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GES REPORTER




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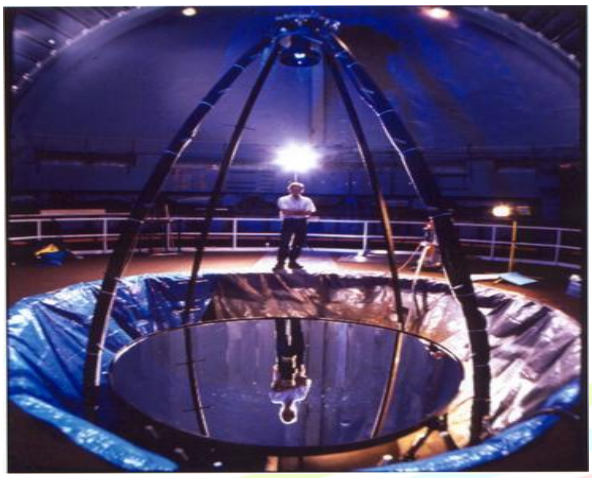
Liquid Mirror Telescope

- The four-meter International Liquid Mirror Telescope (ILMT) saw the first light recently, gazing out from its vantage on Devasthal, a hill in Uttarakhand, into the deep sky.

- The telescope, staring at the sky overhead, will make sky surveys possible and obtain images that can help observe transient phenomena such as supernovae and record the presence of space debris or meteorites. Basically, watch the skies.
- The telescope has been built by a collaboration of scientists from Canada, Belgium and India.
- It is located at an altitude of 2,450 meters on the Dimeters Observatory campus of the Aryabhata Research Institute of Observational Sciences (ARIES) in Nainital district, an autonomous institute under the Department of Science and Technology, Government of India.
- A large pool of mercury placed in a vessel is spun around so fast that it curves into a parabolic shape.
- Since mercury is reflective, this shape helps in focusing the reflected light.
- A thin sheet of Mylar protects the mercury from the wind.
- The telescope, having a primary mirror that is liquid, cannot be turned and pointed in any direction.
- It “stares” at the zenith and watches the sky as the earth rotates, thereby giving a view of different objects.
- This property can be used to scan and survey the sky, and observe transient and moving objects such as meteorites.

- It will work in tandem with the existing 3.6-metre Devasthal Optical Telescope.
- Once it starts making observations, the telescope will collect gigabytes of data, which will need to be analyzed using artificial intelligence and machine learning (AI and ML) tools.



China and pacific islands

The story so far:

- Wang Yi, the Foreign Minister of China, is currently on an eight-day visit to ten Pacific Island Countries (PICs), and has co-hosted with Fiji the Second China-Pacific Island Countries Foreign Ministers Meeting on May 30, 2022.
- During the meeting, China's effort to push through a comprehensive framework deal, the draft of which was leaked earlier, failed to gain consensus among the PICs

What is the strategic significance of the PICs?

- The Pacific Island Countries are a cluster of 14 states which are located largely in the tropical zone of the Pacific Ocean between Asia, Australia and the Americas.
- They include Cook Islands, Fiji, Kiribati, Republic of Marshall Islands, Federated

States of Micronesia (FSM), Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, and Vanuatu. The islands are divided on the basis of physical and human geography into three distinct parts Micronesia, Melanesia, and Polynesia.

- The islands are very small in land area, and are spread wide across the vast equatorial swathe of the Pacific Ocean.
- As a result, though they are some of the smallest and least populated states, they have some of the largest Exclusive Economic Zones (EEZs) in the world.
- Large EEZs translate into huge economic potential due to the possibility of utilizing the wealth of fisheries, energy, minerals and other marine resources present in such zones.
- Hence, they prefer to be identified as Big Ocean States, rather than Small Island States.
- In fact, Kiribati and FSM, both PICs, having EEZs larger than that of India
- The Pacific islands also acted as one of the major theatres of conflict during the Second World War between imperial Japan and the U.S. Due to the remoteness of these islands from the Soviet Union and major population centres of the world, some of the major nuclear weapon test sites of the U.S., the U.K. and France were located here.
- In addition, the 14 PICs, bound together by shared economic and security concerns, account for as many number of votes in the United Nations, and act as a potential vote bank for major powers to mobilize international opinion.

What does China seek to achieve from the PICs and how?

- China does not have any particular historical linkages to the PICs unlike the

Western powers.

- Therefore, its interest in the PICs is of relatively recent origin, and is linked to China's rise in the past few decades.
- The PICs lie in the natural line of expansion of China's maritime interest and naval power.
- They are located beyond China's 'First Island Chain', which represents the country's first threshold of maritime expansion.
- The PICs are located geostrategically in what is referred to by China as its 'Far Seas', the control of which will make China an effective Blue Water capable Navy an essential prerequisite for becoming a superpower.
- At a time when the Quadrilateral Security Dialogue has emerged as a major force in the Indo-Pacific vis-à-vis China, the need to influence the PICs have become an even more pressing matter for China.
- Apart from the vast marine richness of the PICs, the Taiwan factor plays a major role in China's Pacific calculus.
- China, which considers Taiwan to be a breakaway territory, is preparing for what seems like an inevitable military invasion. In this context, it becomes important to break Western domination of island chains of the Pacific which could impede reunification.
- Wooing the PICs away from the West and Taiwan will therefore make the goal of Taiwan's reunification easier for China

What are the implications of China's latest move?

- China has increasingly started talking about security cooperation in addition to its economic diplomacy towards the PICs.

- In April 2022, China signed a controversial security deal with the Solomon Islands, which raised regional concerns.
- Prior to the current visit of Wang Yi, two draft documents prepared by the Chinese side were leaked, and gained the attention of regional leaders in the Pacific as well as the larger international community.
- One of the documents is the "China-Pacific Island Countries (PICs) Common Development Vision", and the other is "China-Pacific Islands Five-Year Action Plan on Common Development (2022-2026)".
- The vision gives a broad proposal about co-operation in the political, security, economic and strategic areas, whereas the action plan outlines the more specific details of cooperation in the identified areas.
- The secrecy surrounding the draft, and the haste with which it was discussed with the governments of the PICs during the meeting sent worrying signals across the Pacific
- The intensification of China's diplomacy towards the Pacific Islands have made the powers who have traditionally controlled the regional dynamics like the U.S. and Australia more cautious.
- The U.S. has started revisiting its diplomatic priority for the region ever since the China-Solomon Islands deal.

Eco Sensitive zone

- The Supreme Court directed that every protected forest, national park and wildlife sanctuary across the country should have a mandatory eco-sensitive zone (ESZ) of a minimum one km starting from their demarcated boundaries.
- Environment Ministry guidelines show that the purpose of declaring ESZs around

national parks, forests and sanctuaries is to create some kind of a "shock absorber" for the protected areas.

- These zones would act as a transition zone from areas of high protection to those involving lesser protection
- The judgement, by Justice Bose, observed that the government should not confine its role to that of a "facilitator" of economic activities for the "immediate upliftment of the fortunes of the State".
- The State also has to act as a trustee for the benefit of the general public in relation to the natural resources so that sustainable development could be achieved in the long term.
- "Such a role of the State is more relevant today, than, possibly, at any point of time in history with the threat of climate catastrophe resulting from global warming looming large,"
- Eco-Sensitive Zones (ESZs) are also known as Ecologically Fragile Areas (EFAs).
- Eco-sensitive zones are areas notified by the MoEFCC around Protected Areas, National Parks and Wildlife Sanctuaries.
- The purpose of declaring ESZs is to create some kind of "shock absorbers" to the protected areas by regulating and managing the activities around such areas.
- As per the National Board for Wildlife NBWL, the delineation of eco-sensitive zones have to be site-specific, and the activities should be regulative in nature and not prohibitive unless required.
- The basic aim is to regulate certain activities around National Parks and Wildlife Sanctuaries to minimize the negative impacts of such activities on the fragile

ecosystem encompassing the protected areas.

- They also act as a transition zone from areas of high protection to areas involving lesser protection.

POSHAN ABHIYAN

- India is afflicted by public health issues such as child malnutrition (35.5% stunted, 67.1% anaemic) attributing to 68.2% of under-five child mortality
- National Nutrition Mission (NNM), rebranding it the Prime Minister's Overarching Scheme for Holistic Nutrition, or POSHAN Abhiyaan.
- It has the objective of reducing malnutrition in women, children and adolescent girls.
- The Ministry of Women and Child (MWCD) continues to be the nodal Ministry implementing the NNM with a vision to align different ministries to work in tandem on the "window of opportunity" of the first 1,000 days in life (270 days of pregnancy and 730 days; 0-24 months
- POSHAN Abhiyaan (now referred as POSHAN 2.0) rightly places a special emphasis on selected high impact essential nutrition interventions, combined with nutrition-sensitive interventions, which indirectly impact mother, infant and young child nutrition, such as improving coverage of maternal-child health services, enhancing women empowerment, availability, and access to improved water, sanitation, and hygiene and enhancing homestead food production for a diversified diet.

