

## CURRENT AFFAIRS

THE BEST MAGAZINE FOR GEOGRAPHY, ENVIRONMENT AND SCIENCE CURRENT AFFAIRS

**INS VIKRANT**  
**REBORN**  
India's First Indigenously-Built Aircraft Carrier

**VITAL STATS**

- Cost: ₹20,000 Crore
- Weight: 45,000 tonnes
- Length: 262 metres
- Width: 62 metres
- Top Speed: 28 knots
- Compartments: 2,300
- Crew Strength: 1,700

**AIR POWER TO BE DEPLOYED**

- MiG-29K Fighter Jets
- Kamov-31 Helicopters
- MH-60R Multi-role Helicopters

**DID YOU KNOW?**

- Flight deck is the size of two football grounds
- 8 power generators enough to light up Kochi city

**TOP FEATURES**

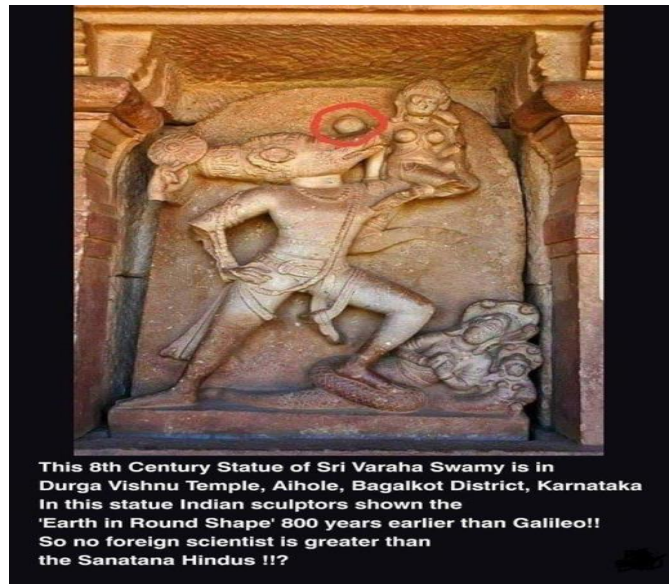
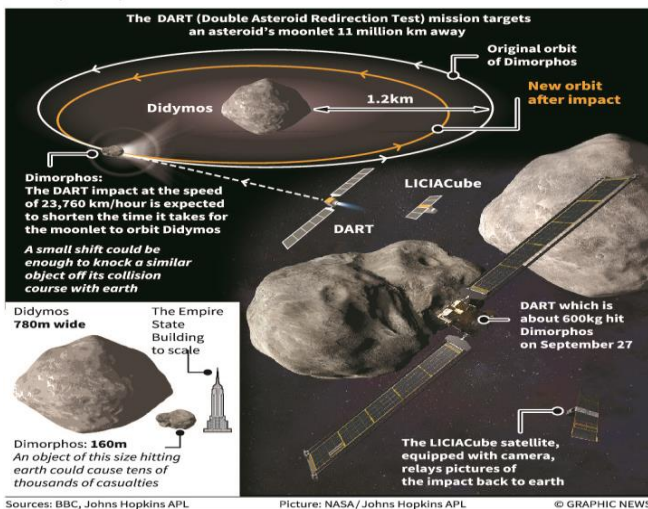
- First aircraft carrier to be constructed in India
- Largest warship to be built in India
- Has capacity to operate 30 aircraft
- 15 decks, multi-speciality hospital, pool
- Specialised cabins for women officers



THE HINDU

### Ready, set, crash!

NASA's DART spacecraft collided with the space rock Dimorphos (which orbits around Didymos, the primary asteroid) and has therefore, deflected the trajectory of the pair of space rocks



Presented by

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Wireless communications networks and Science and Technology

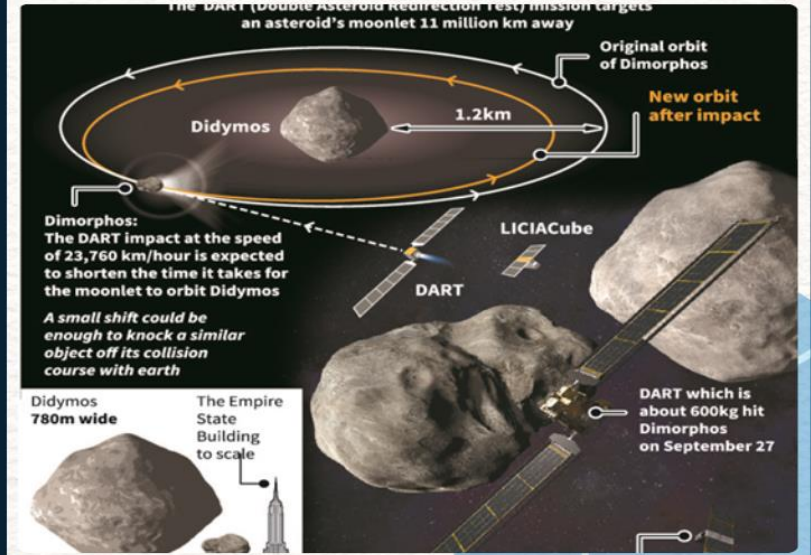
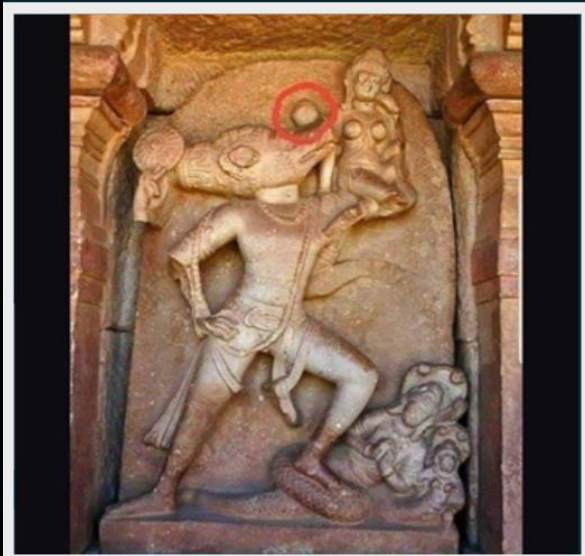
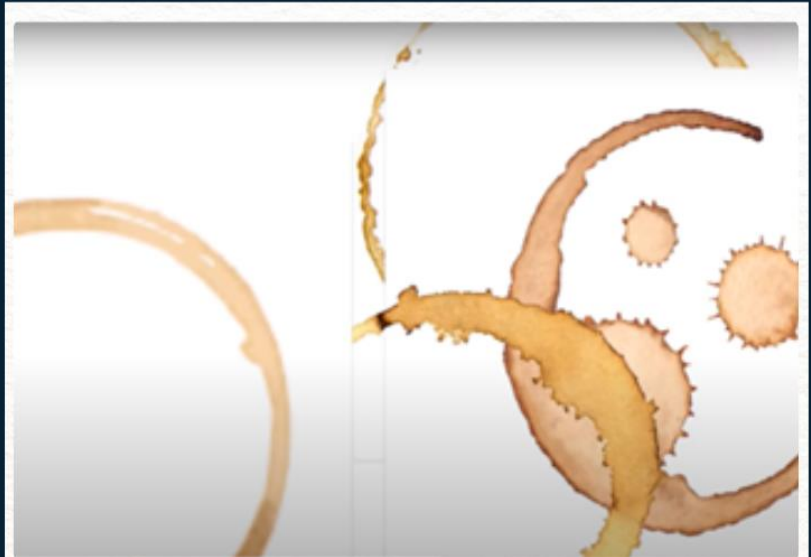
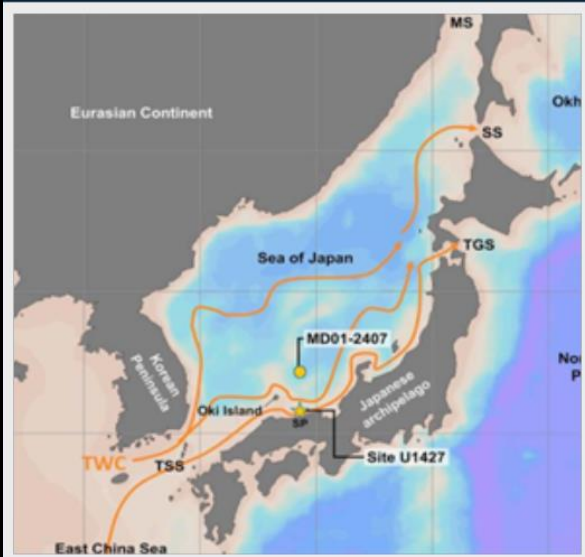
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SEPTEMBER  
2022

# CURRENT AFFAIRS GES REPORTER

The best magazine for Geography,  
Environment and Science Current Affairs





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## Ban on single use plastic

Since July 1, 2022, India has banned the manufacture, import, stocking, distribution, sale, and use of single-use plastic (SUP) items with low utility and high littering potential.

- India is a party to the United Nations Environment Assembly (UNEA)

### Why are single-use plastics harmful?

- The purpose of single-use plastics is to use them once or for a short period of time before disposing of them.
- Plastic waste has drastic impacts on the environment and human health.
- There is a greater likelihood of single-use plastic products ending up in the sea than reusable ones

### What is the impact on the environment?

- Littered single-use plastic items have an adverse effect on both terrestrial and aquatic ecosystems.
- All countries face a major environmental challenge due to pollution caused by single-use plastic items.
- India piloted a resolution on single-use plastics pollution at the 4th United Nations Environment Assembly in 2019, recognizing the urgent need for the global community to address this issue.
- India is not the first country to ban single-use plastics.
- Bangladesh became the first country to ban thin plastic bags in 2002; New Zealand banned plastic bags in July 2019.
- China had issued a ban on plastic bags in 2020 with a phased implementation.
- As of July 2019, 68 countries have plastic bag bans with varying degrees of enforcement

### What are the plastic waste management rules in India?

- With effect from September 30, 2021, the Plastic Waste Management Amendment Rules, 2021, prohibited the manufacture, import, stocking, distribution, sale, and use of plastic carry bags whose thickness is less than 75 microns.
- From December 31, 2022, plastic carry bags whose thickness is less than 120 microns will be banned.
- It means that the ban does not cover all plastic bags; however, it requires the manufacturers to produce plastic bags thicker than 75 microns which was earlier 50 microns
- The notification clearly mentioned that plastic or PVC banners/ hoardings should have more than 100 microns in thickness and non-woven plastic (polypropylene) must be more than 60 GSM (grams per square meter).
- Non-woven plastic bags have a cloth-like texture but are counted among plastics. Still, plastic or PET bottles, counted among the most recyclable types of plastic, have been left out of the scope of

the ban.

- In addition, the Indian government has taken steps to promote innovation and create an ecosystem for accelerated adoption and availability of alternatives across the country
- To ensure the effective enforcement of the ban, national and State-level control rooms will be established, as well as special enforcement teams for the purpose of checking the illegal sale and use of single-use plastics.
- To prevent the movement of banned single-use plastic items between States and Union Territories, border checkpoints have been established.
- In an effort to empower citizens to help curb the plastic menace, the Central Pollution Control Board (CPCB) has launched a grievance redressal application.
- The Government has been taking measures for awareness generation towards the elimination of single-use plastics
- The awareness campaign has brought together entrepreneurs and start-ups, industry, Central, State and local Governments, regulatory bodies, experts, citizen organizations, R&D and academic institutions.

#### What is the role of the manufacturer?

- In addition, the Ministry of Environment, Forests, and Climate Change notified the Plastic Waste Management Amendment Rules, 2022 on February 16, 2022. Extended Producer Responsibility (EPR) is the responsibility of a producer for the environmentally sound management of the product until the end of its life.
- The guidelines provide a framework to strengthen the circular economy of plastic packaging waste, promote the development of new alternatives to plastic packaging and provide the next steps for moving towards sustainable plastic packaging by businesses.
- Now the challenge is to see how the local level authorities will enforce the ban in accordance with the guidelines.
- Banned items such as earbuds with plastic sticks, plastic sticks for balloons, etc., are non-branded items and it is difficult to find out who the manufacturer is and who is accountable for selling because these items will be available in the market even after the issuing of guidelines.

## Women participation in STEM

- The Government of India has been ramping up efforts to remove gender inequality by providing incentives for women's higher education.
- Some of these initiatives such as the Gender Advancement for Transforming Institutions (GATI), i.e., a pilot project under the Department of Science and Technology to promote gender equity in science and technology, and Knowledge Involvement in Research Advancement through Nurturing (KIRAN), i.e., a plan under the Department of Science and Technology again to encourage women scientists in science and technology and also preventing women scientists from giving up research due to family reasons, are noteworthy.
- Some institutions are setting up creches so that the scientist mothers can carry on with their research work uninterrupted
- According to available UNESCO data on some selected countries, India is at the lowest position, having only 14% female researchers working in STEM areas. But India is not very far behind many advanced countries in this aspect.
- For example, Japan has only 16% female researchers, the Netherlands 26%, the United States 27% and the United Kingdom 39%
- In India, about 43% of women constitute the graduate population in STEM, which is one of the highest in the world, but there is a downside to this; only 14% of women join academic institutions and universities.
- Although male and female participation in graduate studies is comparable, the participation of women in research has dropped significantly (27% female as compared to 73% male).
- Thus, the visibility of female faculty in universities and research institutes is significantly lower
- According to a report published recently, at most STEM institutes, women occupy 20% of all professorial positions
- The number of women in senior management positions in the corporate sector in India is 39%, which is higher than the global average.
- Number of women CEOs in Fortune 500 companies is 15% while female board members in the management of private enterprises has been growing from 15% (2016), 16.9% (2018) to 19.7% in 2022
- Encouraging the participation of women in the workforce in the private sector with the adoption of various schemes for women began long ago when compared to the initiatives taken by the Government of India in recent years.
- Various schemes such as flexi-hour work time, rejoining the workforce after an interim break, sections operated only by women, etc. were introduced in private enterprises as early as the 1990s

with the benefits being reaped now

## INS VIKRANT



- India commissioned its first indigenously designed and built aircraft carrier, INS Vikrant, and joined a small group of countries which include the U.S., the U.K., Russia, France and China, that have the capability to design and build carriers with a displacement of over 40,000 tonnes.

- What India has demonstrated is the capacity to develop a carrier although it has been operating these ships for over 60 years.
- It took 17 years from the time the steel was cut and around ₹20,000 crore to make Vikrant a reality
- the new aircraft carrier is a sign of India's expanding atmanirbhar bharta or self-reliance in defence
- The Indian Navy's ambition is to have three aircraft carriers — it already has INS Vikramaditya procured from Russia — and it has suggested that the expertise gained from building Vikrant



could now be used to build a second, more capable, indigenous carrier

- At the commissioning ceremony in Kochi, Defence Minister Rajnath Singh reiterated India's interest in "a free, open and inclusive Indo-Pacific" and Mr. Modi's idea of 'SAGAR' or

Security and Growth for All in the Region.

- A strong Navy is also critical to India's ambition to grow its share in global trade, which is largely





maritime INS Vikrant significantly expands the Indian Navy's footprint in the backdrop of increasing Chinese activity in the region and New Delhi's closer cooperation with the U.S.

- While MiG-29K fighter jets will now be integrated into the fleet air arm of Vikrant, the Navy has taken an active interest in procuring either the French Rafale M or the American F/A-18 Super Hornet.
- This would need structural modifications in the ship which would allow operating these more capable aircraft from its deck.

## India's cyber infrastructure

In the Supreme Court of India earlier, the law was finally settled in Arjun Pandit Rao Khotkar vs Kailash Kushanrao Gorantyal & Ors.

- The Court held that a certificate under Section 65B(4) of the Indian Evidence (IE) Act was a mandatory prerequisite for the admissibility of (secondary) electronic record if the original record could not be produced.
- With 'police' and 'public order' being in the State List, the primary obligation to check crime and create the necessary cyber infrastructure lies with States.
- At the same time, with the IT Act and major laws being central legislations, the central government is no less responsible to evolve uniform statutory procedures for the enforcement agencies.
- Though the Government of India has taken steps that include the setting up of the Indian Cyber Crime Coordination Centre (I4C) under the Ministry of Home Affairs to deal with all types of cybercrime, much needs to be done to plug the infrastructural deficit

### No procedural code

- There is no separate procedural code for the investigation of cyber or computer-related offences.

- As electronic evidence is entirely different in nature when compared with evidence of traditional crime, laying down standard and uniform procedures to deal with electronic evidence is essential.
- The broad 'guidelines for the identification, collection, acquisition and preservation of digital evidence' are given in the Indian Standard IS/ISO/ IEC 27037: 2012, issued by the Bureau of Indian Standards (BIS).
- This document is fairly comprehensive and easy to comprehend for both the first responder

### Shortage of technical staff

- Second, there have been half hearted efforts by the States to recruit technical staff for the investigation of cybercrime.
- A regular police officer, with an academic background in the arts, commerce, literature, or management may be unable to understand the nuances of the working of a computer or the Internet.
- He can at best, after proper training, act as a first responder who could identify digital evidence and secure the scene of crime or preserve digital evidence till the arrival of an experts
- It is essential that State governments build up sufficient capacity to deal with cybercrime.
- It could be done either by setting up a separate cyber police station in each district or range, or having technically qualified staff in every police station.
- Further, the Information Technology (IT) Act, 2000 insists that offences registered under the Act should be investigated by a police officer not below the rank of an inspector.
- The fact is that police inspectors are limited in number in districts, and most of the field investigation is done by sub-inspectors
- Third, the cyber forensic laboratories of States must be upgraded with the advent of new technologies.
- Offences related to cryptocurrency remain under-reported as the capacity to solve such crimes remains limited.
- The central government has proposed launching a digital rupee using blockchain technology soon.

### Need for localization

- Most cybercrimes are trans-national in nature with extra-territorial jurisdiction. The collection of evidence from foreign territories is not only a difficult but also a tardy process.
- India has extradition treaties and extradition arrangements with 48 and 12 countries, respectively.
- In most social media crimes, except for the prompt blocking of an objectionable website or suspect's account, other details do not come forth quickly from large IT firms.

