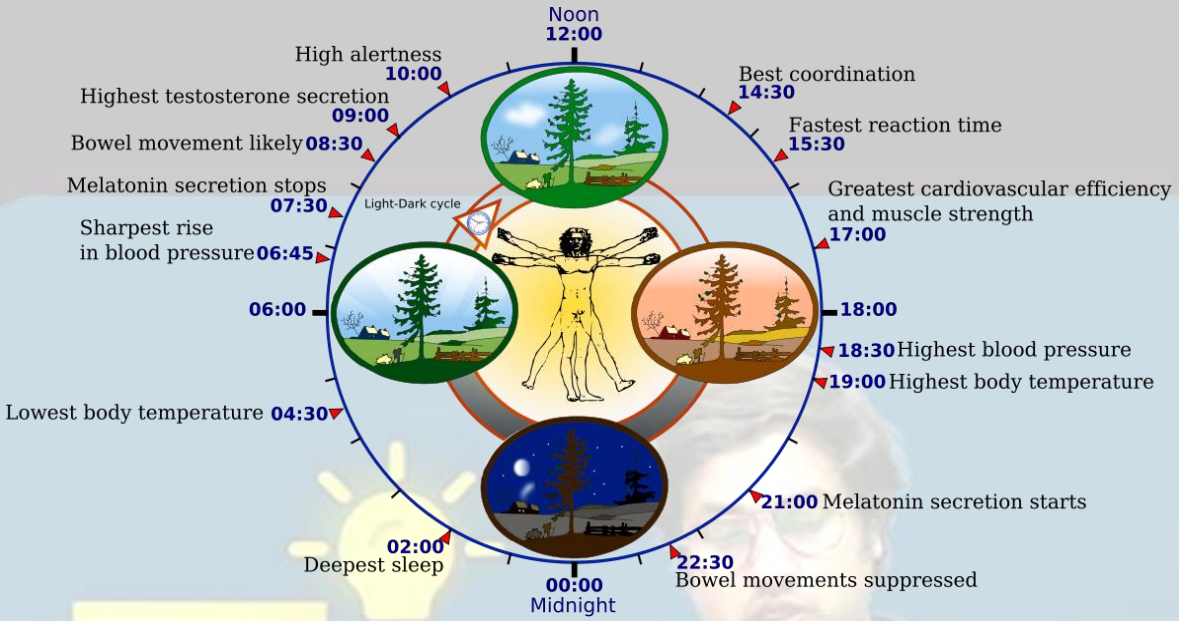
- **The XPoSat is designed for observation from a low earth orbit (non-sun synchronous orbit of 650-km altitude, low inclination of approximately six degrees) and will carry two scientific payloads.**
- **With these two payloads, the mission is capable of simultaneous studies of temporal, spectral, and polarisation features of the bright X-ray sources.**
- **The mission objectives include the measurement of X-ray polarisation in the energy band of 8-30 keV emanating from X-ray sources and long-term**

spectral and temporal studies of cosmic X-ray sources in the energy band of 0.8-15 keV. The mission life is expected to be approximately five years.

- **The primary payload, POLIX (Polarimeter Instrument in X-rays), is designed to measure polarimetry parameters, specifically the degree and angle of polarisation, in the medium X-ray energy range of 8-30 keV photons originating from astronomical sources.**
- **The secondary payload is the XSPECT (X-ray Spectroscopy and Timing) payload, which will provide spectroscopic information within the energy range of 0.8-15 keV.**

Internal clock

- **Ambient light does not only allow us to see, it also influences our sleep -wake rhythm.**
- **A study in mice in 2019 suggested that yellowish light has a stronger influence on the internal clock than bluish light.**
- **In humans, the main effect of light on the internal clock and sleep is probably mediated via the light- sensitive ganglion cells.**
- **To understand the effects of the different light stimuli on humans, in the sleep laboratory the researchers determined whether the internal clock of the participants had changed depending on the colour of the light.**
- **The study found that the human circadian clock is relatively insensitive to shifts in light colour towards warmer colour temperatures at constant melanopic illumination.**
- **Melanopic illuminance defines the magnitude of human circadian light responses under a wide range of conditions.**



India position in war front

India's position

- **India's positions, which are largely aligned with those of the Global South, are driven by both its specific interests and the larger trends it sees in the global dynamics.**
- **In the case of Ukraine, it condemned the war and called for talks and a ceasefire without naming any party.**
- **Even under heavy pressure, it was careful not to let the crisis affect its multifaceted strategic partnership with Russia.**
- **In the case of Gaza, it repeatedly condemned the Hamas attack on Israel, an important bilateral partner, while also reiterating its traditional position in support of the two- state solution.**

India joined the global chorus calling for a ceasefire.

- **The U.S. seems less in control of the geopolitical developments unfolding in its spheres of interests Europe and West Asia.**
- **Its efforts to weaken Russia are not rewarding and it is unable to control a vengeful Israel, which is affecting its reputation in the Arab World, and the Global South in general.**
- **China is focused on its immediate periphery and is wary of risks. Russia is the weakest among the three great powers.**
- **So India, itself a strong proponent of a multipolar world, sees the global order in flux.**
- **It appears to be careful not to align with any great power, while maximising its interest through multi- engagement and trying to be a voice of the Global South.**