NHFS data is a pointer

- There is a substantial increase in antenatal service attendance (58.6 to 70.0%); women having their own savings bank accounts (63.0 to78.6%); women owning

mobile phones that they themselves use (45.9 % to 54.0%); women married before 18 years of age (26.8 % to 23.3 %); women with 10 or more years of schooling (35.7% to 41.0%), and access to clean fuel for cooking (43.8 % to 68.6%)

- Preconception nutrition, maternal nutrition, and appropriate infant and child feeding remain to be effectively addressed.
- India has 20% to 30% undernutrition even in the first six months of life when exclusive breastfeeding is the only nourishment required.
- Neither maternal nutrition care interventions nor infant and young child feeding practices have shown the desired improvement.
- We need to systematically review the status, and develop and test a new system that would combine the human resource of ICDS and health from village to the district and State levels.

E waste management rule 2021

E-waste (Management and Handling) Rule

- One major change is the introduction of a market for e-waste recycling certificates.
- The draft rules state that producers of e-goods have to ensure that at least 60% of their produced e-waste is recycled by 2023.
- This shift from collection rate targets (which set targets for the collection of e-waste as a percentage of the quantity of products sold by weight in the market in the previous year) in the current Rules to recycling rate targets in the proposed Rules is another important change.

- The proposed market for e-waste recycling appears unrealistic.
- First, large-scale recycling of e-waste is still in its infancy in India. Most of the recycling of valuable material is carried out within the informal sector using inefficient and unsafe technologies.
- At a time when the technical feasibility and commercial viability of different recycling technologies and approaches for e-waste components is being worked upon in India, a target to recycle 60% of the e-waste generated in 2022-23 appears too optimistic
- Second, if the regulatory targets were to create a vibrant market for recycling, the existing formal and informal players would have to play a crucial role
- The informal sector accounts for a vast majority of e-waste processed in India. Most e-waste policy debates have centred on the integration of the informal sector into the formal systems.
- The proposed regulations, however, place the responsibility of such integration on the State governments without specifying what the incentives are for them to do this.

Steering Committee powers

- The other major change is the introduction of a Steering Committee to oversee the "overall implementation, monitoring, and supervision" of the regulations.
- This Committee, for example, has the power to decide on the product-wise "conversion factor" that determines the value of the recycling certificate, specify how the environmental compensation fund could be utilized, resolve disputes, and "remove any difficulty in smooth implementation of these regulations."
- While such an institutional mechanism could provide more certainty in

implementation, there is lack of representation in the Committee.

- The Rules propose the Chairman of the CPCB as the Chairperson of the Committee, which would include representatives of the Environment Ministry, the Electronics and IT Ministry, and the associations of producers and recyclers.
- But it is surprising that representation from science/academia and civil society organizations is not deemed appropriate
- The draft e-waste Rules propose a few positive changes, including expanding the definition of e-waste, more clearly specifying the penalties for violation of rules, introducing an environmental compensation fund based on the 'polluter pays' principle, and recognizing the informal waste workers.

Single-use plastic

The story so far:

- A ban on the use of single-use plastics that was notified by the Union Environment Ministry on August 2021 came into effect on July 1 this year.
- The notification said national and State-level control rooms would be set up to check illegal manufacture, import, stocking, distribution, sale, and use of banned single-use plastic items.
- The Plastic Waste Management Amendment Rules, 2021, will also prohibit the manufacture, import, stocking, distribution, sale, and use of plastic carry bags having a thickness less than 120 microns with effect from December 31, 2022

What is single-use plastic?

- The Centre defines it as an object made of plastic that is intended to be used "only once" before being disposed of or recycled.

- For the purposes of the ban, there is a list of 21 items that come under the definition of single-use plastic
- According to the Environment Protection (EP) Act, violating the ban could invite "punitive action".
- Manufacturers and distributors of single-use plastic goods were directed to have zero inventory by June 30, according to officials in the Union Environment Ministry.
- The EP Act says that violating the ban could invite a five-year imprisonment and a fine of upto ₹1 lakh, or both. If the violations are repeated, it could mean additional fines up to ₹5000 for each day.
- There are different penalties for companies, organizations, and government departments under the EP Act.
- Fast Moving Consumer Goods companies (FMCG) would be severely affected by the ban due to their dependence on plastic straws and plates.
- Their replacements, industry representatives say, are available but cost much more than their plastic alternatives.
- There is also limited capacity in India to provide biodegradable replacements.

Space Sustainability

The story so far:

- On June 23, the U.K. hosted the fourth summit for Space Sustainability in London in collaboration with the Secure World Foundation.
- In line with the ambitious U.K. National Space Strategy, George Freeman, the Minister of Science, announced a new 'Plan for Space Sustainability.'

- According to him, this plan aims to “set a global commercial framework for the insurability, the licensing and the regulation of commercial satellites.”
- It also aims to reduce the cost for those who comply with the best sustainability standards and thus encourages a thriving ecosystem for the industry

What does sustainability in outer space mean?

- The earth’s orbital environment has more than tripled in the past decade. As the cost of missions reduces and the number of players increase, the complexity of missions and slot allotment issues also increase.
- With the emergence of large constellations and complex satellites, there is a risk of collisions and interference with radio frequencies.
- As the outer space is considered a shared natural resource, the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS) in 2019 adopted a set of 21 voluntary, non-binding guidelines to ensure the long-term sustainability of outer space activities.
- One of the hot issues when it comes to space sustainability is orbital crowding.
- It poses a direct threat to the operations and safety of a mission and is likely to cause legal and insurance-related conflicts.
- Space debris is another prominent issue. After the completion of a mission, an ‘end-of-life protocol’ requires space objects to be moved to the graveyard orbit or to a low altitude.
- Neither of the options are sustainable in the long run. Other causes of concern are solar and magnetic storms which potentially damage communication systems.
- Such space weather threats need to be addressed along with the efforts to identify the terrestrial carbon footprint of outer space missions.

- Long-term sustainability looks toward space research and development of technology to ensure the reuse and recycling of satellites at every stage.
- The U.K. plan proposes active debris removal and in-orbit servicing

What does the U.K. plan for space sustainability entail?

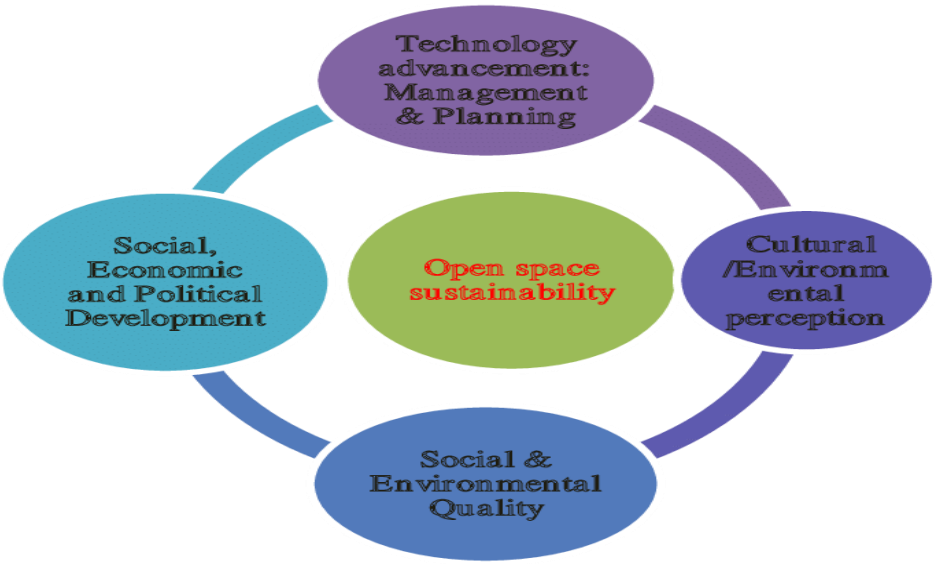
- The U.K. calls for an "Astro Carta" for space sustainability, based on the Artemis Accords model for sustainable space exploration.
- The U.K. Space Sustainability plan mentions four primary elements:
- to review the regulatory framework of the U.K.'s orbital activity; to work with organizations such as the G-7 and the UN to emphasise international engagement on space sustainability;
- To try and develop safety and quality-related metrics that quantify the sustainability of activities; and, to induce additional funding of $6.1 million on active debris removal.
- The U.K. also confirmed investments in its National Space Surveillance and Tracking Programme, which works on collision assessment services for U.K.-licenced satellite operator.

Where does India stand on space sustainability?