- Therefore, ‘data localization’ must feature in the proposed Personal Data Protection law so that enforcement agencies are able to get timely access to the data of suspected Indian citizens.

## Inflatable Aerodynamic decelerator (IAD)

The Indian Space Research Organization (ISRO) just declared that it has successfully demonstrated the new technology with Inflatable Aerodynamic Decelerator (IAD)

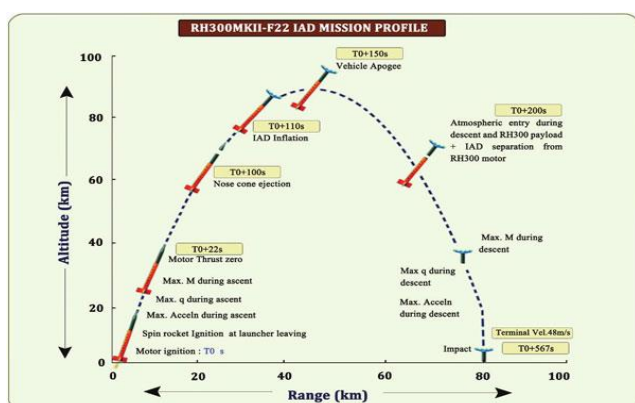
### What is IAD?

Inflatable Aerodynamic Decelerator or IAD in short is a technique used for an atmospheric entry payload. An inflatable envelope and an inflatant (anything that inflates the envelope, like air or helium) make up the inflatable aerodynamic decelerator.

- The inflatant is designed to fill the inflatable envelope to a condition such that it surrounds the payload meant to enter the atmosphere of a planet or satellite and causes aerodynamic forces to slow it down.
- In simpler words, IAD is designed to increase drag upon entering the atmosphere of any planetary body, like Earth, Mars, or even Moon. Its shape is maintained by a closed, gas-pressured body and the inflatant gas is also generated internally. Some versions also use ram air or both.

### ISRO's IAD

- ISRO's latest IAD has been designed and developed at Vikram Sarabhai Space Centre.
- The Liquid Propulsion Systems Centre (LPSC), an R&D wing of ISRO created the pneumatic inflation system for the IAD system. In the inflation system, it uses compressed nitrogen stored in a bottle,



recovery.

### Where does ISRO intend to use it?

- The IAD will help ISRO in performing many space tasks effectively including recovery of spent stages of rockets, for landing payloads on missions to other planetary bodies.
- This is the first instance where an IAD has been specially created for spent stage

- "This demonstration opens a gateway for cost-effective spent stage recovery using the Inflatable Aerodynamics Decelerator technology and this IAD technology can also be used in ISRO's future missions to Venus and Mars,

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## Nanourea

The world's first nano urea liquid plant has been inaugurated by Prime Minister Modi at Kalol in Gujarat.

- India has become the first country to start commercial production of Nano urea in the world.

### What is a nano urea liquid?

- Nano urea liquid is a nanotechnology-based fertilizer to increase the growth of crops by restoring nitrogen to plants as an alternative to conventional urea. It enhances the nutritional quality and productivity of the crop along with improving the underground water quality.
- Conventional Urea, a chemical fertilizer, is used to artificially fulfill the nitrogen need of the plant while Nano urea liquid is developed to replace the former and cut down its requirement by 50%.
- The Indian Farmers Fertilizer Cooperative Limited (IFFCO), a cooperative society, has developed and patented nano urea liquid technology.

### What are the benefits of nano urea liquid?

- "The power of a full sack of urea has come into a half-liter bottle, leading to huge savings in logistics. The Plant will produce about 1.5 Lakh bottles of 500 ml per day."
- Nano urea liquid will help in reducing the use of chemical fertilizers to save the environment because the imbalanced use of fertilizers is deteriorating the health of the soil. It is also causing air and water pollution. Nano Urea can be a game-changer as it will cut down the use of conventional urea up to 50%.
- It will also help in direct savings, reduce transportation costs, and make storage much easier.

### How does it work?

- According to the IFFCO website, "When sprayed on leaves, Nano Urea easily enters through stomata and other openings and is assimilated by the plant cells.
- It is easily distributed through the phloem from the source to sink inside the plant as per its need. Unutilized nitrogen is stored in the plant vacuole and is slowly released for proper growth and development of the plant.



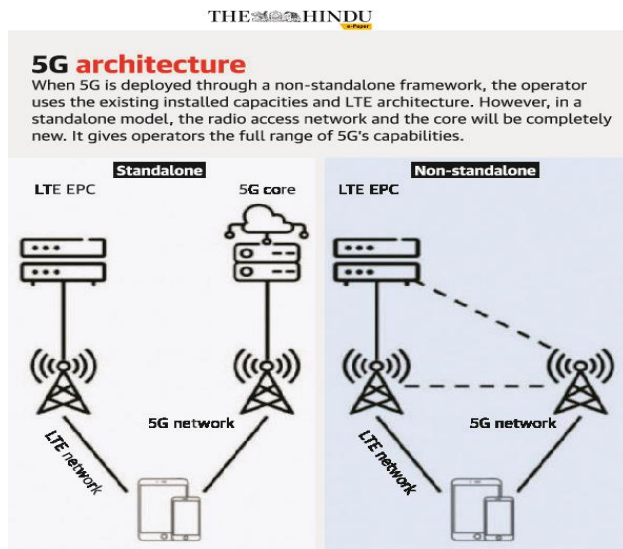
## Criticism

- Nano urea sold in 500-ml bottles has only 4% nitrogen (or around 20 g).
  - Plants need nitrogen to make protein and they source almost all of it from soil bacteria which live in a plant's roots and have the ability to break down atmospheric nitrogen, or that from chemicals such as urea into a form usable by plants.
  - To produce one tonne of wheat grain, a plant needs 25 kg of nitrogen.
  - For rice, it is 20 kg of nitrogen, and for maize, it is 30 kg of nitrogen.
  - Not all the urea cast on the soil, or sprayed on leaves in the case of nano urea, can be utilized by the plant. If 60% of the available nitrogen was used, it would yield 496 kg of wheat grain.
  - Even if 100% of 20 g of nano urea, which is what is effectively available, is utilized by the plant, it will yield only 368 g of grain
  - "Urea is highly water soluble and already reaches the lowest form of concentration when absorbed. How nanoparticles can increase the effectiveness of nitrogen uptake by being still smaller
- 

## Dark sky reserve

- In a first-of-its-kind initiative, the Department of Science & Technology (DST) has announced the setting up of India's first dark sky reserve at Hanle in Ladakh
- Hanle, which is about 4,500 meters above sea level, hosts telescopes and is regarded as one of the world's most optimal sites for astronomical observations.
- However, ensuring that the site remains well suited for astronomy implies keeping the night sky pristine, or ensuring minimal interference to the telescopes from artificial light sources such as electric lights and vehicular lights from the ground.
- A dark sky reserve is a designation given to a place that has policies in place to ensure that a tract of land or region has minimal artificial light interference.
- The International Dark Sky Association is a U.S.-based non-profit that designates sites as international dark sky places, parks, sanctuaries and reserves, depending on the criteria they meet
- To promote astro-tourism, villages around Hanle would be encouraged to promote homestays equipped with telescopes that visitors can use to view the night sky. Villagers would also be trained to help visitors with astronomical observations

## 4G multiplexing



- With 4G-capable cell phones, people could make calls over the Internet instead of via telephone networks.

- This generation's evolution to 4G+ (LTE advanced), which offered download speeds of 200 to 300 Mbps, made it easier for people to connect and talk over the Internet.

- Secondly, 4G's multiplexing capability, technically known as orthogonal frequency division multiplex (OFDM), provided a level of

efficiency in achieving high data transfer rates while allowing multiple users to share a common channel.

- The OFDM modulation scheme divides a channel into several subcarriers.
- These subcarriers are spaced orthogonally so they don't interfere with one another despite the lack of guard bands between them. "OFDM is a very good choice for a mobile TV air interface.
- It offers good spectral efficiency, immunity to multi-path, good mobile performance, and it works well in single-frequency networks such as those planned for mobile TV," according to a research paper titled
- A 5G-based connected future is upon us. That means deploying services in a world filled with 4G compatible devices. So, telecom operators have two options.
- They can either build a non-standalone (NSA) or standalone architecture.
- In an NSA framework, the operator can use their existing installed capacities and LTE architecture to deploy 5G services while implementing a new radio access network (RAN).
- The SA model, on the contrary, is a pure play 5G architecture that provides operators full range of the fifth-generation capability and lets them slice the network. In this architecture, RAN and the core are completely new.

## Earthquake in China

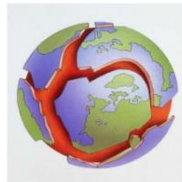


**Lithosphere**

The Lithosphere is the outer shell of the Earth including the crust and the upper mantle. It is composed of brittle rock.

The lithosphere is broken into the tectonic plates. The plates or chunks of crust, drift about on the magma in the mantle below.

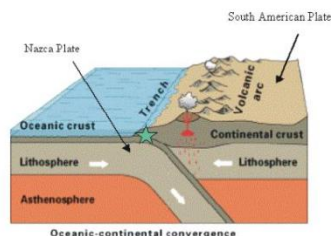
They move only a few centimeters a year.



A subduction zone is a place where two plates collide.

Plates are constantly shifting and moving, so when they subduct, one pushes beneath the other.

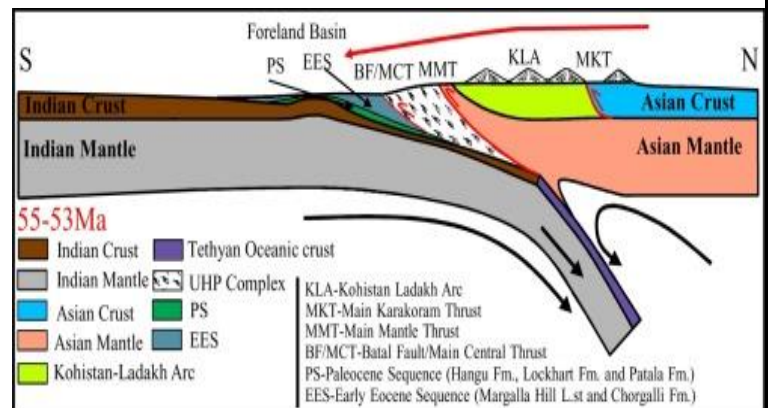
Subduction zones create geologic formations such as mountain ranges, ocean trenches, and island arcs, as well as phenomena like earthquakes and volcanoes.



- The collision of India with the rest of Asia has led to seismic activity throughout **Western China**, particularly in **Tibet** and the **Yunnan**, **Xinjiang**, **Sichuan**, **Gansu** and **Qinghai** provinces. However, these regions in comparison with **Eastern China** have a low population density.

- These areas also in general have poorer transport and building codes.

- Throughout China, poor building codes increases the damage and loss of life from earthquakes.

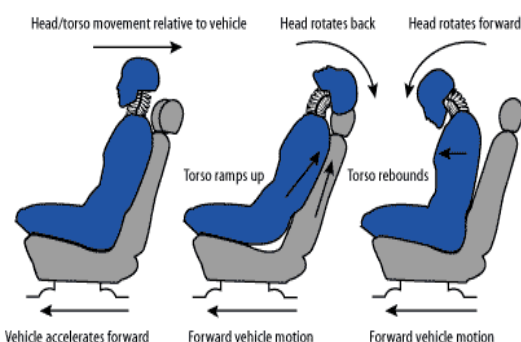


## Conversion therapy

The National Medical Commission (NMC) has written to all State Medical Councils, banning conversion therapy and calling it a “professional misconduct

- Conversion therapy is the pseudoscientific practice of attempting to change an individual's sexual orientation, gender identity, or gender expression to align with heterosexual and cisgender norms
- Common methods of conversion therapy are counseling, visualization, social skills training, psychoanalytic therapy, and spiritual interventions. Other methods that have been used include ice-pick lobotomies;
- A lobotomy, or leucotomy, is a form of neurosurgical treatment for psychiatric disorder or neurological disorder (e.g. epilepsy) that involves severing connections in the brain's prefrontal cortex.
- chemical castration with hormonal treatment; aversive treatments, such as "the application of electric shock to the hands and/or genitals"; "nausea-inducing drugs ... administered... with the presentation of homoerotic stimuli";
- In 2021, Justice N. Anand Venkatesh of the Madras High Court issued a slew of interim guidelines for the police, activists, Union and State Social Welfare Ministries, and the National Medical Commission, regarding the LGBTQIA+ community, to “ensure their safety and security to lead a life chosen by them.”
- The ruling prohibited any attempt to medically “cure” or change the sexual orientation of LGBTQIA+ (lesbian, gay, bisexual, transgender, queer, intersex, asexual or of any other orientation) people.
- It urged the authorities to take action against “professional[s] involving themselves in any form or method of conversion therapy,” which could include the withdrawal of license to practice medicine

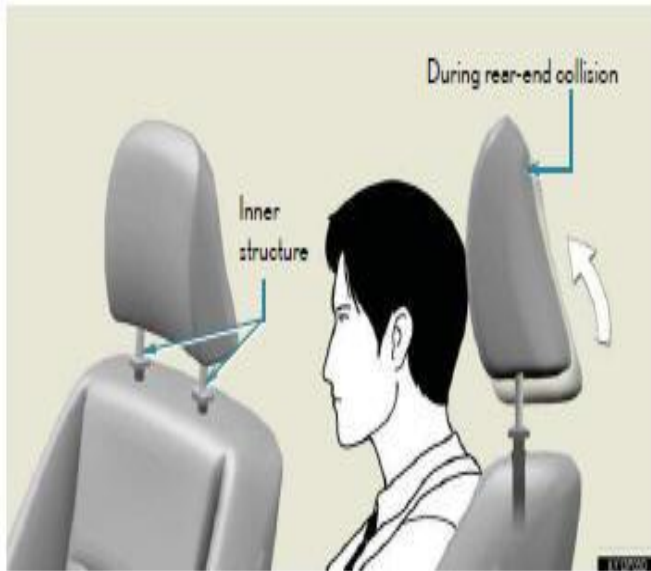
## Head restraint



### What role do head restraints play?

- Head restraints, which are found either as adjustable models or molded into the seats, prevent a whiplash injury.
- This type of injury occurs mostly when the vehicle is struck from behind, leading to sudden extreme movement of





the neck backwards and then forwards. It could also happen vice versa in other circumstances.

- The injury involves the muscles, vertebral discs, nerves and tendons of the neck
- What stands out is that the amended Motor Vehicles Act of 2019 already requires the occupants of a passenger vehicle to wear a seat belt.
- As per Section 194(B) of the Act, whoever drives a motor vehicle without wearing a safety belt or carries passengers not wearing seat belts

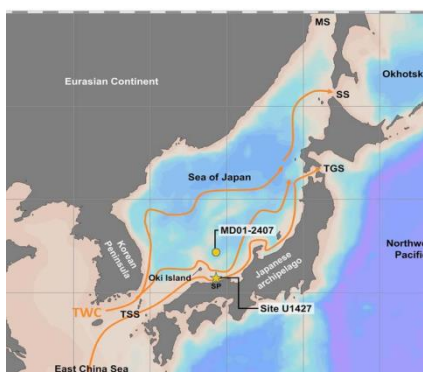
shall be punishable with a fine of one thousand rupees.

- Evidently, although cars are equipped with seat belts, the enforcement for rear seat occupants is virtually absent in India

### Heatwaves in China and its impact

- China has logged its hottest August since records began, state media reported on Tuesday, following an unusually intense summer heat wave that parched rivers, scorched crops and triggered isolated blackouts.
- As a result of the drought and the increasing power consumption due to the heat, there was a resulting energy crisis of which several factories had to be shut down. The heat wave also caused far-reaching effects on the country's economy.
- Because of the drought and persistent heat, there were more forest fires in China, particularly in the Chongqing region.
- Also because of the lack of rain and the persistent heat, the level of the Yangtze dropped sharply, and the Three Gorges Dam was opened as a result to direct water into that river. It has been reported that silver iodide was used to form clouds in Anhui and other provinces.
- Poyang Lake, China's largest freshwater lake, in Nanchang, East China's Jiangxi Province has been reduced to just 25% of its usual size due to extreme weather conditions, causing a major drought

## Sea of Japan

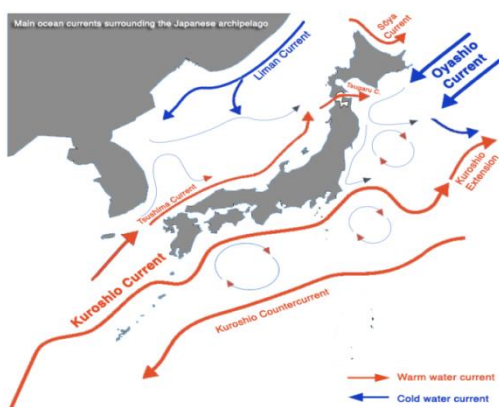


- The Sea of Japan is the marginal sea between the Japanese archipelago, Sakhalin, the Korean Peninsula, and the mainland of the Russian Far East.

- The Japanese archipelago separates the sea from the Pacific Ocean. Like the Mediterranean Sea, it has almost no tides due to its nearly complete enclosure from the Pacific Ocean.

- This isolation also affects faunal diversity and salinity, both of which are lower than in the open ocean.

- The sea has no large islands, bays or capes. Its water balance is mostly determined by the inflow and outflow through the straits connecting it to the neighboring seas and the Pacific Ocean. Few rivers discharge into the sea and their total contribution to the water exchange is within 1%.
- The seawater has an elevated concentration of dissolved oxygen that results in high biological productivity. Therefore, fishing is the dominant economic activity in the region.



- The Kuroshio (Japan Current), the Tsushima Current and the East Korea Warm Current bring warmer and more saline water to the north.

- There they merge into the Tsugaru Current and flow into the Pacific Ocean through the Tsugaru Strait.

- They also feed the Sōya Current and exit through the La Perouse Strait to the Sea of Okhotsk.

- The returning branch is composed of the Liman,

North Korea and Central (or Mid-) Japan Sea currents which bring fresh and cold water along the Asian coast to the south

## Origin of indo pacific

### The Origins of 'Indo-Pacific' Nomenclature

- The origin of the term 'Indo-Pacific' is traced to German geopolitical scholar Karl Haushofer who used it in the 1920s in his work, 'Indopazifischen Raum' while Indian historian Kalidas Nag referenced it in the 1940s.
- In more contemporary history, the term gained prominence after then Japanese Prime Minister Shinzo Abe's speech in the Indian parliament in August 2007, where he remarked, "We are now at a point at which the Confluence of the Two Seas is coming into being. The Pacific and the Indian Oceans are now bringing about a dynamic coupling as seas of freedom and of prosperity.
- Japan was among the first countries to use the phrase 'Free and Open Indo-Pacific' in its official discourse. In 2017, the United States (US) adopted the concept and translated it into the three pillars of security, economics, and governance.
- For India, its Indo-Pacific policy was enunciated by Prime Minister Narendra Modi at the Shangri-La Dialogue in 2018 where he outlined the seven elements of the country's vision for the region

### India: Linchpin of the Indo-Pacific

- India is poised to play a significant role in the future of the Indo-Pacific, and it perhaps begins with the country's cultural connections with the other countries in the region. For instance, while the Angkor Wat in Cambodia is well-known, the Cham civilization in Vietnam also shared a common culture with India.
- The name "Indonesia" is derived from the Greek words *Indos* and *nesos*, meaning "Indian islands".
- Some analysts have noted that India's wide presence is such that "the influence of Indian culture and language has permeated Southeast Asia organically and without state sponsorship, political imposition or concrete effort
- Some observers are of the view that the concept of the Indo-Pacific is simply an attempt to be a counterweight to the rise of China.
- However, this brief argues, the growing salience of the Indo-Pacific is a consequence of the changing dynamics of economic interactions in the region, overall, and in particular, the rise of India. Indeed, there cannot be an Asia-wide concept without the inclusion of India as an economic and military power.
- Economically, India is figuring prominently in the trade profile of countries in the region. Australia, Saudi Arabia, the UAE, Singapore, Indonesia, Japan, Malaysia, the US, and China, are among the top 15 of India's trade partners.

- India's trade with ASEAN has also registered a steady improvement. In terms of investments, Japan and Singapore are leading investors in India after Mauritius
- 

### Anti nasal vaccine

- India's first nasal COVID-19 vaccine, developed by Bharat Biotech, has been approved for primary immunization in those 18 and above

#### What is a nasal vaccine?

- In nasal approach, the vaccine dose is given via nose, rather than orally or through the arm.
- As the target is to deliver a dose which goes right into the respiratory pathways, the vaccine is either injected through a specific nasal spray or through aerosol delivery.

#### How it works?

- As the virus normally enters your body through the nose, the nasal vaccine causes your immune system to make proteins in your blood and in your nose that help you fight the virus.
- A doctor will spray the vaccine into your nostrils with a small syringe that has no needle.
- It usually takes about two weeks for it to start to work.
- Given the potency and rapid spread of the coronavirus, some say it makes sense to develop vaccines for the airway as well as the more standard jabs.

#### How is nasal vaccine different?

- Many microbes, including the coronavirus, enter the body through the mucosa wet, squishy tissues that line the nose, mouth, lungs and digestive tract triggering a unique immune response from cells and molecules there.
- Intramuscular vaccines generally do a poor job of eliciting this mucosal response and must instead rely on immune cells mobilized from elsewhere in the body flocking to the site of infection.

#### How effective is it?

- An effective nasal dose not only protects against Covid- 19, but it also prevents the spread of the disease by offering another kind of immunity that occurs primarily in the cells that line the nose and throat.
- The nasal vaccine targets immune cells present in the mucosal membrane and tissue- which provides systematic as well as mucosal immunity present in other sites such as lungs and the intestines. Hence, a nasal vaccine may be more capable of inoculating crowds against the deadly infection and prevent even mild symptoms from developing.



## Joint space exercise

- India and the U.S. will undertake joint military drills in October in Auli, Uttarakhand. Auli is at an altitude of 10,000 feet and some 95 km from the Line of Actual Control (LAC).
- The time is ripe for the inaugural India, U.S. joint space military exercise.
- First, this single act will push India's defence partnership into a new orbit.
- Second, it will send a strong message to a common adversary.
- Third, it will have other ripple effects for the wider Quad.
- Space has been singled out as a critical area of cooperation in the recent Defence Technology and Trade Initiative (DTTI) meeting between India and the U.S. For the first time in history, both countries are jointly staring at a common adversary. Nothing binds friends together as sharing the same displacement anxiety.
- The launch of the tri-service Defence Space Agency (DSA) has permanently taken the military away from the shadows of civil space.
- The government has also set up the Defence Space Research Agency (DSRA) to help develop space-based weapons for the DSA.
- Space is as much recognized as a military domain as land, water, air and cyber
- The lowest hanging fruit would be a joint anti-satellite (ASAT) missile test. It is essentially a missile launched from the Earth's surface to destroy a satellite passing overhead.
- Both countries have demonstrated capability in this.
- The test would be against a simulated orbital target as that does not create space debris and is not included in the wording of the U.S. moratorium.
- Eventually, this will lead to other space military collaborations such as directed energy weapons, rendezvous and proximity operations (RPOs), co-orbital ASATs

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## Space programmes

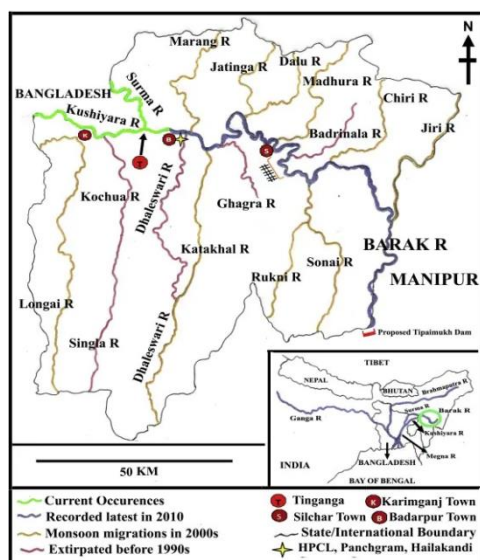
France conducted its first space military exercise, ASTERX, in 2021. China is marching ahead to the Cis-Lunar space (region beyond the geosynchronous orbit) with an ambition to establish a permanent presence on the Moon by 2024.

- The doctrine in space is still evolving with the U.S. urging partner countries to lay down rules and norms.
- China and Russia have released a draft binding treaty of their own.
- Red lines and norms will eventually emerge but until then it provides an ideal new theatre to push

Indo-U.S. military collaboration forward.

- Space has assets that form the bedrock of the modern economy — GPS (PNT — position navigation timing), telecom networks, early warning systems for missiles and weather forecasts all are enabled by our satellites in GEO or LEO orbits

## Kushiyara



India and Bangladesh on Tuesday signed a water-sharing agreement

The two leaders agreed to share the waters of the Kushiyara, a common river, in the first such arrangement between the countries since 1996.

The agreement will benefit southern parts of Assam state in India and the Sylhet region in Bangladesh

- The Kushiyara River is a distributary river in Bangladesh and Assam, India. It forms on the India-Bangladesh border as a branch of the Barak River, when the Barak

separates into the Kushiyara and Surma.

- The waters that eventually form the Kushiyara originate in the uplands of the state of Assam and pick up tributaries from Nagaland and Manipur



## Anti TB campaign

- Tuberculosis caused the largest number of deaths among all other infectious diseases in the country.
- India has a little less than 20% of the world's population, but has more than 25% of the total TB patients of the world. "This is a matter of concern
- India has the world's highest tuberculosis (TB) burden, with an estimated 26 Lakh people contracting the disease and approximately 4 Lakh people dying from the disease every year.
- The economic burden of TB in terms of loss of lives, income and workdays is also substantial.
- TB usually affects the most economically productive age group of society resulting in a significant

loss of working days and pushing TB patients further into the vortex of poverty.

- The Ministry of Health and Family Welfare (MoHFW) is implementing an ambitious National Strategic Plan with the goal to achieve SDG End TB targets by 2025.
- The challenge of tuberculosis requires a multi-sectoral response to address the social determinants like nutritional support, living and working conditions, and an increase in access to diagnostic and treatment services.
- For effective engagement of the community in the path towards ending TB in India, MoHFW is implementing the “Community Support to TB patients - Pradhan Mantri TB Mukh Bharat Abhiyaan.
- Ni-kshay Mitra (Donor) for this program include co-operative societies, corporates, elected representatives, individuals, institutions, non-governmental organizations, political parties and partners who can support by adopting health facilities (for individual donor), blocks/urban wards/districts/states for accelerating response against TB to complement government efforts, as per the district-specific requirements in coordination with the district administration.

#### Objectives of the Initiative:

1. Provide additional patient support to improve treatment outcomes of TB patients
2. Augment community involvement in meeting India’s commitment to end TB by 2025
3. Leverage Corporate Social Responsibility (CSR) activities

#### Stakeholders for The Initiative:

•TB Patient • Community • Ni-kshay Mitra - Co-operative / Corporate / Elected Representative / Individual / Institution / NGO / Political Party / Partner • State & District Administration • Central TB Division, MoHFW, GoI

#### Expected Output of The Initiative:

1. This initiative will increase the active involvement of society in the fight against tuberculosis.
2. This activity aims at increasing awareness among the public regarding tuberculosis.
3. Involvement of the community in supporting the treatment cascade shall also help in the reduction of stigma.
4. Provision of additional support to the TB patient shall also result in the reduction of the out-of-pocket expenditure for the family of the TB patient.
5. Ultimately improved nutrition for the TB patient shall result in better treatment outcomes.

## Flood in Bangalore

- Lakes and their catchment areas were soon transformed into private lands.
  - Builders backfilled these and soon made quick money building apartments, shopping malls and information-technology parks
  - We have achieved some success in rainwater harvesting, solar water heating, segregation of garbage and the stoppage of littering,
  - First, we must execute institutional euthanasia. A multiplicity of institutions does not improve execution.
  - They are deliberately constructed to get in each other's way, complicate governance and preserve opportunities that benefit corrupt politicians, bureaucrats and land exploiters.
  - Outdated institutions need to be replaced by a constitutionally compliant structure, with local governments at the top
  - Second, our community needs to steel itself for some tough decisions. Climate resilience goes beyond flood control; it needs minimizing the damaging environmental impact of cities.
  - We must take hard decisions on transportation, curb car travel and improve cheap public transport with more buses instead of waiting for the expensive metro
- 

## Rabies

Rabies is a disease that is caused by a family of viruses called the lyssaviruses and found in a range of mammals.

- The virus targets the central nervous system and is nearly 100% fatal to the host animal if it succeeds in infecting it.
- Though many animals from cats to crocodiles can be transmitters of the virus, it is most likely to spread to people from the bite of an infected dog or a cat as they are the most common pets.
- Despite being potentially lethal, the virus is slow-moving

### How is the vaccine made?

- The vaccine is made up of an inactivated virus that is expected to induce the body into producing antibodies that can neutralize the live virus in case of infection.
- There are also test vaccines that involve genetically modified viruses.
- There is no single-shot rabies vaccine or one that offers permanent immunity.
- There are mainly two ways of administering the rabies vaccine.
- One, called post-exposure prophylaxis (PEP), is given to persons who have been exposed via a



bite to an animal suspected to be infected.

- The vaccines are administered either into the muscles, or into the skin.
  - It can also be given ahead of time to persons who have a high risk of being infected, such as veterinarians, animal handlers, areas with a high number of rabies infection, by what is called Pre Exposure Prophylaxis (PrEP).
  - The advantage of a PrEP is that if bitten, one doesn't need a immunoglobulin injection, and two subsequent shots of the vaccine will suffice for full protection
- 

### Nasal vaccine

- Bharat Biotech's nasal vaccine for primary immunization against COVID-19 in the 18-plus age group for restricted use in an emergency situation.
- It is hoped that Bharat Biotech's ChAd36-SARS-CoV-S recombinant vaccine, to be administered nasally and developed in association with the University of Washington, will prove a powerful tool in the battle against the virus by preventing infections, something the other vaccines have not been able to do.

#### What does the vaccine do?

A nasal vaccine is delivered through the nose or mouth and it is expected to work on the mucosal lining, prompting an immune response at the entry points of the virus in the human body

- The reason for that is that they are injected into the muscle.
- "Intramuscular shots prompt an immune response that includes T cells, which destroy infected cells, and B cells, which produce antibodies that 'neutralize' pathogens binding to them to stop them entering healthy cells. These cells and antibodies circulate through the bloodstream.
- But they aren't present at high enough levels in the nose and lungs to provide rapid protection
- Bharat [Biotech] and CanSino [Chinese vaccine maker that has secured a license to use another nasal vaccine] won't know whether their vaccines can achieve this until they have conducted further efficacy studies,"

## Kushiyara agreement

### The story so far:

During Bangladesh Prime Minister Sheikh Hasina's visit to India from September 5 to 8, the two sides signed a slew of agreements, including the first water sharing agreement since the landmark Ganga Waters Treaty, 1996.

A memorandum of understanding (MoU) was signed on sharing of the waters of the Kushiyara river, a distributary of the Barak river which flows through Assam, and then on to Bangladesh.

### What is the Kushiyara agreement?

- Over the last century, the flow of the Barak river has changed in such a way that the bulk of the river's water flows into Kushiyara while the rest goes into Surma.
- According to water expert, Dr. Ainun Nishat, the agreement is aimed at addressing part of the problem that the changing nature of the river has posed before Bangladesh as it unleashes floods during the monsoon and goes dry during the winter when demand of water goes up because of a crop cycle in Sylhet
- under this MoU, Bangladesh will be able to withdraw 153 cusecs (cubic feet per second) of water from the Kushiyara out of the approximately 2,500 cusecs of water that is there in the river during the winter season
- Boro rice cultivation in the region had been suffering as India did not allow it to withdraw the required water from the Kushiyara

### How will Bangladesh use the water?

- The water of Kushiyara will be channeled through the Rahimpur Canal project in Sylhet.
- The Rahimpur Canal project in Zakiganj upazila or subdivision of Sylhet was built to help the farmers access Kushiyara's water but the facility used to remain dry during the lean season without serving the purpose for which it was built.
- The eight km long canal is the only supplier of water from the Kushiyara to the region and Bangladesh has built a pump house and other facilities for withdrawal of water that can now be utilized.

### Why is the water from the Kushiyara so important for Rahimpur Canal?

- The water of the Kushiyara has been used for centuries in Sylhet's subdivisions like the Zakiganj, Kanaighat and Beanibazar areas. But Bangladesh has witnessed that the flow and volume of water in the canal has reduced during the lean season.

- The utility of the river and the canal of rice as well as a wide variety of vegetables for which Sylhet is famous.
- The additional water of Kushiya through the Rahimpur Canal therefore is the only way to ensure steady supply of water for irrigation of agriculture fields and orchards of the subdivisions of Sylhet.

#### What was India's objection to the Rahimpur Canal?

- Bangladesh had carried out the Upper Surma Kushiya Project which included clearing and dredging of the canal and other connected channels of water; but the channels could not be of much use to Bangladesh because India objected to the move and claimed that the dyke and other infrastructure interfered in border security as Kushiya itself forms part of the border between the two sides

#### Wildfire and ozone damage

- Ozone layer damage Smoke from Australia's extreme wildfires between December 2019 and February 2020 increased atmospheric temperatures and probably made the hole in the ozone layer bigger.
- The plumes of smoke that rose into the atmosphere caused temperatures to spike by 3°C over Australia.

#### lysine butyrylation

Our genetic material DNA is wrapped around protein balls called histones to form the highly organized genome.

- Different chemical modifications of both DNA and histones can dictate the fate of genes in terms of them being switched on or remaining switched off.
- This on/off balance of gene expression is critical for health and disease.
- chemical modification of histone lysine butyrylation is critical for fat cell development that underlies obesity manifestation
- we could finally demonstrate that a semi-synthetic derivative of garcinol, a molecule naturally found in *Garcinia indica* (kokum) fruit rind, could selectively reduce the levels of this modification by inhibiting the catalytic activity of the enzyme responsible for it the master

## Cloudburst- formation, Clausius Clapeyron relationship

- Cloudbursts violent and voluminous amounts of rain pouring down in a short duration over a small area
- Clouds blanket 70% of the Earth's surface at any given time. They are like a thin layer of the floating ocean, with enough water to cover the entire surface of Earth with about one inch of rain.
- Cloudburst events are often associated with cumulonimbus clouds that cause thunderstorms and occasionally due to monsoon wind surges and other weather phenomena.
- Cumulonimbus clouds can grow up to 12-15 km in height through the entire troposphere (occasionally up to 21 km) and can hold huge amounts of water.

### Characteristics

- However, cloudbursts are not defined based on cloud characteristics and do not indicate clouds exploding.
- Cloudbursts are defined by the amount of rainfall. According to the India Meteorological Department (IMD), 100 mm of rain in an hour is called a cloudburst. Usually, cloudbursts occur over a small geographical region of 20 to 30 sq. km
- In India, cloudbursts often occur during the monsoon season, when the southwesterly monsoon winds bring in copious amounts of moisture inland.
- The moist air that converges over land gets lifted as they encounter the hills.
- The moist air reaches an altitude and gets saturated, and the water starts condensing out of the air forming clouds.



• This is how clouds usually form, but such an orographic lifting together with a strong moisture convergence can lead to intense cumulonimbus clouds taking in huge volumes of moisture that is dumped during cloudbursts.

• Tall cumulonimbus clouds can develop in about half an hour as the moisture updraft happens rapidly, at a pace of 60 to 120 km/hr.