- The headquarters of the Indian National Space Promotion and Authorisation Centre (In-SPACe) was formally inaugurated last month.
- One can expect an increased role of the private sector in India's space activities.
- India hosts promising start-ups like Agnikul and Skyroot, which are developing launch vehicles for small payloads and Dhruva Space, which works on high-tech solar panels for satellites and satellite deployers

- The Indian Space Research Organization (ISRO) has initiated 'Project NETRA' to monitor space debris.
- The domestic surveillance system would provide first-hand information on the status of debris, which would aid further planning on protecting space assets.
- In April 2022, India and the U.S. signed a new pact for monitoring space objects at the 2+2 dialogue.
- The controlled anti-satellite weapons (ASAT) tests and the risk of collisions must be collectively addressed.
- To provide in-orbit servicing, ISRO is developing a docking experiment called 'SPADEX'.
- It looks at docking a satellite on an existing satellite, offering support in re-fuelling and other in-orbit services while enhancing the capability of a satellite
- Today, any entity (government or private) with the necessary access to resources and technology can invest in outer space.
- Sustainable practices in outer space would directly help reduce orbital crowding and collision risk while nurturing future technologies.
- As the natural course of evolution, the Plan for Space Sustainability, which includes private industries, is a timely move.
- While most National Space Programs set sustainability standards, a collective effort by all space players, with the active role of the UN COPUOS or the United Nations Office for Outer Space Affairs (UNOOSA), is needed to set equitable standards for the ease of activities. Many of the measures for sustainability are resource-consuming and expensive for medium-and-small space programs.
    - The UK's Astro Carta idea throws light on the need for addressing the

principles and rules that guide the activities of entities in outer space.



TB control

- Tuberculosis is the worst among endemic diseases, killing 1.5 million people every year (WHO).
- TB affects adults in their most productive years and therefore impoverishes the family and the nation.
- In India, the TB capital of the world, the disease kills some 1,400 persons every day
- The National TB Control Programme of 1962 was a district-based one with public-private participation.
- However, upscaling the model proved unsuccessful and the programme failed to control TB.
- With that we lost self-confidence and began doing what we were told to do by the WHO under the Revised National TB Control Programme (RNTCP)
- There are obvious flaws in the RNTCP.

- First, for a programme that is heavily funded by the government, there is no prescribed method of monitoring the trajectory of TB control.
- Second, the assumption that treating pulmonary TB patients alone would control TB was epidemiologically fallacious in India.
- Third, RNTCP has failed to elicit people's partnership in TB control.
- In India's AIDS Control Programme, public education was given high priority
- Realizing that TB was not under control, WHO called for another programme revision through a World Health Assembly Resolution in 2014 to eliminate TB by 2035.
- Diseases that have social determinants tend to decline over time with better housing, nutrition, education and income this is what a 'secular trend' is.
- Globally, by this 'secular trend', the burden of TB had been falling by 1% or 1.5% per year.

Paddy production

- The Centre has asked the State governments to take steps to increase the sowing of paddy in the wake of reports that the sown area has shrunk
- The Centre's data say that paddy has been sown on 43.45 lakh hectares till July 1, which is 27.05% less than the 59.56 lakh hectares during the corresponding period of 2021

NFSA ranking

- Odisha secured the first rank for the implementation of the National Food Security Act (NFSA).
- Uttar Pradesh and Andhra Pradesh stood second and third, respectively, in the

index prepared by the Centre,

- Among the special category States, Tripura secured the first rank. Himachal Pradesh and Sikkim stood at the second and third positions.

India rhino vision 2022

- The one-horned rhinos of western Assam's Manas National Park, bordering Bhutan, are expected to have high life expectancy and significant growth in population, the 14th Assam rhino estimation census has revealed.
- Manas, a UNESCO World Heritage Site and a tiger reserve, had about 100 resident rhinos prior to 1990, but a prolonged ethno-political conflict thereafter took a heavy toll with extremist groups known to have traded the horns of the herbivores for weapons.
- A rhino reintroduction programme under the Indian Rhino Vision 2020 was started in 2006.
- This entailed the translocation of rhinos from Kaziranga National Park and Pobitora Wildlife Sanctuary besides orphans hand-reared at the Centre for Wildlife Rehabilitation and Conservation at Kaziranga.

The Indian Rhino Vision 2020

- The Indian Rhino Vision 2020 (IRV2020) program has come to a close with the recent translocation of two rhinos to Manas National Park in Assam.
- Launched in 2005, Indian Rhino Vision 2020 was an ambitious effort to attain a wild population of at least 3,000 greater one-horned rhinos spread over seven protected areas in the Indian state of Assam by the year 2020.
- Seven protected areas are Kaziranga, Pobitora, Orang National Park, Manas National Park, Laokhowa wildlife sanctuary, Burachapori wildlife sanctuary and

Dibru Saikhowa wildlife sanctuary.

- It is a collaborative effort between various organisations, including the International Rhino Foundation, Assam's Forest Department, Bodoland Territorial Council, World Wide Fund - India, and the US Fish and Wildlife Service.

Aegean Sea

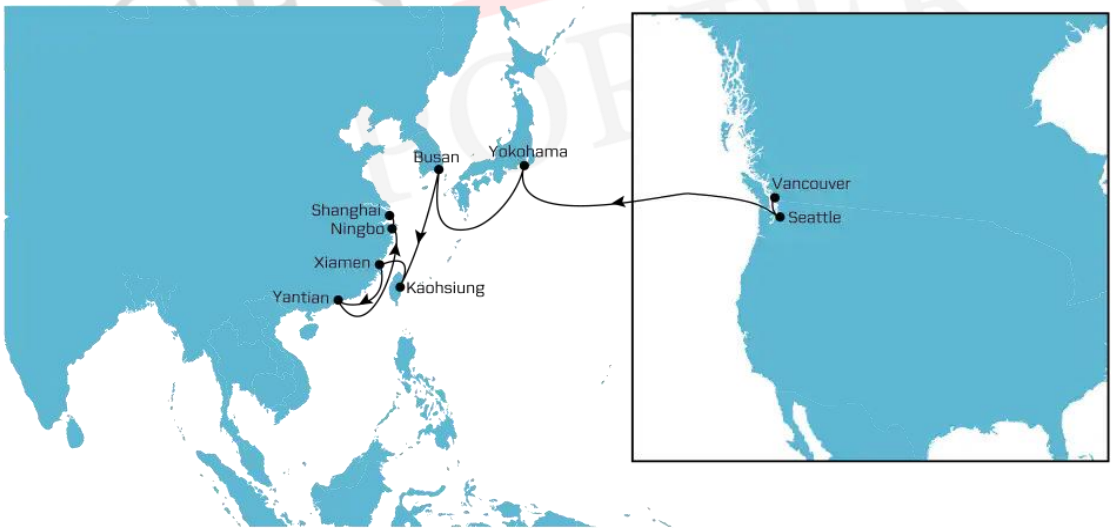
- Turkish President Recep Tayyip Erdogan on Thursday warned Greece to demilitarize islands in the Aegean Sea.
- Turkey says Greece has been building a military presence in violation of treaties that guarantee the unarmed status of the Aegean islands.
- It argues the islands were ceded to Greece on the condition they remained demilitarized.
- History of disputes Greece and Turkey are NATO allies, but the neighbouring countries have a history of disputes over a range of issues, including mineral

exploration in the eastern Mediterranean and rival claims in the Aegean Sea.

- Greece maintains Turkey has deliberately misinterpreted the treaties and says it has legal grounds to defend itself following hostile actions by Ankara, including a threat of war if Greece extended its territorial waters.

Joint exercise at Shanghai coast

- China and Pakistan on Sunday began four-day naval exercises off the coast of Shanghai, involving Pakistan's most advanced China built frigate and paving the way for closer security cooperation between the two countries in the Indian Ocean
- The exercises are the second edition of Sea Guardians, following drills held in January 2020 in the Arabian Sea off Karachi.



Dark matter

The story so far:

- Many physicists strongly believe that the entire visible part of the universe forms only 5% of all matter in it.

- They believe the rest is made up of dark matter and dark energy.
- Once this was convincingly demonstrated through various indirect observations and calculations, experiments started being set up to hunt for these elusive particles.
- The latest to hit the news in the field of dark matter is a dark matter detector experiment named LUX-ZEPLIN (LZ) in South Dakota in the U.S. As of today this is the most sensitive dark matter detector in the world

What is dark matter and why is it so elusive?

- All interactions in the universe are a result of four fundamental forces acting on particles strong nuclear force, weak nuclear force, electromagnetic force and gravitation.
- Dark matter is made up of particles that do not have a charge which means they do not interact through electromagnetic interactions
- So, these are particles that are “dark”, namely because they do not emit light, which is an electromagnetic phenomenon, and “matter” because they possess mass like normal matter and hence interact through gravity.
- Gravitational force, besides not being fully integrated and understood by particle physicists, is extremely weak

If we cannot see it and have not detected it yet, why do physicists believe strongly that dark matter exists?