• More prone areas Cloudbursts, hence, occur

mostly over the rugged terrains over the Himalayas, the Western Ghats, and northeastern hill States of India

- Detecting cloudbursts while satellites are extensively useful in detecting large-scale monsoon weather systems, the resolution of the precipitation radars of these satellites can be much smaller than the area of individual cloudburst events, and hence they go undetected.
- The skillful forecasting of rainfall in hilly regions remains challenging due to the uncertainties in the interaction between the moisture convergence and the hilly terrain, the cloud microphysics, and the heating cooling mechanisms at different atmospheric level
- Multiple doppler weather radars can be used to monitor moving cloud droplets and help to provide nowcasts (forecasts for the next three hours).
- This can be a quick measure for providing warnings, but radars are an expensive affair, and installing them across the country may not be practically feasible.
- A long-term measure would be mapping the cloudburst-prone regions using automatic rain gauges.
- If cloudburst-prone regions are co-located with landslide-prone regions, these locations can be designated as hazardous.
- The risk at these locations would be huge, and people should be moved, and construction and mining in nearby regions should be restricted as that can aggravate the landslides and flash flood impacts
- Climate change is projected to increase the frequency
- And intensity of cloudbursts worldwide. As the air gets warmer, it can hold more moisture and for a longer time.
- We call this the Clausius Clapeyron relationship.
- A 1-degree Celsius rise in temperature may correspond to a 7-10% increase in moisture and rainfall.
- This increase in rainfall amount does not get spread moderately throughout the season.
- As the moisture holding capacity of air increases, it results in prolonged dry periods intermittent with short spells of extreme rains.



## Crisis of Apple farmer

- Laws in the State restrict the transfer of land in favor of a person who is not an agriculturist of Himachal Pradesh.
- In the late 1980s and early 1990s, peasant movements were successful in raising the support prices for apple.
- However, in the 1990s, with rising fragmentation of land, low productivity and withdrawal of state support, agriculture became unsustainable.
- The cost of production of agricultural items increased substantially, denying remunerative prices to the poor and marginal growers.

### Reasons for crisis

There are two major reasons for the current crisis.

- The first is the increasing cost of production.
- The input cost of fertilizers, insecticides, and fungicides has risen in the last decade by 300%, as per some estimates.
- The cost of apple cartons and trays and packaging has also seen a dramatic rise.
- The second and immediate trigger for the agitation was the increase in the Goods and Services Tax on cartons from 12% to 18%.
- This was done to ensure that farmers are forced to sell their produce to big buyers instead of selling it in the open market
- Large players do not buy apples in cartons; they procure them in plastic trays and decide the rate on the basis of kilogram.
- By doing this, they argue that the cost of packaging gets reduced. It is true that it does — in the open market; the price is decided on the basis of an apple carton.
- In this manner, the big players induce the apple farmers to sell the produce to them.
- But there is a catch. Unlike in the open market, where apples of all varieties/grades are procured, the large players only procure apples of high quality

What is required is an independent body that is duly supported and trusted by the farmers.

- Such a body should have representatives of apple growers, market players, commission agents and the government.
- This must be a statutory body that is also given the task of conducting research in the apple economy
- The big growers have also started to shift from the conventional varieties to more genetically modified varieties called the spur, most of which are imported from European nations

## Increase in Coal based power plant

- India may need up to 28 gigawatts of new coal-fired power plants by 2032 to meet power demand that is expected to more than double from the current 404.1 GW
- “It is seen that apart from under-construction coal based capacity of 25 GW, the additional coal-based capacity required till 2031-32 may vary from 17 GW to around 28 GW
- India’s annual electricity demand could grow by an average of 7.2% over the five years to March 2027, almost double the rate of increase in the fiscal years from 2017 to 2022, the plan said.
- The share of coal in India’s total power generation, however, is likely to fall below 60% by 2027, with India targeting the addition of 500 GW in non-fossil based installed capacity by 2030
- Although India is a major greenhouse gas producer, its per capita power demand and emissions are much lower than most developed countries, while it accounts for the lion’s share of the world’s additional renewable energy output, along with China.
- A draft electricity policy report issued last year indicated India may build new coal-fired plants due to their lower cost, although it gave no estimates of how much capacity might be built.

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## Windfall tax

The story so far: Finance Minister Nirmala Sitharaman on September 2, defended the windfall tax imposed by the Centre on domestic crude oil producers, saying that it was not an ad hoc move but was done after full consultation with the industry

### What is a windfall tax?

- Windfall taxes are designed to tax the profits a company derives from an external, sometimes unprecedented event — for instance, the energy price-rise as a result of the Russia-Ukraine conflict
- There have been varying rationales for governments worldwide to introduce windfall taxes, from redistribution of unexpected gains when high prices benefit producers at the expense of consumers, to funding social welfare schemes, and as a supplementary revenue stream for the government

### Why are countries levying windfall taxes now?

- Prices of oil, gas, and coal have seen sharp increases since last year and in the first two quarters of the current year, although they have reduced recently.
- Pandemic recovery and supply issues resulting from the Russia-Ukraine conflict shored up energy

demands, which in turn have driven up global prices.

- The rising prices meant huge and record profits for energy companies while resulting in hefty gas and electricity bills for households in major and smaller economies

#### What are the issues with imposing such taxes?

- Analysts say that companies are confident in investing in a sector if there is certainty and stability in a tax regime.
- Since windfall taxes are imposed retrospectively and are often influenced by unexpected events, they can brew uncertainty in the market about future taxes
- “Introducing a temporary windfall profit tax reduces future investment because prospective investors will internalize the likelihood of potential taxes when making investment decisions”.

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### Fall in rubber prices

The story so far: After a moderate post-pandemic revival, the price of natural rubber (NR) has crashed to a 16-month low of ₹150 per kg (RSS grade 4) in the Indian market

#### What has caused the sharp fall in prices?

- The current fall in prices is attributed primarily to a weak Chinese demand and the European energy crisis, along with high inflation and an import glut, among other things.
- While the unrelenting zero COVID strategy in China, which consumes about 42% of the global volume, has cost the industry dearly, analysts have also flagged the acceleration of imports.
- The domestic tyre industry, according to them, is sitting pretty on an ample inventory, especially in the form of block rubber from the Ivory Coast and compounded rubber from the Far East.
- Where does India stand in terms of the production and consumption of natural rubber?
- India is currently the world's fifth largest producer of natural rubber while it also remains the second biggest consumer of the material globally.

#### How does the falling price affect the growers?

- The turnaround has exposed the growers — mostly small and medium scale — to a painful reckoning, contributing to wide-spread panic in Kerala, which accounts for nearly 75% of the total production.
- The precipitous plunge in prices coupled with high costs have also left them staring at an uncertain future, forcing some to stop production for the time being.

- The impact of the price fall is felt more in the rural areas, where most people are solely dependent on rubber cultivation and have no other option but to cut expenses.
- This has caused sluggishness in the respective local economies, which also coincided with the festive season in Kerala.

#### What do the farmers demand?

- The key demands they have raised to the Union government include raising the import duties on latex products and compound rubber to make it on par with natural rubber, by either 25% or ₹30 per kg, whichever is lower. Its demands to the state government are to raise the replanting subsidy in Kerala,

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## Draft Indian port bills 2022

#### What is the current legal framework for ports in India?

- Approximately 95 per cent of India's trade by volume and 68 per cent by value are moved through maritime transport facilitated by 212 ports (12 major and 200 minor ports) along its 7,517 km coastline.
- While the major ports are under the administrative control of Ministry of Shipping, the non-major ports are under the jurisdiction of respective State Maritime Boards/ State Government.
- The major ports are governed under the Major Port Trusts act, 1963. All the non-major Ports (minor ports) are governed under the Indian Ports Act, 1908 which regulates the berths, stations, anchoring, fastening, mooring and unmooring of vessels.
- The draft IP Bill 2022 seeks to repeal and replace the 114-year-old Indian Ports Act of 1908.

#### What are the key objectives of the draft bill?

- Promote integrated planning between States inter-se and Centre-States through a purely consultative and recommendatory framework;
- ensure prevention of pollution measures for all ports in India while incorporating India's obligations under international treaties;
- address lacunae in the dispute resolution framework required for burgeoning ports sector and
- Usher-in transparency and cooperation in the development and other aspects through the use of data.

### What are the key international obligations addressed under the bill?

The new Bill incorporates a number of international instruments to which India is a party, in the national legislation namely, International Ship and Port Facility Security (ISPS) Code 2004, International Convention for the prevention of pollution from ships (MARPOL) 1973 and International Convention for the Control and Management of Ships Ballast Water and Sediments (Ballast Water Management Convention) 2004.

- The ISPS code is important for the safety of ships, ports, seafarers and government agencies and prescribes responsibilities to various stakeholders to "detect security threats and take preventive measures against security incidents affecting ships or port facilities used in international trade."
- MARPOL is the main international convention covering prevention of pollution of the marine environment by ships from operational or accidental causes.
- The Ballast Water Management Convention or BWM Convention aims at preventing the spread of potentially harmful aquatic organisms and pathogens in ships' ballast water when it is released into port premises or adjacent environment

### What are the key features of the bill?

- establish a national council for fostering structured growth and development of the port sector, and ensure optimum utilization of the coastline of India
- empower and establish State Maritime Boards for effective administration, control and management of non-major ports in India;
- provide for adjudicatory mechanisms for redressal of port related disputes and,
- prevention and containment of pollution at ports, and take measures for conservation of ports

### What is the National Council referred to in the draft bill?

- Chapter II of the draft bill seeks to establish a Maritime State Development Council (MSDC) to be chaired by the Union minister for ports, shipping, and waterways and Ministers in charge of ports in the Maritime States and UT of Puducherry as the members. Such a Council has been in existence for many years and the draft bill gives a legal backing to the council.
- The draft bill proposes to make this Council a permanent body with powers to formulate a national plan as a recommendatory framework for realizing the full potential of major and non-major ports in the country and assess the progress of such plan and revise such plan from time to time.



### What is the role of State Maritime Board envisaged in the draft?

- The bill also requires every State Government to establish a State Maritime Board for all the non-major ports within the State.
- The Maritime Board is required to perform a host of functions, namely, initiating plans for development of non-major ports in the State; framing and amending port tariff; developing new non-major ports in the State and adjudicating port-related disputes in accordance with this Act.

### Why is the proposed adjudicatory mechanism controversial?

- The draft to amend the 1908 act creates a new mechanism for resolution of disputes.
  - The bill has proposed to make the Adjudicatory Board constituted under section 54 of the Major Port Authorities Act, 2021 (that governs 11 of the 12 ports owned by the Centre) perform the role of an Appellate Tribunal for settling disputes.
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### Indian patent system

- Long pendency of processing patent applications in India.
- Therefore, it has recommended several measures to reduce this.
- Increasing the efficiency of processing patent applications will certainly improve the patent ecosystem in the country.
- Section 9(1) of the Patents Act provides that those applications accompanied by provisional specifications be supported by complete specifications within one year.
- Section 21(1) requires patent applicants to re-file documents if the patent examiner finds them not meeting the requirements.
- A plausible reason could be that the applicants are not confident about their applications passing scrutiny and, therefore, do not pursue their applications
- The higher education sector of India is rising in prominence in the research and development spending and patenting landscape of India.
- The share of this sector in the gross domestic expenditure on R&D (GERD) has increased from 5% in 2013 to 7% in 2018, as UNESCO's data on science, technology and innovation shows.
- The number of patent applications filed by the top 10 academic institutes and universities in India (in terms of the number of patent applications) rose by more than two times in four years, from 838 in 2015-16 to 2,533 in 2019-20.
- Their share in the patent applications by residents also doubled from 6.4% to 12.2% during the

same period.

- The growing prominence of this sector in patenting activity indicates the priority it attaches to commercially significant technological innovations.
  - When the higher education sector is increasingly focusing on the development component of R&D, it is also expected that the collaboration between industry and academia will also increase in the area of R&D
  - As the patent system is a critical aspect of the national innovation ecosystem, investing in the patent ecosystem will help in strengthening the innovation capability of India
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### From no alignment to All alignment

- Indian foreign policy that balances various blocs — pitting India's membership of the SCO and BRICS (Brazil, Russia, India, China and South Africa) against its membership of the Quad (Australia, India, Japan, the U.S.), groups such as the I2U2 ( India-Israel-U.S.-UAE), and the Indo-Pacific Economic Framework (IPEF).
- This was highlighted more recently with India joining the Russian-led 'Vostok' Army Exercises along with China, and plans to host SCO-RATS (or the Regional Anti-Terrorist Structure of the Shanghai Cooperation Organization) counter terror exercises while the Indian Air Force took part in the Australian 'Pitch Black' exercises, and the Indian Army is planning exercises with the U.S
- (Yudh Abhyas) next month close to the Line of Actual Control (LAC).
- In a Venn diagram, India is the only country that would form the intersection, a part of all of those groupings
- It is worth noting that the SCO membership is not premised on India's traditional non-aligned posture.
- While Mr. Modi has skipped all the Non Aligned Movement summits in his tenure (the only Indian Prime Minister to do so, apart from caretaker Prime Minister Charan Singh in 1979), he chose to lead India into the SCO in 2017.
- Next year, India will host the SCO summit, and is expected to invite all members this includes Chinese President Xi Jinping and Pakistan's Prime Minister Shahbaz Sharif showing how far New Delhi will be willing to go in its commitment to the SCO.
- The Government has not only rejected calls to cut its Russian oil imports but it has also done the reverse: imports of Russian oil jumped from 0.66 million tonnes in the first quarter to 8.42 million tonnes in the second this year

- it asserts its right to buy discounted Russian oil in order to stave off inflation for the Indian consumer
- Push back against the American threats of sanctions on the S-400 Triumf missile defence system deal and on oil trade with Russia, has forced the U.S. to blink.

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## Shadow libraries

Shadow or mirror libraries are online databases that duplicate digital records like e-books or academic articles.

- Shadow libraries are online databases of readily available content that is normally obscured or otherwise not readily accessible.
  - Such content may be inaccessible for a number of reasons, including the use of paywalls, copyright controls, or other barriers to accessibility placed upon the content by its original owners.
  - Shadow libraries usually consist of textual information like in electronic books but may also include other digital media, including software, music, or films.
  - Examples of shadow libraries include Library Genesis, Z-Library and Sci-Hub, which are popular academic shadow libraries
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## National list of essential medicine

- On September 13, the National List of Essential Medicines (NLEM), 2022, was released, with 384 drugs in it across 27 categories. While 34 new drugs are on the list, 26 drugs from NLEM, 2015,

### What is an Essential Medicines List

- As per the World Health Organization (WHO), Essential Medicines are those that satisfy the priority health care needs of the population.
- The list is made with consideration to disease prevalence, efficacy, safety and comparative cost-effectiveness of the medicines. Such medicines are intended to be available in adequate amounts, in appropriate dosage forms and strengths with assured quality.
- They should be available in such a way that an individual or community can afford.
- Drawing an essential medicines list (EML) is expected to result in better quality of medical care, better management of medicines and cost-effective use of health care resources.

## Criteria for inclusion of a medicine in NLEM 2015

The criteria are as follows

- The medicine should be approved/licensed in India.
- The medicine should be useful in disease which is a public health problem in India.
- The medicine should have proven efficacy and safety profile based on valid scientific evidence.
- The medicine should be cost effective.
- The medicine should be aligned with the current treatment guidelines for the disease.
- The medicine should be stable under the storage conditions in India.
- When more than one medicine are available from the same therapeutic class, preferably one prototype/ medically best suited medicine of that class to be included after due deliberation and careful evaluation of their relative safety, efficacy, cost-effectiveness.
- Price of total treatment to be considered and not the unit price of a medicine.
- Fixed Dose Combinations (FDCs) are generally not included unless the combination has unequivocally proven advantage over individual ingredients administered separately, in terms of increasing efficacy, reducing adverse effects and/or improving compliance.
- The listing of medicine in NLEM is based according to the level of health care, i.e. Primary (P), Secondary (S) and Tertiary (T) because the treatment facilities, training, experience and availability of health care personnel differ at these levels.

## Criteria for deletion of a medicine from NLEM 2015

- The medicine has been banned in India.
- There are reports of concerns on the safety profile of a medicine.
- A medicine with better efficacy or favorable safety profiles and better cost-effectiveness is now available.
- The disease burden for which a medicine is indicated is no longer a national health concern in India.
- In case of antimicrobials, if the resistance pattern has rendered a medicine ineffective in Indian context.

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## Dolo and ethics

- Recently, a controversy bubbled up regarding the marketing strategies of Micro Labs, a Bengaluru-based pharmaceutical company. Micro Labs, the maker of Dolo-650, was charged of having bribed medical doctors with freebies worth ₹1,000 crore in one year to promote Dolo-650.

- Dolo is an analgesic and antipyretic
- Analgesics are medications that relieve pain
- Antipyretic: Something that reduces fever
- There's more. Para 1.5 of the Indian Medical Council (Professional Conduct, Etiquette and Ethics) Regulations, 2002 states that every physician should, as far as possible, prescribe drugs with generic names.
- It also states that there is both a rational prescription and use of pharmaceutical drugs.
- This is, of course, rarely done and there is no enforcement.
- This regulation also prohibits the disbursement of gifts
- The solution is two-fold. First, a move to prescriptions without brand names should be the default practice.
- Doctors will then have no incentive to promote particular brands and pharmaceutical companies will have no incentive to give freebies to doctors.
- But even if doctors are not able to recommend a certain brand, pharmacists are.
- And their incentive is to recommend brands that give them the highest trade margins, which are based on the maximum retail price (MRP)

## Water crisis

- The UNESCO United Nations World Water Development Report of 2022 has encapsulated global concern over the sharp rise in freshwater withdrawal from streams, lakes, aquifers and human-made reservoirs, impending water stress and also water scarcity being experienced in different parts of the world

### Growing water stress

- Further, the Water Scarcity Clock, an interactive web tool, shows that over two billion people live in countries now experiencing high water stress; the numbers will continue to increase.
- The Global Drought Risk and Water Stress map (2019) shows that major parts of India, particularly west, central and parts of peninsular India are highly water stressed and experience water scarcity.
- A NITI Aayog report, 'Composite Water Management Index' (2018) has sounded a note of caution about the worst water crisis in the country, with more than 600 million people facing acute water shortages.
- The typical response of the areas where water shortage or scarcity is high includes transfer of



water from the hinterlands/upper catchments or drawing it from stored surface water bodies or aquifers.