- If you look at stars all the way from the centre of any galaxy to its rim, the way the velocities of the observed stars change may be plotted.
- In the lab this same function may be plotted on a graph by assuming the visible matter is all that exists.

- There is a marked difference between the observed plot of star speeds and the calculated value as you move from the inner part of the galaxy towards its rim
- In this context, the second evidence came from observations of the so-called Bullet cluster of galaxies.
- The Bullet cluster is formed through the merging of two galaxy clusters. Physicists found from their calculations that the way these mergers took place could not be fully explained if we believed that the visible universe were all that existed.
- Therefore, there should be something like dark matter as well as an estimate of how much dark matter there should be in the universe

What are the candidates for dark matter particles?

- "The neutrino would have been an excellent candidate if it had been more massive,"

- However, being too light, it doesn't fit the bill.
- Other postulated entities include the supersymmetric partner of the Z boson, a particle that mediates the electro-weak interaction.
- Yet other explanations talk about "hidden sector particles" and Axions, a boson and a condensate of dark matter. There are many other theories.

Insulin cool

- Godrej Appliances has introduced Godrej InsuliCool and Godrej InsuliCool cooling solutions for storage of insulin, tackling a major challenge faced by diabetics to store insulin at recommended temperatures.
- "Improper storage of insulin leading to lowering of its potency can lead to

increasing dosage over time. Proper storage of insulin at the recommended temperature can go a significant way in managing diabetes, usually a long running condition in patients,

About Insulin and Diabetes

- Insulin is a hormone made in your pancreas, a gland located behind your stomach.
- Insulin allows your body to use glucose for energy.
- Glucose is a type of sugar found in many carbohydrates.
- Insulin also helps balance your blood glucose levels.
- When there's too much glucose in your bloodstream, insulin tells your body to store the leftover glucose in your liver.
- The stored glucose isn't released until your blood glucose levels decrease.
- Your blood glucose levels may decrease between meals or when your body is stressed or needs an extra boost of energy.
- Diabetes occurs when your body doesn't use insulin properly or make enough insulin. There are two main types of diabetes: type 1 and type 2.
- Type 1 diabetes is an autoimmune disease, which is a type of disease that causes the body to attack itself.
- If you're living with type 1 diabetes, your body cannot make insulin properly.
- This is because your immune system has harmed the insulin-producing cells in your pancreas.
- Type 1 diabetes is more commonly diagnosed in young people, although it can develop in adulthood.

- In type 2 diabetes, your body has become resistant to the effects of insulin.
- This means your body needs more insulin to get the same effects. As a result, your body overproduces insulin to keep your blood glucose levels normal.
- After many years of this overproduction, the insulin-producing cells in your pancreas burn out.
- Type 2 diabetes can affect people of any age.

James Webb Telescope

- NASA on Tuesday unveiled images from the James Webb Space Telescope, the largest and most powerful orbital observatory ever launched
- It was a “deep field” photo of a distant galaxy cluster, SMACS 0723,
- The James Webb Space Telescope (sometimes called JWST or Webb) is an orbiting infrared observatory that will complement and extend the discoveries of the Hubble Space Telescope, with longer wavelength coverage and greatly improved sensitivity.
- The longer wavelengths enable Webb to look much closer to the beginning of time and to hunt for the unobserved formation of the first galaxies, as well as to look inside dust clouds where stars and planetary systems are forming today.
- The James Webb Space Telescope (JWST) is a space telescope designed primarily to conduct infrared astronomy. As the largest optical telescope in space, its greatly improved infrared resolution and sensitivity allows it to view objects too old, distant, or faint for the Hubble Space Telescope
- U.S. National Aeronautics and Space Administration (NASA) led JWST's development in collaboration with European Space Agency (ESA) and the

Canadian Space Agency (CSA).

- Infrared astronomy is a sub-discipline of astronomy which specialization observation and analysis of astronomical objects using infrared (IR) radiation.
- The wavelength of infrared light ranges from 0.75 to 300 micrometers, and falls in between visible radiation, which ranges from 380 to 750 nanometers, and submillimeter waves.
- Infrared astronomy began in the 1830s, a few decades after the discovery of infrared light by William Herschel in 1800.
- The NASA Goddard Space Flight Center (GSFC) in Maryland managed telescope development, the Space Telescope Science Institute in Baltimore on the Homewood Campus of Johns Hopkins University operates JWST, and the prime contractor was Northrop Grumman.
- The telescope is named after James E. Webb, who was the administrator of NASA from 1961 to 1968 during the Mercury, Gemini, and Apollo programs.

MISSION GOALS

- Search for the first galaxies or luminous objects formed after the Big Bang
- Determine how galaxies evolved from their formation until now
- Observe the formation of stars from the first stages to the formation of planetary systems
- Measure the physical and chemical properties of planetary systems, including our own Solar System, and investigate the potential for life in those systems

INSTRUMENTS

- Near Infrared Camera (NIRCam)

- Near Infrared Spectrograph (NIRSpec)
- Mid Infrared Instrument (MIRI)
- Fine Guidance Sensors/Near Infrared Imager and Slitless Spectrograph (FGS/NIRISS)
- Food fortification
- Centre had started the second phase of distribution of fortified rice from April 1.
- A total of 90 districts have been covered, and the Centre is targeting 291 districts, he added.
- The scheme, started in October 2021, aims to supply fortified rice to beneficiaries of the Integrated Child Development Services (ICDS) and the Pradhan Mantri Poshan Shakti Nirman, or PM-POSHAN, scheme.
- The health risks involved in the consumption of fortified rice, which has added nutrients, and the warnings experts had given to the Centre against such a scheme,
- Although the benefits far outweighed the harmful effects.

What is food fortification?

- Fortification is the practice of deliberately increasing the content of one or more micronutrients (i.e., vitamins and minerals) in a food or condiment to improve the nutritional quality of the food supply and provide a public health benefit with minimal risk to health.
- As well as increasing the nutritional content of staple foods, the addition of micronutrients can help to restore the micronutrient content lost during processing.
- Fortification is an evidence-informed intervention that contributes to the

prevention, reduction and control of micronutrient deficiencies.

- It can be used to correct a demonstrated micronutrient deficiency in the general population (mass or large-scale fortification) or in specific population groups (targeted fortification) such as children, pregnant women and the beneficiaries of social protection programmes.
- When the vitamins and minerals are not added to the foods during the processing but just before consumption at home or at schools or child-care facilities, it is called point-of-use fortification.

Global food crisis

- The crisis can emerge in the form of food shortages, trade disruptions, a rise and spread in hunger and poverty levels, a depletion of foreign exchange reserves for net food importing countries, a strain on a nation's fiscal resources due to an increase in spending on food safety nets, a threat to peace, and even social unrest in some places.
- Recent spike in food prices which has been triggered by supply disruptions due to COVID-19 and further aggravated by the Russia-Ukraine war.
- Some other important factors that have also contributed to a rise in food prices and the build-up of price shocks can be discerned from the trade patterns and composition of the usage of food commodities.
- The current food price spike first began in vegetable oils and then expanded to cereals.
- The trade patterns of these commodities show that around 38% of the vegetable oil produced and consumed is globally traded.
- In the case of wheat, dependence on trade to meet global demand forms 25%,

while only one tenth of rice output or consumption is traded.

- Trade dependence for maize is 16%.
- It is evident then that the effect of global trade disruption will be higher for commodities that are traded more and vice-versa
- The proportion of vegetable oil used for biodiesel increased from 1% in 2003 to 11% in 2011; it went up to more than 15% in 2021. This is further related to energy prices.
- When crude prices increase beyond a certain level it becomes economical to use oilseeds and grains for biodiesel and ethanol, respectively.
- The second reason for the use of food crops for biofuel is the mandates to increase the share of renewable energy resources.
- Food prices are also expected to go up in the current and next harvest season because of an increase in the prices of fertilizer and other agrochemicals.
- Implications for India Export and import in the agriculture sector constituted 13% of gross value added in agriculture during 2020-21.
- Therefore, some transmission of an increase in global prices on domestic prices is inevitable. (Transmission of international prices to domestic prices can be prevented only if there is no trade.)
- This transmission of global prices to the domestic market can be moderated through trade policy and other instruments.
- This is precisely what India has been doing to balance the interests of producers and consumers and in protecting the economy against excessive volatility in international prices.

Wheat export restrictions

- The recent ban on wheat exports and restrictions on the export of other food commodities by India need to be seen in the light of an abnormal situation created by spikes in international prices.
- Some experts see it as a setback to India's image as a reliable exporter as this move is seen to disrupt (regular) export channels.