- This triggers sectoral and regional competition; rural-urban transfer of water is one such issue of global concern
- Increasing trans-boundary transfer of water between rural and urban areas has been noted in many countries since the early 20th century.

### Urban water use

- According to Census 2011, the urban population in India accounted for 34% of total population distributed in 7,935 towns of all classes.
- It is estimated that the urban population component in India will cross the 40% mark by 2030 and the 50% mark by 2050 (World Urbanization Prospects, 2018).
- The urban population accounted for 50% of the total world population by the end of the last century
- Examining the urban water management trajectory, it is evident that in the initial stages when a city is small, it is concerned only with water supply; in a majority of cases, water is sourced locally, with groundwater meeting the bulk of the supply.
- As the city grows and water management infrastructures develop, dependence shifts to surface water
- Available studies covering Nagpur and Chennai indicate the imminent problem of rural-urban water disputes that the country is going to face in the not-so-distant future as water scarcity grows, which will be further exacerbated by climate change.
- Institutional strengthening can offer entry points and provide opportunities to build flexibility into water resource allocation at a regional level, enabling adjustments in rapidly urbanizing regions.

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### Climate action and cooperative federalism

- Tamil Nadu Chief Minister M. K. Stalin, at the Madurai Corporation Primary School Athimoolam II in Simmakal, Madurai, launched the Chief Minister's Breakfast Scheme for students of Class I to V in government schools.
- The scheme covers around 1.14 Lakh students in 1,545 schools which include 417 municipal corporation schools, 163 municipality schools and 728 taluk and village panchayat-level schools.
- A sum of ₹33.56 crore has been set apart for the scheme

### What was the impact of the mid-day meal scheme on school education?

- After the improved version of the mid-day meal scheme in 1982, the Gross Enrollment Ratio (GER) at primary level (standards I to V) went up by 10% during July-September, 1982 as compared to the corresponding period in 1981

### Where should the programme focus more?

- Anaemia is a major health problem in Tamil Nadu, especially among women and children, says the 2019-21 National Family Health Survey (NFHS)-5's report.
- From 50% during the period of the 2015-16 NFHS-4, the prevalence of anaemia in children now went up to 57%.
- This and many other health issues can be addressed through the combined efforts of the departments of School Education, Public Health and Social Welfare and Women Empowerment

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## Climate action and cooperative federalism

The story so far: Russia hosted the seventh Eastern Economic Forum (EEF) Vladivostok from September 5 to 8. The four-day forum is a platform for entrepreneurs to expand their businesses into Russia's Far East (RFE).

### What is the Eastern Economic Forum?

- The EEF was established in 2015 to encourage foreign investments in the RFE. The EEF displays the economic potential, suitable business conditions and investment opportunities in the region.
- Agreements signed at the EEF increased from 217 in 2017 to 380 agreements in 2021, worth 3.6 trillion roubles.
- As of 2022, almost 2,729 investment projects are being planned in the region.
- The agreements focus on infrastructure, transportation projects, mineral excavations, construction, industry and agriculture

### Who are the major actors in the Forum? What are their interests?

- This year, the Forum aimed at connecting the Far East with the Asia Pacific region.
- China is the biggest investor in the region as it sees potential in promoting the Chinese Belt and Road Initiative and the Polar Sea Route in the RFE.
- China's investments in the region account for 90% of the total investments

- Besides China, South Korea has also been gradually increasing its investments in the region.
- South Korea has invested in shipbuilding projects, manufacturing of electrical equipment, gas-liquefying plants, agricultural production and fisheries
- Japan is another key trading partner in the Far East. In 2017, Japanese investments through 21 projects amounted to \$16 billion.
- Under Shinzo Abe's leadership, Japan identified eight areas of economic cooperation and pushed private businesses to invest in the development of the RFE
- India seeks to expand its influence in the RFE.
- During the forum, Prime Minister Narendra Modi expressed the country's readiness in expanding trade, connectivity and investments in Russia.
- India is keen to deepen its cooperation in energy, pharmaceuticals, maritime connectivity, healthcare, tourism, the diamond industry and the Arctic

#### What does the EEF aim for?

- The primary objective of the EEF is to increase the Foreign Direct Investments in the RFE.
- The region encompasses one-third of Russia's territory and is rich with natural resources such as fish, oil, natural gas, wood, diamonds and other minerals. The sparse population living in the region is another factor for encouraging people to move and work in the Far East.
- The region's riches and resources contribute to five percent of Russia's GDP. But despite the abundance and availability of materials, procuring and supplying them is an issue due to the unavailability of personnel.
- The RFE is geographically placed at a strategic location; acting as a gateway into Asia.
- The Russian government has strategically developed the region with the aim of connecting Russia to the Asian trading routes.
- With the fast modernization of cities like Vladivostok, Khabarovsk, Ulan-Ude, Chita and more, the government aims to attract more investments in the region.
- Russia is trying to attract the Asian economies in investing and developing the far east

#### Will India be able to achieve a balance between the EEF and the Indo-Pacific Economic Framework for Prosperity (IPEF)?

- The U.S.-led Indo-Pacific Economic Framework for Prosperity (IPEF) and the EEF are incomparable based on its geographic coverage and the partnership with the host-countries.
- India has vested interests in both the forums and has worked towards balancing its involvement.
- India has not shied away from investing in the Russia-initiated EEF despite the current international conditions. At the same time, India has given its confirmation and acceptance to

three of the four pillars in the IPEF.

- The country understands the benefits of being involved in the development in the RFE but it also perceives the IPEF as a vital platform to strengthen its presence in the Indo-Pacific region.
  - The IPEF also presents an ideal opportunity for India to act in the region, without being part of the China-led Regional Comprehensive Economic Partnership or other regional grouping like the Comprehensive and Progressive Agreement for Trans-Pacific Partnership .
  - The IPEF will also play a key role in building resilient supply chains. India's participation in the forum will help in disengaging from supply chains that are dependent on China and will also make it a part of the global supply chain network.
  - Additionally, the IPEF partners will act as new sources of raw material and other essential products, further reducing India's reliance on China for raw materials
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### Climate change and monsoon

- The problem is that it is very challenging for us to understand the situation, which calls for a lot more research.
- Persistence of intense La Nina conditions, the abnormal warming of East Indian Ocean, negative Indian Ocean Dipole (IOD), southward movement of most of the monsoon depressions and lows and pre-monsoon heating over the Himalayan region are melting glaciers
- There is more evidence coming our way on how global warming has been impacting the Indian monsoon.
- Most of the monsoon weather systems have been travelling across central parts of the country, changing the area of rainfall.
- But we did see a large regional and temporal variability in rainfall this year.
- Our research shows that global warming increases the fluctuations in the monsoon, resulting in both long dry periods and short spells of heavy rains.
- This year, the monsoon was potentially influenced by La Nina also the cooler than usual Pacific conditions,
- One of the major impacts of changes in track of monsoon systems can be seen on kharif crops, particularly rice production.
- They form a significant share of more than 50% of total food grain production during this period.
- Bihar, West Bengal and Uttar Pradesh, which account for a third of the country's total rice production, have been highly deficit despite an active monsoon current in July and August.
- These uneven distribution rains along with increasing temperatures and humidity give rise to pest

attacks and diseases. This will, in turn, impact the quality of the grain as well as the nutrition value may vary

- Drought, on the other hand, reduces plant transpiration rates and may result in leaf rolling and drying, reduction in leaf expansion rates and plant biomass, immobilization of solutes and increased heat stress of leaves.
  - Recent research indicates that monsoon rainfall became less frequent but more intense in India during the latter half of the 20th century
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### Ecology and Agriculture economics

- An ecological niche is the right set of environmental conditions under which an animal or plant species will thrive.
- A range of ecological niches can occur within an ecosystem.
- Biodiversity is the result of these niches being occupied by species that are uniquely suited to them.
- Desert plants, for example, are suited for dry, arid ecological niches because they have the ability to store water in their leaves
- As the world's climate undergoes change, the ability of existing species to hold on to their biogeographic niches may be altered.
- This has an important bearing on agriculture, as practices and crop choices that have worked well for centuries may no longer be ideal.
- Factors that are altered by such changes include the availability of food and nutrients, occurrence of predators and competing species.
- Non-living, or abiotic factors also affect ecological niches.
- These include temperature, amount of available light, soil moisture, and so on.
- *Crocus sativus*, the saffron plant, is propagated through underground stems called corms. It is thought to be a native of Greece, and grows best under mediterranean climate conditions.
- Today, Iran grows nearly 90% of the world's saffron.
- India produces 5% of the world's saffron.
- Historically, some of the world's most prized saffron has been grown in old lake beds of Kashmir
- The study identified 4,200 square kilometer of new areas suitable for saffron cultivation in places in Jammu and Kashmir, Himachal Pradesh, North Sikkim, Imphal, Manipur and Udagamandalam, Tamil Nadu.



## Induced Pluripotent Stem (iPS) cell

- Small trials are sparking fresh enthusiasm for induced pluripotent stem (iPS) cell research.
  - iPS cells are adult cells that have been coaxed into an embryonic-like state and can develop into any cell type in the body.
  - The studies involved repairing the cornea and treating heart diseases, macular degeneration and Parkinson's disease.
  - Induced pluripotent stem (iPS) cells, are a type of pluripotent stem cell derived from adult somatic cells that have been genetically reprogrammed to an embryonic stem (ES) cell-like state through the forced expression of genes and factors important for maintaining the defining properties of ES cells
  - iPSC are derived from skin or blood cells that have been reprogrammed back into an embryonic-like pluripotent state that enables the development of an unlimited source of any type of human cell needed for therapeutic purposes
- 

## Saturn tilt

- Swirling around the planet's equator, the rings of Saturn are a dead giveaway that the planet is spinning at a tilt.
- The belted giant rotates at a 26.7-degree angle relative to the plane in which it orbits the sun.
- Astronomers have suspected that this tilt comes from gravitational interactions with Neptune, as Saturn's tilt precesses at nearly the same rate as the orbit of Neptune.
- But a new modelling study by astronomers at MIT and elsewhere has found that, while the two planets may have once been in sync, Saturn has since escaped Neptune's pull
- The researchers propose in a study (Science) that Saturn, which today hosts 83 moons, once harboured one more, an extra satellite that they name Chrysalis.
- Together with its siblings, Chrysalis orbited Saturn for several billion years, tugging on the planet in a way that kept its tilt, says a release.
- But around 160 million years ago, the team estimates, Chrysalis became unstable and came too close to its planet that pulled the satellite apart.
- The loss of the moon was enough to leave Saturn with the present-day tilt
- The researchers surmise, while most of Chrysalis' shattered body may have made impact with Saturn, a fraction of its fragments could have remained suspended in orbit, eventually breaking into small icy chunks to form the planet's signature rings.

- The missing satellite, therefore, could explain two long standing mysteries: Saturn's present-day tilt and the age of its rings, which were previously estimated to be about 100 million years old much younger than the planet itself

## Atomic clocks and quantum entanglement

High-precision atomic clocks and quantum entanglement, to achieve two atomic clocks that are “entangled.”

- This means the inherent uncertainty in measuring their frequencies simultaneously is highly reduced.
- While this is a proof-of concept experiment, it has the potential for use in probing dark matter, precision geodesy and other such applications
- Quantum entanglement is the physical phenomenon that occurs when a group of particles are generated, interact, or share spatial proximity in a way such that the quantum state of each particle of the group cannot be described independently of the state of the others, including when the particles are separated by a large distance.
- An atomic clock is a clock that measures time by monitoring the resonant frequency of atoms. It is based on atoms having different energy levels.
- Electron states in an atom are associated with different energy levels, and in transitions between such states they interact with a very specific frequency of electromagnetic radiation.
- This phenomenon serves as basis for the International System of Units' (SI) definition of a second
- The topic of quantum entanglement is at the heart of the disparity between classical and quantum physics: entanglement is a primary feature of quantum mechanics not present in classical mechanics.
- Measurements of physical properties such as position, momentum, spin, and polarization performed on entangled particles can, in some cases, be found to be perfectly correlated.
- Atomic clocks grew in accuracy and became so dependable that in 1967, the definition of a second was revised to be the time taken by 9,192,631,770 oscillations of a cesium atom.
- At the start of the 21st century, the cesium clocks that were available were so accurate that they would gain or lose a second only once in about 20 million years.
- At present, even this record has been broken and there are “optical lattice clocks” that are so precise that they lose a second only once in 15 billion years
- two strontium atoms separated in space by a small distance, can be pushed into an “entangled

state” so that a comparison of their frequencies becomes more precise

- Potential applications of this when extended in space and including more nodes than two, are in studying the space-time variation of the fundamental constants and probing dark matter — deep questions in physics. In quantum physics, entanglement is a weird phenomenon described as a “spooky action at a distance” by Albert Einstein.
  - Normally, when you consider two systems separated in space that are also independent and you wished to compare some physical attribute of the two systems, you would make separate measurements of that attribute and this would involve a fundamental limitation to how precisely you can compare the two — for two separate measurements have to be made.
  - On the other hand, if the two were entangled, it is a way of saying that their physical attributes, say spin, or in this case, the frequency, vary in tandem.
  - Measuring the attribute on one system, tells you about the other system.
  - This in turn improves the precision of the measurement to the ultimate limit allowed by quantum theory
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### Lumpy skin disease



- The lumpy skin disease (LSD) virus that has killed at least 50,000 cattle in India this year may be structurally different from the version of the virus prevalent in India in 2019, raising questions on whether the new vaccine being developed for safeguarding cattle may be adequately protective.
- This is significant as Lumpi-ProVacInd, a vaccine developed by the Indian Veterinary Research Institute, and the Indian Council of Agricultural Research (ICAR) National Research Centre on Equines is based on LSD virus samples from cattle in Ranchi afflicted in the 2019 outbreak
- Lumpy skin disease is caused by the lumpy skin disease virus (LSDV), which belongs to the genus capripoxvirus, a part of the poxviridae family (smallpox and monkeypox viruses are also a part of the same family). The LSDV shares antigenic similarities with the sheep pox virus (SPPV) and the goat pox virus (GTPV) or is similar in the immune response to those viruses.
- It is not a zoonotic virus, meaning the disease cannot spread to humans.
- It is a contagious vector-borne disease spread by vectors like mosquitoes, some biting flies, and ticks and usually affects host animals like cows and water buffaloes.

- According to the United Nations Food and Agriculture Organization (FAO), infected animals shed the virus through oral and nasal secretions which may contaminate common feeding and water troughs.
- Thus, the disease can either spread through direct contact with the vectors or through contaminated fodder and water.
- Studies have also shown that it can spread through animal semen during artificial insemination.
- LSD affects the lymph nodes of the infected animal, causing the nodes to enlarge and appear like lumps on the skin, which is where it derives its name from

#### What is the geographical distribution and how did it spread to India?

- The disease was first observed in Zambia in 1929, subsequently spreading to most African countries extensively, followed by West Asia, Southeastern Europe, and Central Asia, and more recently spreading to South Asia and China in 2019

#### What are the economic implications?

- The spread of the disease can lead to “substantial” and “severe” economic losses according to FAO and the World Organization for Animal Health (WOAH).
- The disease leads to reduced milk production as the animal becomes weak and also loses appetite due to mouth ulceration.
- The income losses can also be due to poor growth, reduced draught power capacity and reproductive problems associated with abortions, infertility and lack of semen for artificial insemination.
- Movement and trade bans after infection also put an economic strain on the whole value chain
- India is the world’s largest milk producer at about 210 million tonnes annually. India also has the largest headcount of cattle and buffalo worldwide.
- In Rajasthan, which is witnessing the worst impact of LSD , it has led to reduced milk production, which lessened by about three to six Lakh litres a day
- The FAO has suggested a set of spread control measures for LSD, which involves vaccination of susceptible populations with more than 80% coverage, movement control of bovine animals and quarantining, implementing biosecurity through vector control by sanitizing sheds and spraying insecticides, strengthening active and passive surveillance;
- Spreading awareness on risk mitigation among all stakeholders involved, and creating large protection and surveillance zones and vaccination zones.
- The Union Ministry of Fisheries, Animal Husbandry and Dairying informed that the ‘Goat Pox Vaccine’ is “very effective” against LSD and is being used across affected States to contain the

spread

- The affected States have put movement bans in place and are isolating infected cattle and buffaloes, spraying insecticides to kill vectors like mosquitoes, with some affected States such as Maharashtra, Rajasthan, Delhi, and Uttar Pradesh also setting up dedicated control rooms and helpline numbers to guide farmers whose cattle have been infected.
- In a major breakthrough, two institutes of the Indian Council of Agricultural Research (ICAR) have developed an indigenous vaccine for LSD, which the Centre plans to commercialize and roll out in the next three to four months.

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## Proof of stake v/s proof of work

### The story so far:

- On September 15, the Ethereum blockchain fully transitioned to a new way of processing transactions.
- This is an important day for crypto trackers as the Ethereum's Merge event, as it is known, could change the nature of crypto and Web3 itself.
- Developers say the transition to what is called a 'proof-of-stake' consensus mechanism will cut Ethereum's energy consumption by 99.95%

### What is Ethereum?

- Ethereum is one of the most used platforms by developers to build decentralized apps (dApps), smart contracts, and even crypto tokens.
- The platform's currency, Ether is only second to Bitcoin (BTC) in terms of market capitalization.
- The change in the way Ethereum builds the blockchain comes with not just environmental consequences, but also major cyber and financial security implications.

## Proof of stake



The probability of validating a new block is determined by how large of a stake a person hold.



The validators do not receive a block reward, instead they collect network fees as their reward.

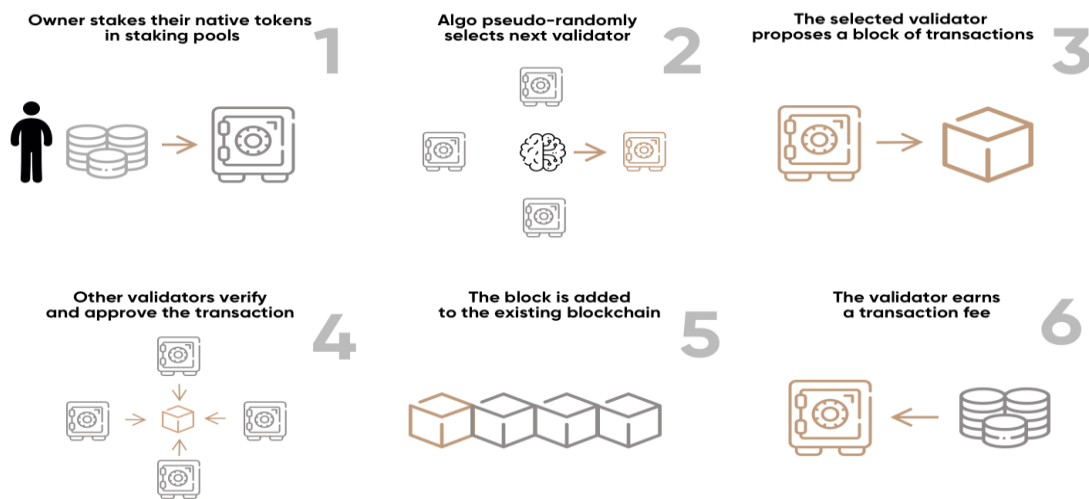


Proof of stake systems can be much more cost and energy efficient than proof of work, but are less proven.

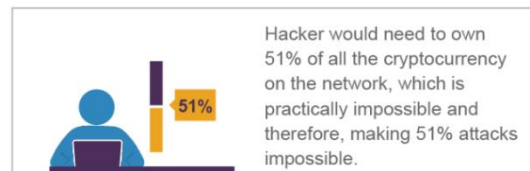
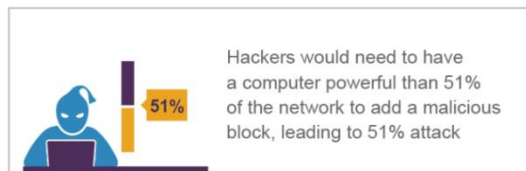
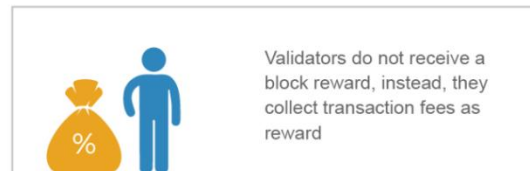
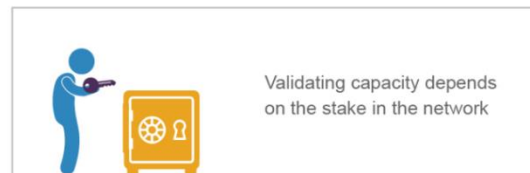
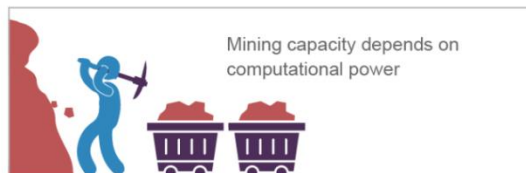
## What is the importance of consensus mechanisms? Why is there a need for a new mechanism?

- Decentralized transactions are processed on blockchains using consensus mechanisms.
- Ethereum's former method, 'proof-of-work', which is also used by Bitcoin, needs powerful mining hardware that consumes a lot of electricity and generates enormous amounts of heat.
- This energy is then used to process extremely difficult mathematical puzzles, the solution of which would let new transactions be added to the blockchain so as to reward the miners with crypto.

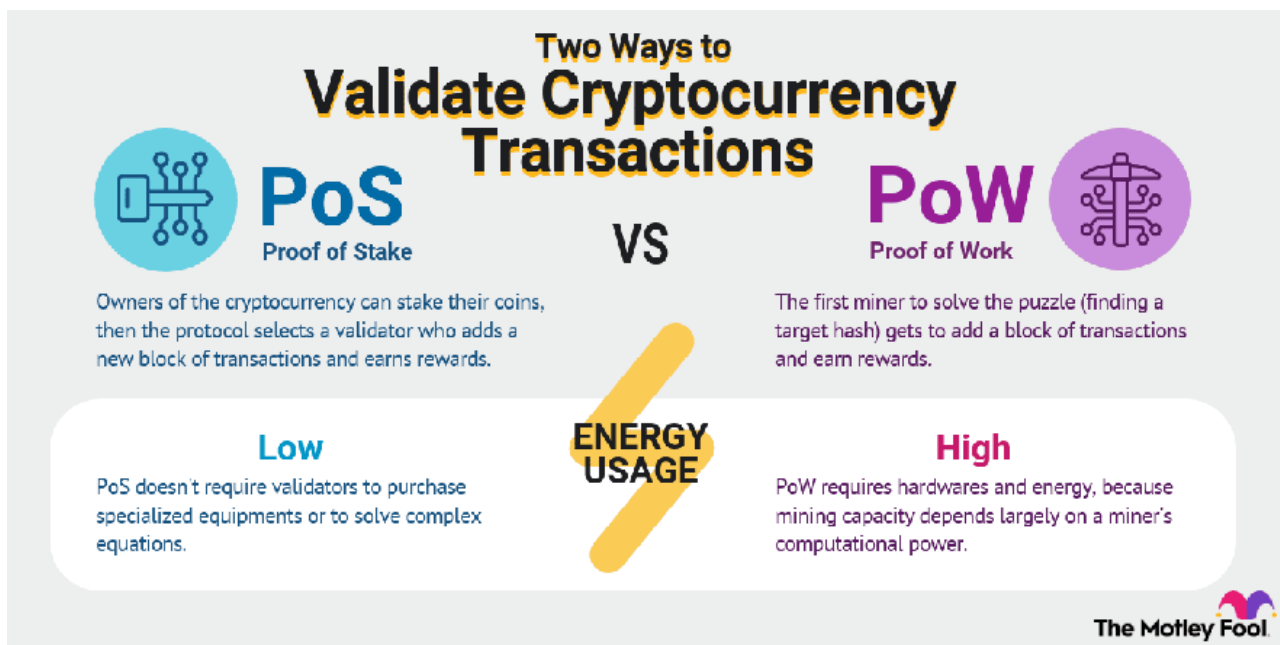
### HOW STAKING WORKS IN THE PROOF-OF-STAKE CONSENSUS MECHANISM



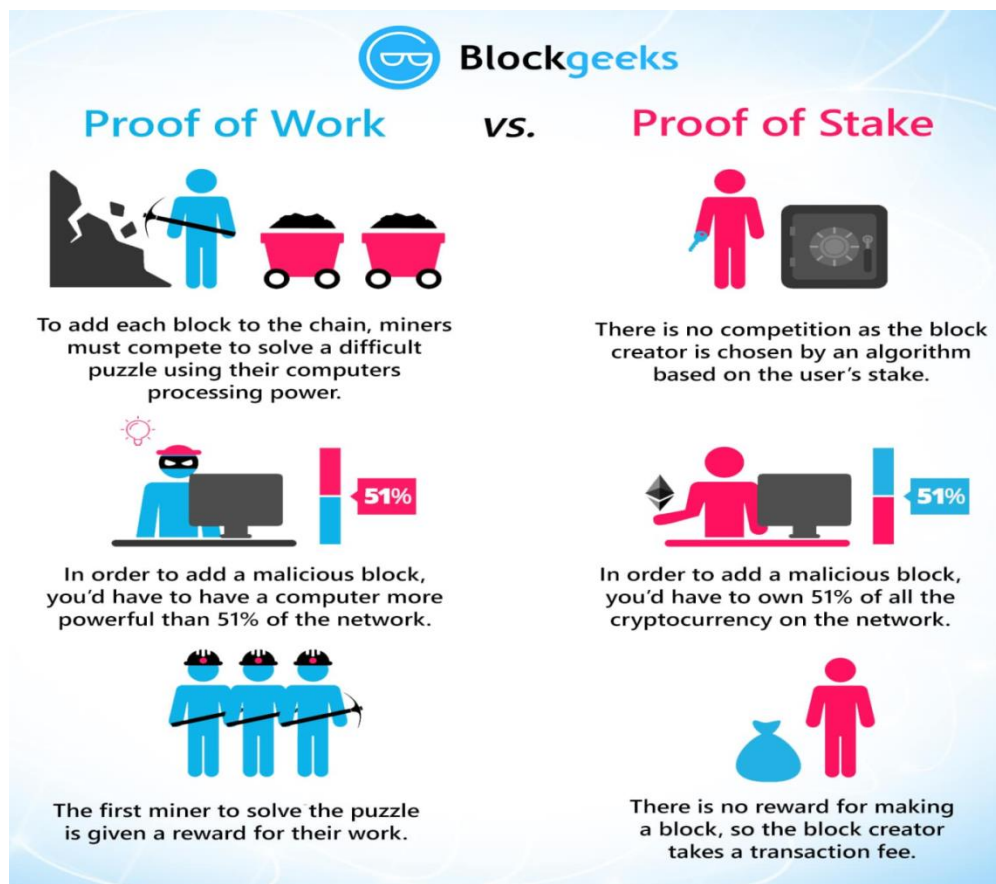
## Proof of Work VS Proof of Stake







- Many environmentalists, policy makers, and regulators have strongly criticized the impact of Bitcoin mining on local communities.



- Common centres for mining included China (before a near total crypto ban), the U.S., Russia, and Kazakhstan — countries with cheap electricity rates and colder climate

- Ethereum's website admitted that their crypto's total annualized power consumption nearly matches that of Finland while its carbon footprint is comparable to Switzerland.
- For some time, European countries even mulled a crypto mining ban, while China actually carried out a nationwide crackdown on crypto miners, sending them fleeing overseas.
- Ethereum has decided to switch to a 'proof-of-stake' consensus mechanism, where Ether owners will stake their own coins in order to serve as collateral and help process new blockchain transactions, in return for rewards.
- Some Bitcoin supporters go so far as to say that miners' activities, though harmful to the environment now, will help bring about an energy revolution and the faster adoption of solar, wind, gas, and nuclear energy.
- However, consequences of crypto mining across the globe have included mass electricity blackouts, fire accidents, overburdened grids, struggles between locals and crypto miners for more control over the energy supply, and even crypto mining on indigenous land.

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### Why flood in Bengaluru?

- Higher rates of evaporation from oceans, seas and land are pumping larger amounts of water vapour into the atmosphere in shorter periods of time.
- A warmer atmosphere is able to hold more water vapour, and this has led to an increase in heavy downpours.
- Further, with the warming of the Arabian Sea, cyclonic storms that were earlier largely associated with the Bay of Bengal and the eastern coast are now impacting cities and settlements on the western coast.
- In the coming decades, such extreme rain events are likely to increase. Bengaluru had several advantages compared to many other Indian cities: a high elevation, an undulating topography, interconnected lakes, green spaces that helped soak rain, and rajakaluves (storm-water drains) that helped convey excess runoff.
- Most of these natural as well as human made advantages have been squandered away, both legally and illegally, exacerbating the city's risk and vulnerability to floods
- We have drastically altered the hydrology of Bengaluru at various spatial scales, from local storm-water drains to entire basins and valleys.
- At the city scale, linear infrastructure such as the Outer Ring Road has disrupted natural hydrologic connectivity across the entire watershed.

- At local scales, piles of garbage in smaller drains kickstart a cascade of flood hazards
- As a result, impervious surfaces which have limited to zero ability to allow infiltration of water have increased from 86 sq. km to 213 sq. km.
- What this means is, even 0.01m (10mm) of rain on such surfaces would mean a runoff potential of 2.1 million
- cubic meters of water, and 100 mm (as what Bengaluru experienced recently) would mean a run off of a whopping 21 million cubic meters of water
- The surface area of water bodies in the Varthur watershed declined from around 4.7 sq. km to 3.5 sq. km, suggesting that increased awareness and protection may have worked to limit big encroachments in recent years.
- However, lakes and natural depressions may not always fill up during many monsoons.
- It is not only the physical quantity of the runoff that poses a hazard. When polluted drains and lakes overflow, the flood can pose a health hazard especially to vulnerable and exposed marginal communities living in informal settlements.
- Urbanization is a global and inevitable process, and with cities as engines of the economy, built-up areas will continue to grow

### The way ahead

- For one, a combination of deft, hard and well-designed civil and hydrologic re-engineering is essential to undo the damage from earlier developments, and to invest in ‘blue’ and ‘green’ infrastructure with accountable governance and management to make this successful.
- On a city scale, the potential to restore hydrologic connectivity using mitigation measures across larger, linear hydrologic barriers such as the Outer Ring Road should be explored.
- Locally, citizens, local ward officials and staff will need to work together to minimize dumping of solid waste and garbage in storm-water drains.
- It is important that restoring storm-water drains and hydrologic connectivity at local scales must be done justly, taking into account the impact on vulnerable sections of society and informal settlements.
- All remaining green spaces of the city, grasslands, campuses, and lakes must be seen as much needed lungs and shock absorbers of Bengaluru.
- Early-warning systems using sensors across water bodies and drains, and a network of communication for hotspots of emerging flood risk in the wet-season should be put in place.
- Ability to conserve our last remaining grasslands, lakes, green spaces and invest in hydrologically and ecologically informed infrastructure and buildings can lead to better and safer Bengaluru.

## Spotted deer

- The chital also known as spotted deer, chital deer, and axis deer, is a deer species native to the Indian subcontinent. It was first described and given a binomial name by German naturalist Johann Christian Polycarp Erxleben in 1777
  - It is sexually dimorphic; males are larger than females, and antlers are present only on males.
  - The chital is listed on the IUCN Red List as least concern "because it occurs over a very wide range within which there are many large populations".
  - The chital ranges over 8–30°N in India and through Nepal, Bhutan, Bangladesh, and Sri Lanka.
  - The western limit of its range is eastern Rajasthan and Gujarat.
  - The northern limit is along the Terai belt of the foothills of the Himalaya and from Uttar Pradesh and Uttaranchal through to Nepal, northern West Bengal and Sikkim and then to western Assam and the forested valleys of Bhutan, which are below an elevation of 1,100 m (3,600 ft).
  - The eastern limit of its range is through western Assam to the Sundarbans of West Bengal and Bangladesh. Andaman and Nicobar Islands and Sri Lanka are the southern limits.
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## Fire safety

- The horrific fire accident on September 12 in Secunderabad, Telangana
- A report by the Regional Fire Officer pointed out several irregularities, including absence of set-back spaces and escape routes, defunct firefighting equipment, spiral staircase around the elevator shaft, basement utilized illegally for commercial purposes, and absence of smoke management and emergency lighting
- Applicability of fire safety norms is another gap through which several builders escape.
- Almost all commercial establishments where fire mishaps took place in recent past did not fall into the category

### Fire safety norms

- The residents need to conduct Fire Safety Audits in every half-yearly and submit its report to the regulated fire department.
- Hazard Identification & Risk Assessment (HIRA) shall focus on identifying potential hazards.
- A comprehensive Fire Safety Audit will address the inherent fire hazards of the daily activities in occupancy and shall recommend fire measures to reduce them.
- Each Municipal Corporation having a population of more than 1 million must put in a fire

hazard response and prevention plan for their respective jurisdictions.

- 13th Finance commission recommendation on fire safety must get implemented.
- A part of the grant allocated by the commission to the Urban Local Bodies (ULBs) must get utilized on refurbishing the Fire services in their jurisdiction.
- The Urban Local Bodies (ULBs) shall provide financial support to State Fire Services Department

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### Rupees depreciation

The rupee is yet again facing renewed pressure, along with major peers, as the dollar continues to strengthen in the wake of the Federal Reserve's latest jumbo 75 basis points interest rate increase and the U.S. central bank's unequivocal message that it remains squarely focused on taming inflation

- The rupee's slide was softened by the Reserve Bank of India's intervention to smoothen volatility
- The fact that the rupee is not alone in depreciating against the dollar can be of little comfort to Indian companies reliant on imports of raw materials or services for the smooth functioning of their businesses
- The higher import bill is also bound to add inflationary pressures to an economy already beset by persistently elevated inflation and further complicates monetary policy makers' efforts to rein in the price gains.
- The rupee's more than 8% depreciation against the dollar so far in 2022, with almost all of the weakening having occurred in the wake of Russia's invasion of Ukraine
- Overseas portfolio investors too have once again turned net sellers of Indian stocks and debt in the last two sessions after having resumed their purchases of local assets
- Overseas portfolio investors too have once again turned net sellers of Indian stocks and debt in the last two sessions after having resumed their purchases of local assets
- And the Fed's projection of further steep monetary tightening, of at least another 125 basis points, is only likely to lead to more outflows over the last quarter of this year.
- With the rupee's real effective exchange rate (REER), or trade-weighted average of its value, also signaling that the Indian currency is still overvalued, the RBI's rate setting panel will have a fine tightrope to walk next week as it battles to restore a semblance of price stability without choking growth and by ensuring the rupee does not weaken too sharply.

#### What is a Real effective exchange rate (REER)?

- REER is the weighted average of a country's currency as compared to an index or basket of other

major currencies.