Global impact

- The Green Revolution technology which spread in developing countries from the 1970s to the 1990s helped in keeping food prices low and relatively stable.
- As the steam of Green Revolution technology slowed down with the start of the 21st century, food prices began increasing in real terms
- The world requires new breakthroughs such as Green Revolution technology, for large-scale adoption in order to enable checks on food prices rising at a faster rate.
- This in turn requires increased spending on agriculture research and development (especially by the public sector and multilateral development agencies).
- There is a need to strengthen and rejuvenate the global agri-research system under the Consultative Group on International Agricultural Research (CGIAR) which is heading towards disarray.
- Biofuel protocols have contributed to the global food crisis for the second time in the last 15 years.
- Diversion of land under food crops and food output for biofuel should be carefully calibrated with implications for food availability.

Lamda

- LaMDA, Google’s modern conversational agent is enabled with a neural network capable of deep learning.
- LaMDA is Google’s answer to the quest for developing a non-goal directed chatbot that dialogues on various subjects.
- Such advanced software could revolutionize customer interaction and help AI-enabled internet search

What is a neural network?

- A neural network is an AI tech that attempts to mimic the web of neurons in the brain to learn and behave like humans.
- Early efforts in building neural networks targeted image recognition.
- The artificial neural network (ANN) needs to be trained like a dog before being commanded.
- For example, during the image recognition training, thousands of specific cat images are broken down to pixels and fed into the ANN

What is LaMDA?

- LaMDA is short for 'Language Model for Dialogue Applications', Google's modern conversational agent enabled with a neural network capable of deep learning.
- Instead of images of cats and dogs, the algorithm is trained using 1.56 trillion words of public dialogue data and web text on diverse topics.
- The neural network built on Google's open-source neural network, Transformer, extracted more than 137 billion parameters from this massive database of

language data.

How is LaMDA different from other chatbots?

- Chatbots like 'Ask Disha' of the Indian Railway Catering and Tourism Corporation Limited (IRCTC) are routinely used for customer engagement.
- The repertoire of topics and chat responses is narrow.
- The dialogue is predefined and often goal-directed.
- LaMDA is Google's answer to the quest for developing a non-goal directed chatbot that dialogues on various subjects.
- The chatbot would respond the way a family might when they chat over the dinner table; topics meandering from the taste of the food to price rise to bemoaning war in Ukraine.
- Inspired by the mathematician Alan Turing's answer to the question 'Can a machine think?', AI tech today aims to satisfy the Turing test to qualify as 'intelligent'.
- Turing was the designer and builder of the world's first computer, ENIGMA, which was used to break the German codes during the Second World War.
- To test if a machine 'thinks', Turing devised a practical solution. Place a computer in a closed room and a human in another.
- If an interrogator interacting with the machine and the human cannot discriminate between them, then Turing said that the computer should be construed as 'intelligent'.

Is the technology dangerous?

- The challenges of AI metamorphosing into sentient are far in the future; however, unethical AI perpetuating historical bias and echoing hate speech are the real dangers to watch for.
- Imagine an AI software trained with past data to select the most suitable candidates from applicants for a supervisory role.
- Women and marginalized communities hardly would have held such positions in the past, not because they were unqualified, but because they were discriminated against.
- While we imagine the machine to have no bias, AI software learning from historical data could inadvertently perpetuate discrimination.

Nuclear disarmament

- The Stockholm International Peace Research Institute (SIPRI) released its yearbook a few days back highlighting some trends of the past year in international security. Russia leads the charge in absolute numbers of nuclear inventory.
- India is the top weapons importer during the 2017-2021 period. Other countries to feature in the top five arms importers list include Saudi Arabia, Egypt, China, and Australia.
- According to SIPRI, these five nation states account for 38% of total global arms import.
- Recent geopolitical events transpiring around the world in practically all regions have made the global security climate more unstable.

- Military modernization is seen to be a global trend.
- All nuclear weapon owning states have, over the years, stated and worked upon their intention to modernize multiple facets of their armed forces

What are the key developments/concerns flagged by the yearbook?

- The yearbook mentions low level border clashes between India and Pakistan, the civil war in Afghanistan, and the armed conflict in Myanmar as some of the worrying indicators of an unstable system.
- It also highlighted three cause of concern trends: Chinese-American rivalry, involvement of state and non-state actors in multiple conflicts, and the challenge that climatic and weather hazards pose. It is important to note here that the threat posed by climate change seems to feature in the report only nominally.
- The marginal downsizing observed in the nuclear arsenal has come mostly from the U.S. and Russia dismantling retired warheads.
- But the Russian invasion of Ukraine has raised some serious eyebrows because of the continuous rhetoric from the Kremlin over them not shying away from the use of nuclear weapons.
- China's recent activities surrounding construction of 300 new nuclear missile silos have also been turning head.

Cryptocurrency crash

Why are cryptocurrencies crashing?

- It may not be possible to pinpoint the exact reasons why investors are fleeing cryptocurrencies at the moment.

- Most analysts believe that the fall in the price of cryptocurrencies is in line with the fall in prices of stocks and other assets as central banks such as the U.S. Federal Reserve tighten monetary policy to fight price rise.
- As central banks withdraw liquidity from the market, there's less money chasing assets, which in turn causes the prices of assets to drop.
- Others believe that the crash could also mark the popping of the bubble that has driven the prices of cryptocurrencies to stratospheric levels.
- Sceptics have long argued that the price of cryptocurrencies seems driven more by speculative fervour fuelled by easy monetary policy than by any fundamental factors.
- For instance, the extreme volatility in the price of cryptocurrencies was seen by many as a feature that ruled out the use of cryptocurrencies as money
- The use of cryptocurrencies for real-life transactions was low.
- So, in essence, there was very little reason to believe that the rally in cryptocurrencies was driven by their wider acceptability as an alternative to fiat currencies.

How do governments view cryptocurrencies?

- Some sceptics have also argued that even though private cryptocurrencies can rise to the status of alternatives to fiat currencies over time, governments and central banks may not allow this to happen.
- Many countries have taken several steps to discourage the widespread use of cryptocurrencies.
- While countries such as China and Russia have opted to impose outright bans on cryptocurrencies, others such as India have tried to tax and regulate them heavily.

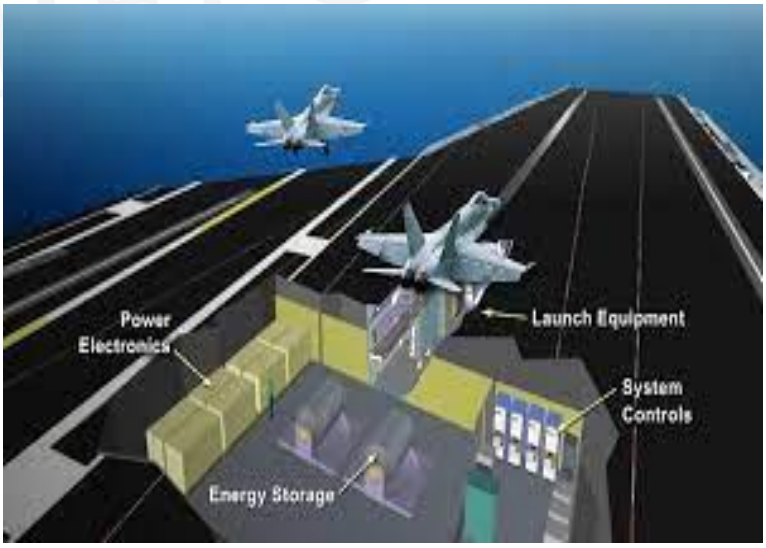
- In India, while the government has not imposed an outright ban on cryptocurrencies, the Reserve Bank of India has been quite vocal about the need to ban them completely.
- It is no surprise that central banks are wary of private cryptocurrencies since they challenge the monopoly that central banks currently enjoy over the money supply of an economy.
- If cryptocurrencies became widely acceptable, it would affect the control that central banks possess over the economy's money supply.

Nutrition scheme

- Under the "Mukhyamantri Matrushakti Yojana", pregnant and lactating mothers will be given 2 kg of chickpeas, 1 kg of tur dal and 1 kg of edible oil free of cost every month from anganwadi centres in Gujarat. An estimated 1.36 lakh women will benefit from the scheme.
- The Prime Minister will also disburse around ₹120 crore towards 'Poshan Sudha Yojana', which is now being extended to all tribal beneficiaries in the State.
- The scheme was being implemented as a pilot project in 10 talukas of five tribal-dominated districts and is now being expanded to 14 tribal dominated districts.
- It offers one nutritious meal a day to pregnant and lactating women.
- The schemes aim to intervene during the first 1,000 days of a child's life, which is the period from conception till the time the child turns two.
- Their objective is to improve infant mortality and maternal mortality rates.
- Biggest Aircraft Fujjan - electromagnetic catapult
- China on Friday launched its biggest and most modern aircraft carrier, marking a

major military advance for the Asian superpower.