- A comparison of the relative trade balance of a country's currency against each country within the index tells about the weightage.
  - This exchange rate is used to determine an individual country's currency value relative to the other major currencies in the index.
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### Sea turtle poaching

- The first worldwide estimate of the number of adult sea turtles moved on the black market suggests that 1.1 million of the reptiles were illegally harvested between 1990 and 2020
  - But poaching is dropping sharply, and most populations worldwide are doing well.
  - But researchers also found that the illegal catch has declined in the past decade 2010 to 2020 by nearly 30%, with some exceptions occurring in large, stable, and genetically stable diverse marine turtle populations.
- 

### Recombinant viruses

- Lumpy Skin Disease (LSD) is a viral disease that predominantly affects cattle.
- First identified in an outbreak in Zambia in 1929, the disease is caused by the LSD virus (LSDV), a poxvirus of the genus capripoxvirus
- In 2016, LSD was reported from Russia and South-East European nations. In the Indian subcontinent, the disease was initially observed in Bangladesh in 2019, followed by China, India, Nepal, Bhutan, Vietnam, Hong Kong and Myanmar
- Adaptation of poxviruses is dominated by genomic mutations, deletions and recombinations.

#### Recombinant viruses

- A recombinant virus may occur naturally or be produced by recombining pieces of DNA using recombinant DNA technology.
- This may be used to produce viral vaccines or gene therapy vectors.
- The term is also used to refer to naturally occurring recombination between virus genomes in a cell infected by more than one virus strain.
- This occurs either by Homologous recombination of the nucleic acid strands or by reassortment of genomic segments.



- Both these and mutation within the virus have been suggested as ways in which influenza and other viruses evolve.
- Recombination events are now well catalogued in poxviruses and mediated by the poxvirus DNA polymerases in cells being co-infected by viruses of same or different genus.
- Recombination of pathogenic and vaccine strains are, therefore, likely when an infected animal is immunized or infection occurs in the pre-immune phase after vaccination.
- We need to accept that animal and plant health are key to human health, and forms the basis of One Health.
- As we move towards industrialized agriculture in the era of climate change, the need has never been acute for preparedness with newer and better tools like molecular surveillance and digital technologies to identify and stop emerging pathogens

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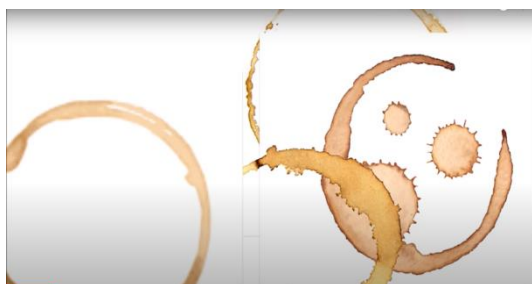
### Working of antivirals drugs

Pfizer's PAXLOVID™ is an investigational SARS-CoV-2 protease inhibitor antiviral therapy, specifically designed to be administered orally so that it can be prescribed at the first sign of infection or at first awareness of an exposure, potentially helping patients avoid severe illness which can lead to hospitalization and death

#### Working of Antiviral drugs

- Rather than killing a virus directly, antivirals usually suppress the virus's ability to infect and multiply in your cells. These drugs often work by inhibiting molecular interactions and functions needed by the virus to produce new copies of itself.
- The way a drug produces its therapeutic effect is called its mechanism of action. Antivirals are often delivered in combinations that have different mechanisms of action.
- This helps to prevent the emergence of mutated drug-resistant viral strains that can bypass the effects of a single drug.
- For example, combination antiviral therapy is now the standard of care in HIV and hepatitis C virus infections. It is highly desirable to develop multiple antivirals whenever possible.

## Coffee ring effect



For about two decades now, the ‘coffee ring effect’ has been known as when a drop of spilt coffee dries up, the outermost edge of the dried drop is a little darker than the centre, forming a darker ‘ring’.

- This is caused by the outward drift of suspended coffee particles from the centre, causing a denser, darkened

rim.

- Now, researchers from Indian Institute of Technology, Madras, have shown that after reaching the rim, as the drop dries, some of the particles undergo an inward drift too.
- This research has applications in agriculture, forensic science and even disease diagnosis.
- The inward movement takes place because the particles are ‘squished’ between the solid plate and the evaporating liquid interface.
- Hence, the ‘coffee’ ring is not formed at the point where the liquid touches the solid, but there is a small gap between the outermost edge and the ring.

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## Perseverance

### Why in news?

- Since July, NASA’s Perseverance rover has drilled and collected four slim cores of sedimentary rock, formed in what was once a river delta on Mars.
- They are the first of this type of rock to be gathered on another world — and scientists are excited because at least two of the cores probably contain organic compounds, which, on Earth, are often associated with living things

### About Perseverance

Mission Name: Mars 2020

Rover Name: Perseverance

Main Job: Seek signs of ancient life and collect samples of rock and regolith (broken rock and soil) for possible return to Earth.

Launch: July 30, 2020

Landing: Feb. 18, 2021, Jezero Crater, Mars

- Following the rover's arrival, NASA named the landing site Octavia E. Butler Landing.

- Perseverance has a similar design to its predecessor rover, Curiosity, although it was moderately upgraded. It carries seven primary payload instruments, nineteen cameras, and two microphones.
- The rover also carried the mini-helicopter Ingenuity to Mars, an experimental aircraft and technology testbed that made the first powered flight on another planet

## Triple dip La Nina

### When does the monsoon withdraw?

- The monsoon begins its withdrawal from the last State it reaches, which is Rajasthan.
- Around September 15, cyclonic systems from the Arabian Sea and the Bay of Bengal that fuel the monsoon from June to September are replaced by an 'anti-cyclone' circulation which means dry, windless conditions start to prevail over western and northern India.
- More technically, withdrawal is a cessation of rainfall activity over northwest India for five straight days, an anticyclone establishing itself in the lower troposphere and a marked reduction in moisture content

### What led to excessive rains in southern and central India?

- In April, the IMD had forecast 'normal' rains over India but by May-end indicated it to be above normal.
- Central India and the southern peninsula were expected to get 6% more than their historical average but what we have seen are rains far in excess of this.
- These heavy rains are premised on a La Nina, the converse phenomenon of the El Nino and characterized by cooler than normal sea surface temperatures in the central Pacific.
- While, El Ninos are linked to reduced rains over India, La Ninas indicate surplus rainfall.
- India is seeing an extended spell of the La Nina, called a 'triple dip' La Nina which is a phenomenon lasting across three winter seasons in the northern hemisphere.
- This is only the third time since 1950 that a triple dip La Nina has been observed.

### Are monsoon patterns changing?

- Since 2019, monsoon in India has returned surpluses, barring a slight dip last year.
- The June-September rainfall in 2019 was 10% more than the 88 cm that India usually gets
- . In 2020, India saw 9% more rain with August registering 27% more rain and September 4% more than its usual quota.
- The rainfall over the country as a whole, in 2021, was 1% less than normal though rainfall in

September was a remarkable 35% above what is usual.

- This year the monsoon is already in surplus by about 6% and a vigorous September is likely to see India post yet another year of surplus rain

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## UNSC reform

- At the heart of India's participation in the 77th General Assembly is the call for a 'reformed multilateralism' through which the United Nations Security Council should reform itself into a more inclusive organization representing the contemporary realities of today.
- India's call for this structural overhaul of global multilateral institutions incorporates institutional accountability and a wider representation of the developing countries.
- For a global organization such as the UN, growing stakes of developing countries in the Security Council could foster trust and leadership across the world.
- The theme of the 77th General Assembly, which seeks "A watershed moment: Transformative Solutions to Interlocking Challenges", places India right in the midst as a strong partner of the UN
- The COVID-19 pandemic was a weak moment for UN's multilateralism.
- It highlighted the UN's institutional limitations when countries closed their borders, supply chains were interrupted and almost every country was in need of vaccines
- Countries of the global South, including India, which stepped up through relief efforts, drug distribution and vaccine manufacturing, have created space for a more inclusive UN, particularly through its Security Council (UNSC) reform

## The UN's faultlines

- Second, UN-led multilateralism has been unable to provide strong mechanisms to prevent wars.
- The shadow of the ongoing Russia-Ukraine war has loomed large over several deadlocks in UNSC resolutions since the war broke out in February this year
- Finally, China's rise, belligerence and aggression which has been on display through its actions in the South China Sea, the Indo-Pacific region, and now increasingly globally, have also underscored the limitations of the UN-style multilateralism
- China's control of multilateral organizations, including the UN, is only increasing — most recently seen in the unofficial pressure China exerted on the former UN's human rights chief, Michelle Bachelet, to stop the release of a report by the UN Human Rights Council on the condition of Uyghurs in China.
- Moreover, China's unabashed use of veto power against India continues at the UN.

- In the most recent case, it blocked a joint India-U.S. proposal at the UN to enlist Sajid Mir, a top Lashkar-e-Taiba (LeT) operative involved in directing the 2008 Mumbai attacks, as a ‘global terrorist
- India hosting of a ministerial meeting of the G4 (Brazil, India, Germany and Japan) holds special significance.
- Another high-level meeting of the Indian delegation with the L.69 Group, on “Reinvigorating Multilateralism and Achieving Comprehensive Reform of the UN Security Council”, will be critical in the planning of the next steps.
- The L.69 group’s vast membership spread over Asia, Africa, Latin America, Caribbean and Small Island Developing States could bring about a wider global consensus on the issue of the UNSC reforms.
- The UN’s responses to both global and regional events have evinced a clear space for leadership and representation, as much as they have depicted its institutional inability to lead globally on its own.
- With starker divisions between countries as result of the Russia-Ukraine war and lingering pandemic-induced restrictions, the need for the UN’s reform is likely to be felt more palpably than ever before.
- Beyond the UN, the Minister’s participation in plurilateral meetings of the Quad (Australia, India, Japan, the U.S.), IBSA (India, Brazil and South Africa), BRICS (Brazil, Russia, India, China and South Africa), Presidency Pro Tempore CELAC (Community of Latin American and Caribbean States), India-CARICOM (Caribbean Community) and other trilateral formats, such as India-France-Australia, India-France-the United Arab Emirates and India-Indonesia-Australia underlines India’s search for new frameworks of global governance, amidst growing frustration with the extant multilateral order

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### Improving sports culture -and soft power

- First, India should concentrate on forging MoUs with nations that excel in specific sports.
- The aim should be to train Indian players overseas.
- For example, Australia and the United Kingdom can assist us in swimming given their standing here.
- When it comes to running, negotiating collaborative training agreements with African countries such as Kenya would be ideal.

- Take this example too: China has requested Indian assistance in improving cricket development in China (Chongqing city).
- Second, TOPS China too also had a similar scheme has demonstrated that focusing on a few sports is beneficial for a country such as India, which is striving to enhance its sporting abilities and standing.
- India needs to boost the number of athletes under TOPS at least 500 athletes should train under the scheme to foster a competitive climate, in turn aiding performance.
- Third, private investment needs to be harnessed to develop infrastructure.
- The better a country performs in sporting events the greater a sports person's interest in their sports atmosphere.
- This also creates a huge market for private players to invest in.
- For example, leading corporate houses in India have already shown how their active participation and investment can improve sporting performance as a result of unique corporate sports programmes
- The Government should also work on a public-private partnership (PPP) model to create basic sporting infrastructure, as recommended by NITI Aayog, at the district level so that talent can be captured at an early stage
- "Soft power", is a "power of attraction through culture, political ideas, and policies rather than coercion" that military hard power exhibits

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### Space as social product

Social theorists like Edward Soja and Andrzej Zieleniec have theorized about individuals' interactions with space and how space becomes a social product and a place for practicing discrimination.

- Spatial vulnerability results from the intersection of social relations of production, class relations, institutional relations and entitlement relations.
- Considering the private plantation land as a social space, the authors explain how the land is symbolic of the economic vulnerability of the labourers which has its roots in the history of slave labour, and how this vulnerability forces them to continue living and working in such deplorable conditions.
- The company, with its ownership of the space, claims power over the workers.
- The social exclusion of the community pervades public discourses and government policies as they are considered mere beneficiaries of State schemes



## Semiconductor industry

- The basic component of a semiconductor chip is a sliver of silicon, which is etched with billions of microscopic transistors, forming patterns to control the flow of current while following different computational instructions
- The chip-making industry is a highly-concentrated one, with the big players being Taiwan, South Korea and the U.S.
- Therefore, the global chip shortage, U.S.-China tensions over Taiwan, and the supply chain blockages owing to the Russia-Ukraine conflict have led major economies to enter the chip-making sector with a renewed push.

### What are the changes to India's chip-making scheme?

- In December 2021, India announced its roughly \$10 billion dollar production linked incentive (PLI) scheme to encourage semiconductor and display manufacturing in the country.
- It also announced fiscal support for a design-linked initiative (DLI) scheme to drive global and domestic investment related to design software, IP rights etc.
- According to the Electronics and IT Ministry, semiconductor demand in India would increase to \$70-\$80 billion by 2026 with the growing demand for digital devices and electronic products
- . In the previous version of the scheme, the Centre was offering to fund 30% of the project cost for 45nm to 65nm chip production, 40% for 28nm to 45nm, and 50% or half of the funding for chips 28nm or below.
- The modified scheme provides uniform 50% fiscal support for all nodes. Besides, it will provide 50% of capital expenditure for other steps of the process as well (chip design and ATMP).
- . In the previous version of the scheme, the Centre was offering to fund 30% of the project cost for 45nm to 65nm chip production, 40% for 28nm to 45nm, and 50% or half of the funding for chips 28nm or below.
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### What are the challenges?

- The outlay of the scheme remains \$10 billion. Notably, just the setting up of one semiconductor fab requires an investment of anywhere between \$3 and \$7 billion.
- They also argue that the initial funding should focus on areas like design and R&D, for which India already has an established talent pool.
- Chip-making also requires gallons of ultrapure water in a single day, which experts say, could be a task for the government to provide to factories, compounded also by the drought conditions

which often prevail in large parts of the country.

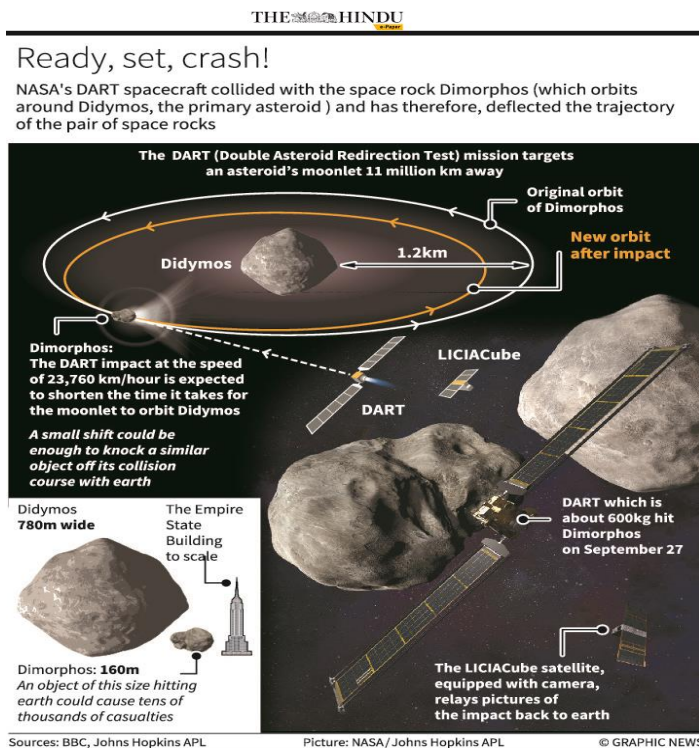
- Another task for the government is to drive up consumer demand in the semiconductor and linked electronics industry to not end up in a situation where these ventures remain successful only till taxpayers are forced to fund required subsidies.

## DART- Planetary Defence at NASA

DART (Double Asteroid Redirection Test) spacecraft collided with the space rock Dimorphos (just 160 meters wide).

### Double Asteroid Redirection Test (DART)

DART is a spacecraft designed to impact an asteroid as a test of technology. DART's target asteroid is NOT a threat to Earth. This asteroid system is a perfect testing ground to see if intentionally crashing a spacecraft into an asteroid is an effective way to change its course, should an Earth-threatening asteroid be discovered in the future.



- DART is the first-ever mission dedicated to investigating and demonstrating one method of asteroid deflection by changing an asteroid's motion in space through kinetic impact.

- This method will have DART deliberately collide with a target asteroid—which poses no threat to Earth—in order to change its speed and path.

- DART's target is the binary, near-Earth asteroid system Didymos, composed of the roughly 780-meter (2,560-foot) -diameter "Didymos" and the smaller, approximately 160-meter (530-foot)-size "Dimorphos," which

orbits Didymos.

- DART will impact Dimorphos to change its orbit within the binary system, and the DART Investigation Team will compare the results of DART's kinetic impact with Dimorphos to highly detailed computer simulations of kinetic impacts on asteroids.

- Doing so will evaluate the effectiveness of this mitigation approach and assess how best to apply it to future planetary defense scenarios, as well as how accurate the computer simulations are and how well they reflect the behavior of a real asteroid.
- This kinetic impact technique, which appears as the climax of Hollywood sci-fi movies like Deep Impact and Armageddon, is also known as the ‘kick’ method.
- It could one day save humanity from a potential cataclysmic collision by safely deflecting a killer asteroid on its course towards earth.
- It could also fuel space mining technologies and unleash the space economy in decades to come

#### What was NASA’s mission?

- NASA, to put it simply, undertook the ‘kick’ technique. Compared to the massive Dimorphos, DART is a tiny Goliath
- Close-up images transmitted by the DART moments before the fatal collision indicate that Dimorphos is more like a pile of rubble loosely held by gravity.
- If true, the impact will eject a cascade of debris, each piece carrying away a bit of momentum and energy.
- And as a net result, the asteroid will suffer a considerable loss.
- It will speed up more, and the orbit will become nearer to Didymos.
- The orbital period will then reduce by as much as 10 minutes.

#### What has been the impact assessment?

- The DART craft carried a high-resolution DRACO (Didymos Reconnaissance and Asteroid Camera for Optical navigation) camera to observe the collision and its consequences.
- The close-up images until its fatal crash are being analyzed.
- In addition, like a kangaroo with a baby in its pouch, a tiny toaster-sized Italian Space Agency-built Light Italian CubeSat for Imaging of Asteroids (LICIACube) took a piggyback ride with the DART

#### What are the other possibilities of this technique?

- At the heels of NASA, China is set to deflect a 40m diameter earth-crossing asteroid called 2020 PN1 sometime in 2026.
- While ostensibly the drive comes from the desire to protect earth from killer asteroids, perhaps the lure of space mining lurks behind.
- Mining rare earth elements comes with a high environmental cost.
- In the coming years, the penalty for polluting could make space mining economically viable.

- The ‘kick’ technique that deflects asteroids can then be used to move a small asteroid into a convenient position for space mining.
- Now shelved, NASA’s Asteroid Redirect Mission (ARM) aimed at precisely this by bringing a 20-tonne space rock near earth to study and mine.
- In a way, the DART mission is also part of this frame.
- For developing green energy technologies electric vehicles, solar panels, wind turbines, and energy storage devices and ushering in the low carbon economy of the future, rare earth elements such as yttrium, niobium, rhodium, palladium, osmium, iridium and scandium are critical.
- They are short in supply, and asteroid mining, it is believed, could solve the rare earth supply problem.
- From the robotic Soviet Luna 16 in the 1970s to U.S. Apollo missions and China’s first lunar sample-return mission, Chang’e 5 all has brought back lunar soil.

### Planetary Defense at NASA

- Near-Earth objects (NEOs) are asteroids and comets that orbit the Sun like the planets, but their orbits can bring them into Earth’s neighborhood - within 30 million miles of Earth’s orbit. Planetary defense is “applied planetary science” to address the NEO impact hazard.
- NASA established the Planetary Defense Coordination Office (PDCO) to manage its ongoing mission of planetary defense. The PDCO:
- Provides early detection of potentially hazardous objects (PHOs) – the subset of NEOs whose orbits predict they will come within 5 million miles of Earth’s orbit; and of a size large enough (30 to 50 meters) to damage Earth’s surface;
- Tracks and characterizes PHO's and issues warnings of the possible effects of potential impacts; Studies strategies and technologies for mitigating PHO impacts; and
- Plays a lead role in coordinating U.S. government planning for response to an actual impact threat.

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### Quality engineering education

- The All-India Council for Technical Education (AICTE) has already approved an adequate number of institutions in engineering and technology to admit at least 23.67 Lakh students.
- That is twice the number of aspirants for engineering education.
- There is, thus, neither a scarcity of seats nor capacity constraints.

- The nation is, in fact, staring at a dearth of institutions offering quality engineering education at an affordable cost.
- In business parlance, that is the ability to deliver value for money. A quick review of the data reveals that the task is daunting.
- AICTE has so far approved 5,926 institutions to offer programmes in engineering and technology.
- Of these only 1,249 (21.07%) came forward to get ranked under the NIRF in 2022. India probably doesn't need more institutions.
- The scope of enhancing the intake in the existing quality institutions also appears limited.
- What is needed is improvement in the overall quality of technical higher education across the board.
- The youth are aspirational. Monetary rewards are a major attraction.
- But that does not mean that they are not orientated towards national development.
- Headline placements serve the purpose of sustaining such motivations.
- It is now for the nation to mitigate the widening gap between the best and the rest, and ensure equality of opportunity in access to quality technical higher education.

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### Banning online content

The Government's order asking YouTube to remove 45 videos from 10 channels can be seen as a justified response to growing concern over the propagation of hate and communally sensitive material over the free video sharing website

- Section 69A of the IT Act, which empowers the Government to block content, was upheld by the Supreme Court only after it noted that the rules provided procedural safeguards, including the need to issue notice to the originators or the intermediary, before a blocking order.
- The latest order invokes the Information Technology (Intermediary Guidelines and Digital Media Ethics Code) Rules, 2021.
- It has a procedure by which an inter-departmental committee considers complaints on content and makes recommendations.
- The Authorized Officer has to take the approval of the Secretary, I&B, before directing the publisher or intermediary to block the relevant content.
- There is an emergency provision under which the Secretary may order content blocking as an interim measure, and thereafter confirm it after getting the committee's views.
- All such blocking orders are meant to be examined by a review committee, which ought to meet

once in two months, but it is not known whether the panel meets regularly

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### New CDS and role of CDS

- The government appointed Lt. Gen. Anil Chauhan (retd.), former General Officer Commanding-in-Chief, Eastern Army Commander, as the Chief of Defence Staff (CDS)
- The Kargil Review Committee, headed by Shri K Subrahmanyam in 1999 had recommended Chapter-1 A wait too long Pending Recommendations Since 1999 Chief of Defence Staff 3 comprehensive review of the National Security framework for improved decision-making in defence matters.
- The Committee also recommended that the mechanisms established between the Defence Ministry and the Service Headquarters and the interface between them, should be holistically studied and reorganized.
- Based on Shri K Subrahmanyam Committee Report, a Group of Ministers (GoM) in 2001 recommended creation of the post of the Chief of Defence Staff
- The Cabinet Committee on Security, in its decision dated 24th December 2019, had also approved the creation of the Department of Military Affairs.
- The creation of the 'Department of Military Affairs' (DMA) in the Ministry of Defence and the appointment of the Chief of Defence Staff as the Permanent Chairman of the Chiefs of Staff Committee (COSC) as well as the Secretary of the Department of Military Affairs
- In addition, to provide Subject Matter Expertise, Officers from the three Armed Forces have also been appointed at the Department of Military Affairs.
- The Department of Military Affairs (DMA), by virtue of being a truly integrated department, will achieve better results at all levels through effective coordination between the Armed Forces and the Civil Services.
- This will help facilitate inter-service integration and better civilian-military coordination in the Nation's Higher Defence Organization.
- It will also strengthen the process of Joint Planning, Operations and Procurement, thereby making Armed Forces more effective and efficient.
- Under this new Department, the Logistics structure is being fully revamped to make it more efficient.
- In this regard, three Joint Services Study Groups (JSSG) are developing common logistic policies for Services that will enhance all supply chain functions such as planning, procurement,



inventory-maintenance, distribution, disposal and documentation

- A concerted effort is being made to move forward from a Single Service approach to integrated planning and execution
- Ten subjects have been fixed for conducting joint training among the three Services.
- Of these, joint training has already started in five areas.
- Keeping in mind the goal of 'Atma Nirbhar Bharat', Department of Military Affairs released the First Positive Indigenisation List of 101 items in August 2020 and the Second Positive Indigenisation List comprising of 108 items on 31st May 21.
- The work of establishing Theatre/Joint Commands is also progressing swiftly.
- Bring about reforms in the functioning of the three Services aimed at augmenting combat capabilities by reducing wasteful expenditure.
- Promote use of indigenous equipment and usher self-reliance in the Defence Industrial Sector.
- Ensure optimal utilization of Infrastructure and rationalize it through Jointness among the Services.
- Integrate and rationalize International Cooperation Plans of the Services in coordination with Ministry of External Affairs.
- Promote greater Jointness and Standardization between the Services.
- Formulate Joint Promotion Policy for the Services.
- Promulgate Joint Staff Assignments for Career Progression and increase cross staffing.
- IVth Cadre review of the Armed Forces.
- Abolition of obsolete Rules and Acts.
- Review the terms of deployment of Territorial Army

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## Geopolitics of Bay of Bengal

Announced the opening of the Centre for Bay of Bengal Studies (CBS) at Nalanda University.

- The official launch of the CBS has once again demonstrated India's commitment to advancing constructive agendas by forging connections and setting up platforms for all those with an interest in the Bay.
- CBS will offer collaborations in areas such as geo-economics and geopolitics, ecology, trade and connectivity, maritime security, maritime law, cultural heritage, and blue economy to generate opportunities for the Bay region.
- This will strengthen India's overall framework for maritime engagement, which aims to advance

sustainable economic growth for all by fostering closer nautical ties.

- The Bay has long been a major commerce hub for the Indian Ocean.
- It created a conduit between the East and the West in terms for trade and culture.
- An Indo-Pacific orientation and the realignment of global economic and military power towards Asia have had a considerable impact on the Bay region.
- The key sea lanes of communication in this area are lifelines for global economic security and are crucial to the energy security that powers the economies of many countries in the region.
- Further, non-traditional dangers including terrorism and climate change have become more prevalent.
- The Bay also provides an opportunity for greater regional cooperation in the environmentally friendly exploration of marine and energy resources.
- The Bay has a biodiverse marine environment
- The Bay's ecosystem is going through an unprecedented crisis brought on by widespread environmental exploitation and geopolitical unrest.
- Species extinction is a result of careless exploitation of the maritime environment, which has severe consequences on biodiversity.
- Problems such as population growth, altered land use, excessive resource exploitation, salinisation, sea level rise, and climate change are exerting significant strain on the Bay's environment.
- Operational discharge from small and medium feeder ships, shipping collisions, unintentional oil spills, industrial waste, pollution, and the accumulation of non-biodegradable plastic litter are all contributing to the deterioration of the Bay.
- A dead zone has formed as a result, and the mangrove trees that protect the shore from the fury of nature are under more threat than ever
- It is essential that nautical neighbours develop a partnership and cooperate because of the maritime domain's interrelated and interdependent nature, transnational character, and cross-jurisdictional engagement of various governments and diverse organizations and enterprises.
- A few concerns that need immediate attention include expanding cooperation in maritime safety and security, enhancing cooperation on maritime connectivity and the ease of maritime transit, and boosting investment possibilities in the maritime connectivity sector.
- The latter subject involves addressing non-traditional threats and fostering group efforts to reduce illicit, unreported, and unregulated fishing
- Littoral governments need to support and promote skill-building, research, and training.
- Countries in the region will need to mobilize incentives and investments, manage oceanic affairs

more effectively, and support people as they switch to alternative lifestyles

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## International law and Flooding

- There has been an increase in the magnitude, the frequency and the intensity of floods in many parts of the world.
- Flooding is still considered to be a natural phenomenon that cannot be entirely prevented.
- But it is compounded by the lack of transparency in the sharing of hydrological information and also information relating to activities (such as by one riparian state) that are transboundary in their effect (affecting other riparian states),

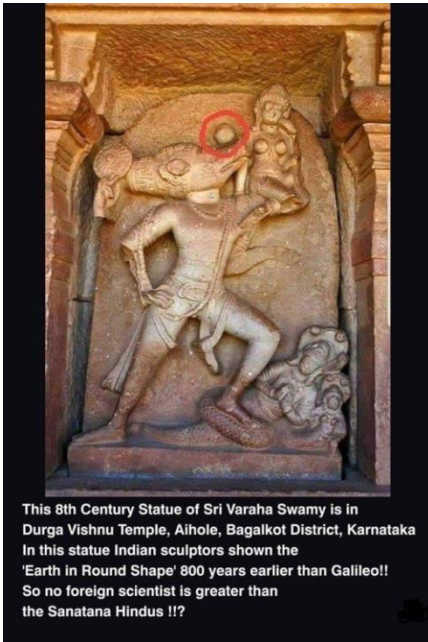
### On customary international law

- In accordance with customary international law, no state has to use its territory in a manner that causes harm to another state while using a shared natural resource; this amounts to saying that there is a binding obligation on all states not to release water to cause floods in another co-sharer of the river water.
- This obligation gives rise to other procedural norms that support the management of floods, which include notification of planned measures, the exchange of data and information, and also public participation
- The Brahmaputra and India's concerns Closer home, there is the case of China being the upper riparian in the Brahmaputra, which spans India and Bangladesh, enjoying apparent leverage vis-à-vis lower riparian India.
- During the monsoon, flooding has been the recurrent feature in the last several decades in Assam.
- India faces other woes in the form of the construction of dams by China. China's excessive water release, as a "dam controller", in violation of customary international law has the potential to exacerbate flooding in Assam in future.
- India's main concern is that there is no comprehensive sub-basin or all basin-level mechanism to deal with water management of Brahmaputra.
- Neither India or China are party to the United Nations Convention on the Law of the Non-Navigational Uses of International Watercourses (UNWC) 1997 or the United Nations Economic Commission for Europe (UNECE) on the Protection and Use of Transboundary Watercourses and International Lakes 1992 (Water Convention).
- The UNWC contains a direct reference to floods, which covers harmful conditions and

emergency situations.

- Article 27 of the Convention says: “Watercourse States shall, individually and, where appropriate, jointly, take all appropriate measures to prevent or mitigate conditions ...that may be harmful to other watercourse States, whether resulting from natural causes or human conduct, such as floods or ice conditions, water-borne diseases, siltation, erosion, salt-water intrusion, drought or desertification.”
- In the absence of any mechanism, India relies on its memorandum of understanding (MoU) with China in 2013 with a view to sharing hydrological information during the flood season (June to September).
- The MoU does not allow India access to urbanization and deforestation activities on the Chinese side of the river basin.
- With the MoU in the background, India by becoming a party to either the UNWC and the Water Convention could lay the groundwork for a bilateral treaty on the Brahmaputra
- India, Nepal and flood prevention Floods are also a recurrent problem in the Koshi and Gandak river basins that are shared by India and Nepal.
- The intensity and magnitude of flooding is rising because of heavy seasonal precipitation as well as glacial retreat due to global warming and human-induced stressors such as land use and land cover changes in the river basin area of Nepal (Terai) and Bihar.
- It is important that the two neighbours view the river basins as single entities, which will help in facilitating an integrated approach for improved basin and flood risk management.
- The India-Nepal Koshi agreement 1954 (revised in 1966) is aimed at reducing devastating flooding in the river basin. The treaty-based joint bodies have also tried to refine the early warning systems for flood forecasting.

## Buddhist caves in Bandhavgarh



The Archaeological Survey of India (ASI) earlier this year discovered Buddhist caves and stupas, and Brahmi inscriptions, dating back to the 2nd century, and Hindu temples from the 9th-11th centuries, and possibly the world's largest Varaha sculpture also dating to the same period, at the Bandhavgarh Tiger Reserve in Madhya Pradesh

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## U.S. in Pacific Islands

The United States on announced \$810 million in new funding for Pacific islands at a summit with President Joe Biden amid inroads by China in the strategic but sparsely populated region.

- \$600 million will be in the form of a 10-year package to clean up and develop dirty waters to support the tuna industry, while the United States will also expand climate and development aid and its diplomatic presence.
- China has asserted itself strongly in recent years through investment, police training and, most controversially, a security pact with the Solomon Islands.
- The Biden administration also announced that the United States would recognize Cook Islands and Niue, a self-governing territory whose foreign and defence policies and currency are linked to New Zealand.
- The step will allow the United States to increase its diplomatic footprint in the Cook Island and Niue, which have fewer than 20,000 inhabitants.
- Western officials and analysts fear that Beijing will use the Solomon Islands as a base to expand militarily into the Pacific.
- The United States and the Region U.S. Indo-Pacific Command, based in Hawaii, encompasses the Pacific Islands as part of its area of responsibility.
- The U.S. military has air and naval bases on Guam and operates the Ronald Reagan Ballistic

Missile Defense Test Site at Kwajalein Atoll in the Marshall Islands.

- The Department of Defense is building a high-frequency radar system in Palau.
- The U.S. military has ties with Fiji, PNG, and Tonga, the only PICs with regular armed forces.
- The Biden Administration's Indo-Pacific Strategy (February 2022) states that the United States "will work with partners to establish a multilateral strategic grouping that supports Pacific Island countries as they build their capacity and resilience as secure, independent actors."

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## China's Influence

China has become a significant actor in the region through diplomacy and economic engagement.

- The PRC is an important market for PIC natural resource exports and tourism. China's fishing fleet in the region has contributed significantly to IUU fishing.
- Ten PICs have joined China's Belt and Road Initiative, which promotes PRC-backed infrastructure development.
- In May 2022, the PRC proposed a sweeping diplomatic, economic, and security pact between China and the region that met resistance among some PICs and was shelved.

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## UNESCO lists Indian textile

UNESCO released a list of 50 exclusive and iconic heritage textile crafts of the country.

- Toda embroidery and Sungadi from Tamil Nadu, Himroo from Hyderabad, and Bandha tie and dye from Sambalpur in Odisha were some of the textiles that made the cut
- According to UNESCO, one of the major challenges to the safeguarding of Intangible Cultural Heritage in the South Asia is the lack of proper inventory and documentation.
- The publication, which aims to bridge this gap, brings together years of research on the 50 selected textiles.
- Some of the iconic handcrafted textiles documented from north India are Khes from Panipat, Chamba rumals from Himachal Pradesh, Thigma or wool tie and dye from Ladakh, and Awadh Jamdani from Varanasi.
- Finding a place From the south, Ilkal and Lambadi or Banjara embroidery from Karnataka, Sikalnayakanpet Kalamkari from Thanjavur have been included.
- Kunbi weaves from Goa, Mashru weaves and Patola from Gujarat, Himroo from Maharashtra and GaradKoirial from West Bengal also find a place among the 50 iconic textiles.



## Flood and corruption

We must decongest the city, plant more trees, save wetlands, even reclaim them, desilt drains, enlarge sewers, deconcretise pavements and stop the clogging of waterways with unsegregated garbage.

- The State government announced tough measures such as the demolition of unauthorized encroachments impeding drainage streams in the city, but quickly backed away. It now plans to divert drains to avoid already built-up areas.
- Corruption cripples economic growth in ways not readily apparent.
- Apart from transferring inordinate wealth to the undeserving, it creates a slew of vested interests, who resist anti-corruption process reforms
- Our narrow, legal definition of corruption enables many in a corrupt system to escape culpability.
- Indian law recognizes only corrupt acts by public servants to be ‘acts of corruption’ under the law.
- As private corruption is not criminalized, many government actions are outsourced to private agents, who collect ‘handling fees’ on behalf of their partners in crime within the government.
- E-Governance is often not the effective solution as claimed. E-enabled systems often only relocate the locus of corruption; they do not solve all of it.
- First, regular assessments and evaluations of ongoing anti-corruption measures
- Second, a genuine regime of whistleblower protection assures honest citizens, politicians, bureaucrats and judges of protection, as they otherwise fear the adverse repercussions for uncovering illegal activities
- Third, there has to be a conscious move towards promoting ethical behavior.

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