- The announcement comes at a time of heightened tensions between China and the United States over Beijing's saber-rattling towards Taiwan
- China's carrier development programme is part of a massive overhaul of the People's Liberation Army
- The new carrier, named Fujian, is the "first catapult aircraft carrier wholly designed and built by China"
- It has significantly more advanced technology than China's two other carriers, including electromagnetic catapults to launch aircraft off its deck
- The other carriers use a skijump-style ramp for takeoffs.
- "The conventional flight deck with (electromagnetic catapults) will at least in theory allow the carrier to launch aircraft faster and with heavier payloads which constitute key deciding factors during battle,



Electromagnetic catapult

- An electromagnetic catapult is a type of aircraft launching system. Currently, only

the United States and China have successfully developed it, and it is installed on the USS *Gerald R. Ford* and the Chinese aircraft carrier *Fujian*.

- The system launches carrier-based aircraft by means of a catapult employing a linear induction motor rather than the conventional steam piston.
- The advantage of the electromagnetic catapult is that it is safer and more reliable because the acceleration process is more uniform and less damaging to the structure of the aircraft compared to the steam catapult.

- Its main advantage is that it accelerates aircraft more smoothly, putting less stress on their airframes.
- Compared to steam catapults, the EMALS also weighs less, is expected to cost less and require less maintenance, and can launch both heavier and lighter aircraft than a steam piston-driven system.
- As the 21st century dawns, steam catapults are running out of steam. Massive systems that require significant manpower to operate and maintain, they are reaching the limits of their abilities, especially as aircraft continue to gain weight.
- Electromagnetic catapults will require less manpower to operate and improve reliability; they should also lengthen aircraft service life by being gentler on airframes.

- The amount of steam needed to launch an airplane depends on the craft's weight, and once a launch has begun, adjustments cannot be made:
- If too much steam is used, the nose wheel landing gear, which attaches to the catapult, can be ripped off the aircraft. If too little steam is used, the aircraft won't reach takeoff speed and will tumble into the water.
- The launch control system for electromagnetic catapults, on the other hand, will know what speed an aircraft should have at any point during the launch sequence, and can make adjustments during the process to ensure that an aircraft will be within 3 mph of the desired takeoff speed.

Cryptocurrency

- Cryptocurrencies were initially touted to be alternatives to fiat currencies. Since the supply of a lot of cryptocurrencies is limited by design, investing in them seemed like a good way to protect one's wealth from inflation fuelled by central banks.
- But as it became obvious that cryptocurrencies have had very little acceptance as money, crypto-enthusiasts began to argue a slightly different case.
- Cryptocurrencies were now touted as an independent asset class like gold and silver that could serve as an effective hedge in times of crisis.
- The crash in the crypto market amidst wider market correction has put to rest the argument that crypto, as an asset class, is as good a hedge as precious metals.
- There is little reason to believe that cryptocurrencies possess any intrinsic value that can make them serve the role of widely accepted money or as a legitimate asset class such as precious metals.
- The acceptability of cryptocurrencies in the wider economy has remained

minuscule and there are no signs of their use for purposes other than wild speculation

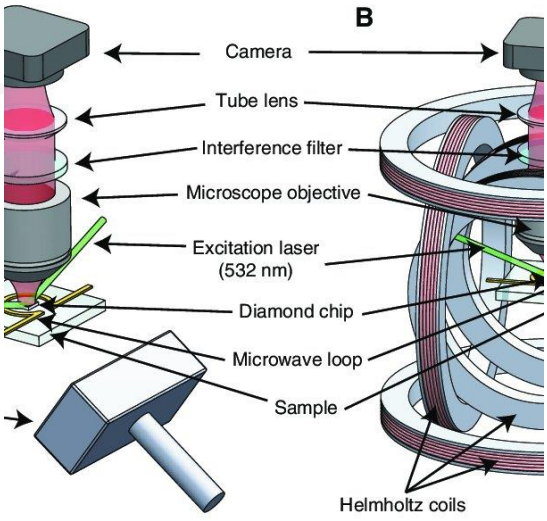
- Governments and their central banks have been largely unwilling to recognise cryptocurrencies as a legitimate investment asset.
- They are also unlikely to recognise private cryptocurrencies as they infringe on the state's fiscal and monetary authority
- regardless of the investment prospects of cryptocurrencies, a proper regulatory framework may help in protecting retail investors, at least from outright scams

Quantum diamond microscope

- Researchers from the Indian Institutes of Technology (IIT) at Mumbai and Kharagpur have built a microscope that can image magnetic fields within microscopic two-dimensional samples that change over milliseconds.
- This has a huge potential for scientific applications, such as in measuring biological activity of neurons and dynamics of vortices in superconductors.
- This is the first time that such a tool has been built to image magnetic fields that change within milliseconds
- Signals in nature exhibit a range of frequencies magnetism in geological rock samples and rare earth magnets can be constant over months; magnetic nanoparticle aggregation inside living cells takes place in minutes; action potentials in neurons are fast, taking milliseconds, whereas precession of atomic spins in complex molecules takes only microseconds.
- The instrument that this team has built works in the millisecond range.
- The key aspect of this sensor is a "nitrogen vacancy (NV) defect centre" in a

diamond crystal.

- Such NV centres act as pseudo atoms with electronic states that are sensitive to the fields and gradients around them (magnetic fields, temperature, electric field and strain).
- "Notably, the fluorescence emitted from these NV centres encodes the magnetic field information,
- Earlier reported magnetic field imaging frame rates were close to 1-10 minutes per frame.
- This would increase to about half an hour per frame for challenging samples like biological cells.
- The instrument built by this group exhibits an imaging frame rate of about 50-200 frames per second, which would translate into a frame acquisition time of about 2-5 milliseconds.



Monkey pox virus

What is the monkey pox virus?

- Monkey pox is not a new virus.
- The virus, belonging to the poxvirus family of viruses, was first identified in monkey's way back in 1958, and therefore the name.
- The first human case was described in 1970 from the Democratic Republic of Congo and many sporadic outbreaks of animal to human as well as human to human transmission has occurred in Central and West Africa in the past with significant mortality
- Since the transmission occurs only with close contact, the outbreaks have been in many cases self-limiting
- While monkeys are possibly only incidental hosts, the reservoir is not known.
- It is believed that rodents and non-human primates could be potential reservoirs.

Does the virus mutate?

- Monkeypox virus is a DNA virus with a quite large genome of around 2,00,000 nucleotide bases.
- While being a DNA virus, the rate of mutations in the monkeypox virus is significantly lower (~1-2 mutations per year) compared to RNA viruses like SARS-CoV-2.

Heatwaves and cyclone Amphan

- Rising greenhouse gas emission is the primary factor for anthropogenic (human-induced) climate change.
- The increase in carbon dioxide concentration can trap the radiation into the atmosphere and not let it go into space.
- This trapping of the extra energy increases the average surface air temperature and warms the climate that we know as global warming.
- As the capacity of the atmosphere to absorb the heat is very less, more than 90% of the extra heat that has been trapped in the climate system has been absorbed by the oceans since 1970, according to IPCC AR5, and IPCC AR6 reports.
- Due to this, oceans are warming globally from the surface to deeper depths.
- The warming of the oceans has severe consequences such as increasing intensity and frequency of extreme events, rising sea levels, melting glaciers, and changing the weather pattern across the globe.
- Faster warming previous studies have shown that due to global warming, the tropical Indian Ocean, at the surface, is warming at a faster rate as compared to the rest of the global ocean.

- The high sea surface temperatures are more susceptible to generating extreme temperature conditions that persist over days to months and are termed as Marine Heatwaves (MHWs).
- This intense warming of the ocean due to MHW has severe socio-economic consequences such as fish mortality, and coral bleaching, and also has the potential to interact and modify other extreme events such as tropical cyclones.
- The anthropogenic warming of the oceans and atmosphere facilitates the generation and intensification of extreme events such as MHWs and tropical cyclones.
- Both marine heat waves and tropical cyclones are the extreme events of the ocean-atmosphere coupled system
- Our study, published in the Frontiers in Climate, is the first study conducted in the Indian Ocean that investigates the interaction between a marine heatwave and super cyclone Amphan in the Bay of Bengal in May 2020

Sea surface temperature

- The Bay of Bengal exhibits high sea surface temperatures (about 28°C) throughout the year and is more prone to tropical cyclones.
- The Bay of Bengal is home to about 5-7% of the total number of tropical cyclones occurring globally each year and this makes the North Indian Ocean vulnerable to the highest number of fatalities globally.
- Amphan was the first super cyclone in the Bay of Bengal in the last 21 years and intensified from category 1 (cyclonic storm) to category 5 (super cyclone) in less than 24 hours.
- Amphan was also the costliest tropical cyclone on record in the North Indian

Ocean, with reported economic losses of approximately $14 billion in India, according to the World Meteorological Organization and 129 casualties across India and Bangladesh.

- According to the latest IPCC report (AR6), Amphan was the largest source of displacement in 2020, with 2.4 million displacements in India alone, out of which around 8,00,000 was pre-emptive evacuation by the authorities
- The cause -found the presence of a strong MHW beneath the track of the cyclone with an extremely high anomalous sea surface temperature of more than 2.5°C that coincided with the cyclone track and facilitated its rapid intensification in a short period.

Black Death

- A strain of Yersinia pestis, the bacterium responsible for the Black Death pandemic in the 1300s (AD 1346–1353), has been traced back to a fourteenth-century outbreak in what is now Kyrgyzstan.
- The area was located on the Silk Road trade route, which might have helped the Black Death pandemic to spread westward.
- The Black Death, the biggest pandemic of our history, was caused by the bacterium Yersinia pestis and lasted in Europe between the years 1346 and 1353.
- Despite the pandemic's immense demographic and societal impacts, its origins have long been elusive.
- Researchers have now obtained and studied ancient Y. pestis genomes that trace the pandemic's origins to Central Asia
- Come from Central Asia, close to Lake Issyk Kul, in what is now Kyrgyzstan.

India and Environment performance index

- The recently-released Environment Performance Index 2022, which ranks 180 countries based on several indicators, has placed India at the bottom of the list.
- The EPI has used 40 performance indicators across 11 ‘issue categories’ to gauge the progress made by nations on climate change, environmental health, and the vitality of ecosystems.
- Denmark topped the list, followed by the United Kingdom and Finland. The cause is not far to seek: these countries have massively reduced the emission of greenhouse gases in recent years.
- The worst performers are India, Myanmar, Vietnam, Bangladesh and Pakistan.
- What is worrying is India’s consistent poor showing: in the 2020 index, India ranked 168th out of 180 countries. Rapidly increasing greenhouse gas emissions, plastic waste generation and deteriorating air quality have put India at the bottom
- On World Environment Day, the Prime Minister, Narendra Modi, announced that India has achieved its target of 10 per cent ethanol blending in petrol five months before the deadline.
- Earlier, in March, Mr Modi’s government had insisted that India is on track to meet its nationally determined contributions that are at the heart of the Paris Agreement.
- Unsurprisingly, the Centre has rejected the EPI, insisting that some of the indicators are “extrapolated and based on surmises and unscientific methods”.
- It has alleged that the shifting of weightage on and the removal of many indicators crucial carbon sinks, such as forests and wetlands, have not been calculated have led to the decline

- Within the overall climate score, India does better in sub-metrics such as growth rates for black carbon, methane and fluorinated gases, and greenhouse gas emissions based on their intensity and per capita volumes.
- The Index rates the country low on projected greenhouse gas (GHG) emissions for mid-century, a target for Net Zero emissions.
- The EPI report estimates that China, India, the United States, and Russia are expected to account for over 50% of global residual greenhouse gas emissions by 2050.

Indian monsoon

- The latest IMD figures suggest that the monsoon is running an 8% deficit. Central India, which has the largest swathe of land dependent on rainfed agriculture, has only got 52% of the rain that is due; the southern peninsula has a 22% deficit.
- Only India's east and north-eastern parts are battling the diametrically opposite problem of too much rain, with floods in Assam and Meghalaya submerging entire villages.
- The northwest of India, where the monsoon is yet to arrive, and reeling under a series of heatwaves, is battling a rainfall deficit of 33%.
- The monsoon rainfall is critical to kharif sowing and so a faltering June has raised concerns in several quarters.
- However, there is little to be worried about at this juncture.
- June rainfall, particularly in the first fortnight, is historically patchy and contributes less than 18% of the monsoon rainfall.
- Meteorologists maintain that there is no correlation of the timing and advent of

the monsoon rainfall with its eventual performance

- Episodes of drought in India and those that are linked to agricultural failures are when the monsoon fails in these two months. The monsoon core zone, which consists of most of the rainfed agriculture regions, too is expected to receive "above normal" rain.
- In previous years, there has been a pattern of 'normal' and 'above normal' rains being forecast only for them to dry up for large periods in July and August, followed by a sudden surge in September.
- This pattern may help deliver the numbers but is not always beneficial for kharif sowing.
- The expectations of a good monsoon are premised on the persistence of a La Niña, the converse of the El Niño and characterized by a cooling of the Central Pacific waters.
- However, the Indian Ocean Dipole (IOD), another index of significance to the monsoon, is expected to be negative. Whether the La Niña can compensate for the dampening of the IOD remains to be seen.

Auctioning 5G Spectrum

The story so far:

- The Union Cabinet, chaired by Prime Minister Narendra Modi, gave its nod for the auction of spectrum that can be used to offer 5G services, at its meeting held on June 14.
- A total of 72,097.85 MHz (or 72 GHz) of spectrum with a validity period of 20 years will be put on sale during the auction planned towards the end of July.
- The auction will be held for spectrum in various Low (600 MHz, 700 MHz, 800

MHz, 900 MHz, 1800 MHz, 2100 MHz, 2300 MHz), Mid (3300 MHz) and High (26 GHz) frequency bands.

- It is expected that the Mid and High band spectrum will be utilized by telecom service providers (TSPs) to roll-out 5G services wherein speeds would be 10 times higher than what is possible through the current 4G services

What are the key issues?

- The two issues that the industry has highlighted with regards to the upcoming auctions are high reserve prices for the spectrum and direct allotment of spectrum to enterprises for setting up captive private networks.
- The government has accepted the recommendations given by the Telecom Regulatory Authority of India (TRAI) on reserve prices for spectrum auctions.
- On allowing direct allocation of spectrum for captive non-public networks, the government has reasoned that the move will spur a new wave of innovations in Industry 4.0 applications such as machine to machine communications, Internet of Things (IoT), Artificial Intelligence (AI) across automotive, healthcare, agriculture, energy, and other sectors.
- However, the Cellular Operators Association of India (COAI), which counts the three private telcos as its members, has said that the move severely degrades the business case of TSPs.
- "This will diminish the revenue so much that there will be no viable business case left for the TSPs and there will not remain any need for 5G networks roll-out by TSPs

What benefits are likely to come with 5G?

- 5G is the next generation cellular technology that will provide faster and more

reliable communication with ultra-low latency.

- As per the set standards, with 5G, the peak network speeds are expected to be in the range of 2-20 Gbps as opposed to about 25 Mbps on current 4G networks.
- In India, however, 4G speeds average at around 6-7 Mbps, but are picking up gradually. It is expected that with 5G technology, consumers will be able to download data heavy content such as 8K movies and games with better graphics in just a few seconds.
- The users will need to update to 5G-enabled devices to access the network, if they are not already using one. However, it is likely that the primary use of the technology will go beyond delivery of services on personal mobile devices.
- 5G is expected to form the backbone of emerging technologies such as IoT and machine to machine communications, thereby supporting a much larger range of applications and services, such as tele-surgery and real time data analytics.
- Ultra-low latency offered by 5G makes the technology desirable for such use cases. Latency is the amount of time data takes to travel between its source and destination.
- 5G is expected to create a cumulative economic impact of $1 trillion in India by 2035, the report added.

Cryptocurrency and El Salvador

The story so far:

- The crash in the price of Bitcoin and other cryptocurrencies has put El Salvador's government in trouble.
- The Central American country, led by President Nayib Bukele who is a self-proclaimed fan of cryptocurrencies, had adopted Bitcoin as an official currency

in September last year.

- The crash in the price of Bitcoin has raised concerns over the government's ability to repay its debt

What is the problem in El Salvador?

- The crash in the price of Bitcoin from around $69,000 in November last year to around $20,000 this week has caused losses to investors around the world.
- According to some estimates, the average cryptocurrency investor is deep in losses after the significant correction in the prices of cryptocurrencies.
- The crash in Bitcoin's price has not spared the government of El Salvador either. President Bukele has been using taxpayer's money to bet on Bitcoin

Why did El Salvador adopt Bitcoin as an official currency?

- In 2001, El Salvador had adopted the U.S. dollar as its official currency. After Bitcoin was adopted as an official currency in September last year, both Bitcoin and the U.S. dollar have been used as official currencies.
- The El Salvador government has been trying to encourage citizens to primarily use Bitcoin for their daily transactions.
- It even came out with a payments wallet named Chivo which gave out for free Bitcoin worth $30 initially to encourage people to use Bitcoin in transactions.
- Analysts believe that the decision to adopt Bitcoin as an official currency may have to do with the El Salvador government's inability to borrow in U.S. dollars
- Bitcoin offers a chance for the El Salvador government to cut down its reliance on the U.S. dollar to fund its spending.
- Greater adoption of Bitcoin in El Salvador will allow the government to tax and

spend in Bitcoins instead of U.S. dollars

How well has Bitcoin done in El Salvador?

- Most citizens of El Salvador have been reluctant to adopt Bitcoin as a medium of exchange, that is, as money.
- Many citizens, it is claimed, registered on the payments wallet Chivo that was pushed by the government simply to sell off their free Bitcoin in exchange for $30.
- It should be noted that the acceptance of cryptocurrencies in general has been miniscule across the globe.
- One big reason for the low acceptance of cryptocurrencies has been their extreme price volatility, making them an unreliable store of value.

Sterlite copper

- Sterlite operated the largest copper smelter plant in India, in Thoothukudi from 1998 to 2018.
- The plant was not operational from March 2018 and was shut down by the Government of Tamil Nadu on 28 May 2018 after protests from locals.
- Sterlite Copper of Thoothukudi in Tamil Nadu has become a moral issue after the police firing on protesters resulted in the deaths of 13 people in May 2018 .
- Sterlite's product, copper, is a strategic metal. Important applications are energy, electrical equipment and electronics.
- Copper production provides strategic balance and price stability.
- The shuttering of the Sterlite plant quickly made India, a copper exporter, an importer.

- However, distrust of Sterlite is so much that many people now credit good rains to the shuttering of the plant.
- The community complains that Sterlite did not employ enough local people and did not give enough contracts for local businessmen.
- Therefore, the corporate group needs to act responsibly and take the people along with it if it wants to conduct its business.

Why Earthquake in Afghanistan?

- The death toll from an earthquake in Afghanistan hit 1,000, disaster management officials said, with more than 600 injured and the toll expected to grow as information trickles in from remote mountain villages
- The quake originated near the city of Khost, which is close to the country's border with Pakistan and about 160 kilometers (100 miles) south of the Afghan capital, Kabul.

What caused the quake?

- Afghanistan is earthquake-prone because it's located in the mountainous Hindu Kush region, which is part of the Alpide belt the second most seismically active region in the world after the Pacific Ring of Fire.
- The Alpide belt runs about 15,000 kilometers, from the southern part of Eurasia through the Himalayas and into the Atlantic. Along with the Hindu Kush, it includes a number of mountain ranges, such as the Alps, Atlas Mountains and the Caucasus Mountains.
- Additionally, the Earth's crust is especially lively in Afghanistan because it is where the Arabian, Indian and Eurasian tectonic plates meet. The Earth's crust is

made up of 15 tectonic plates, which create earthquakes when they shift against each other at their borders. The boundary between the Indian and Eurasian plates exists near Afghanistan's border with Pakistan.

- Tuesday's earthquake formed when the Indian plate crashed violently with the Eurasian plate. Collisions like this shake and squeeze the ground upwards. Along with causing earthquakes, this movement creates mountains like the Himalayas or the Hindu Kush and Pamir mountain ranges in northeast Afghanistan.

New coral species

- Scientists have recorded four species of corals for the first time from Indian waters.
- These new species of azooxanthellate corals were found from the waters off the Andaman and Nicobar Islands.
- The azooxanthellate corals are a group of corals that do not contain zooxanthellae and derive nourishment not from the sun but from capturing different forms of planktons.
- They are deep-sea representatives with the majority of species being reported from depths between 200 meters and 1,000 meters.
- They are also reported from shallow waters unlike zooxanthellate corals that are restricted to shallow waters
- The Zoological Survey of India (ZSI) scientist behind these new findings, Tamal Mondal, said all the four groups of corals are from the same family, Flabellidae.
- Truncatoflabellum crassum (Milne Edwards and Haime, 1848), T. incrustatum (Cairns, 1989), T. aculeatum (Milne Edwards and Haime, 1848), and T. irregulare (Semper, 1872) under the family Flabellidae were previously found in Japan, the

Philippines and Australian waters, while only T. crassum was reported with the range of Indo-West Pacific distribution

- A zooxanthellate corals are a group of hard corals and the four new species recorded are not only solitary but have a highly compressed skeletal structure.
- "Most studies of hard corals in India have been concentrated on reef-building corals while much is not known about non-reef-building corals.
- These new species enhance our knowledge about non-reef-building solitary corals.

Birds strike and aviation safety

- Following two back-to-back bird strikes incidents, the Directorate General of Civil Aviation in a directive to all airport operators has asked all airports to "review their wildlife hazard management plans" for "within and outside the airfield".
- An analysis of 62,416 verified records by the International Civil Aviation Organization's (ICAO) Bird Strike Information System showed that most bird hits were in or near airports during the take-off and approach phases of flight.
- The Salim Ali Centre for Ornithology and Natural History has now expanded a study of air hazard issues to 12 airports across India. Its studies show that each airport in India has its unique ecological setting and therefore the solutions are different

Recommendations

- Recent bird hit incidents show that all areas surrounding an airport ought to be clear of slaughter houses and garbage dumping (factors which can attract wildlife and increase risks).

- Airports are also expected to have incinerators to dispose of garbage removed from aircraft.
- The expert said that airlines are supposed to have some standard operating procedures for bird strike prevention.
- He added that for pilots, it is important to have constant monitoring. After lift-off, the pilot flying should have his eyes on the instruments and the pilot not flying has to have his/her eyes outside to look out for birds.
- This has to be emphasized during training.
- Finally, he said, understanding bird behaviour is something crew and operators need to be familiar with.
- Close to the ground, the instinctive response of birds is to get away from the aircraft path.
- Bird strikes occur when pilots try to climb over them during the initial take-off phase.
- Birds get sucked into an engine as an aircraft engine's field of ingestion is quite high with take-off thrust.
- Over 100ft, birds tend to dive to avoid an aircraft. Therefore, it is important to understand bird behaviour
- The scientist says that it must be noted that each airport in India has its unique ecological setting and therefore the solutions are different.
- For example, if there are 60 avian species that could be around an airport, only five to six could pose a problem.
- A study of birds over a year would lead to a specific list of recommendations on

how to handle the dynamics of these species.

Ancient mosque in Israel

- Israeli archaeologists on Wednesday unveiled a rare ancient mosque in the country's south that the antiquities officials said sheds light on the region's transition from Christianity to Islam.
- The remains of the mosque, believed to be more than 1,200 years old, were discovered during works to build a new neighborhood in the Bedouin city of Rahat, the Israel Antiquities Authority said in a statement.
- The mosque located in the Negev desert contains "a square room and a wall facing the direction of Mecca", with a half-circle niche in that wall pointing to the south.

Wearable technology and cybersecurity

- Digital wearables, smartwatches and fitness trackers pose unique threats to the security and privacy of customer data, warned the Institute of Electrical and Electronics Engineers (IEEE), a global outfit for technical professionals.
- "By connecting a wearable to an extended ecosystem, one is exposing a larger attack surface,"
- "Cybersecurity experts look at this as a supply chain that includes a data generator, an analytics engine and a service provider.
- Each link in the chain, including the connecting networks, presents a potential risk."
- As per a document shared by the IEEE, most criminal intrusions of computer networks have a financial motive.

- That may lead people to conclude that wearables have a low cybersecurity risk. But wearables data, especially in healthcare settings, is often tied to financial information.
- "Depending on the organisations from which it was obtained, stolen health data can be extremely valuable because it often includes so much personally-identifiable information including birthdays, email addresses and other login information, that can be used for identitytheft purposes,"

Types of AI

- Nasscom has introduced "AI Adoption Index" in a bid to assess trends of AI adoption in India.
- The index was the first detailed assessment of AI adoption, beginning with four key sectors of banking, financial services and insurance (BFSI), consumer packaged goods (CPG), retail, healthcare and industrials and automotive.
- These sectors could cumulatively contribute more than 60% of AI's potential value-add of $450 to $500 billion to the country's GDP by 2025
- The apex body said global investments in AI had more than doubled over the last couple of years, from $36 billion in 2020 to a high of $77 billion in 2021

About AI

- Artificial intelligence is the simulation of human intelligence processes by machines, especially computer systems.
- Specific applications of AI include expert systems, natural language processing, and speech recognition and machine vision.

Strong AI vs. weak AI

AI can be categorized as either weak or strong.

- Weak AI, also known as narrow AI, is an AI system that is designed and trained to complete a specific task. Industrial robots and virtual personal assistants, such as Apple's Siri, use weak AI.

- Strong AI, also known as artificial general intelligence (AGI), describes programming that can replicate the cognitive abilities of the human brain. When presented with an unfamiliar task, a strong AI system can use fuzzy logic to apply knowledge from one domain to another and find a solution autonomously. In theory, a strong AI program should be able to pass both a Turing Test and the Chinese room test.

What are the 4 types of artificial intelligence?

- Type 1: Reactive machines. These AI systems have no memory and are task specific. An example is Deep Blue, the IBM chess program that beat Garry Kasparov in the 1990s. Deep Blue can identify pieces on the chessboard and make predictions, but because it has no memory, it cannot use past experiences to inform future ones.

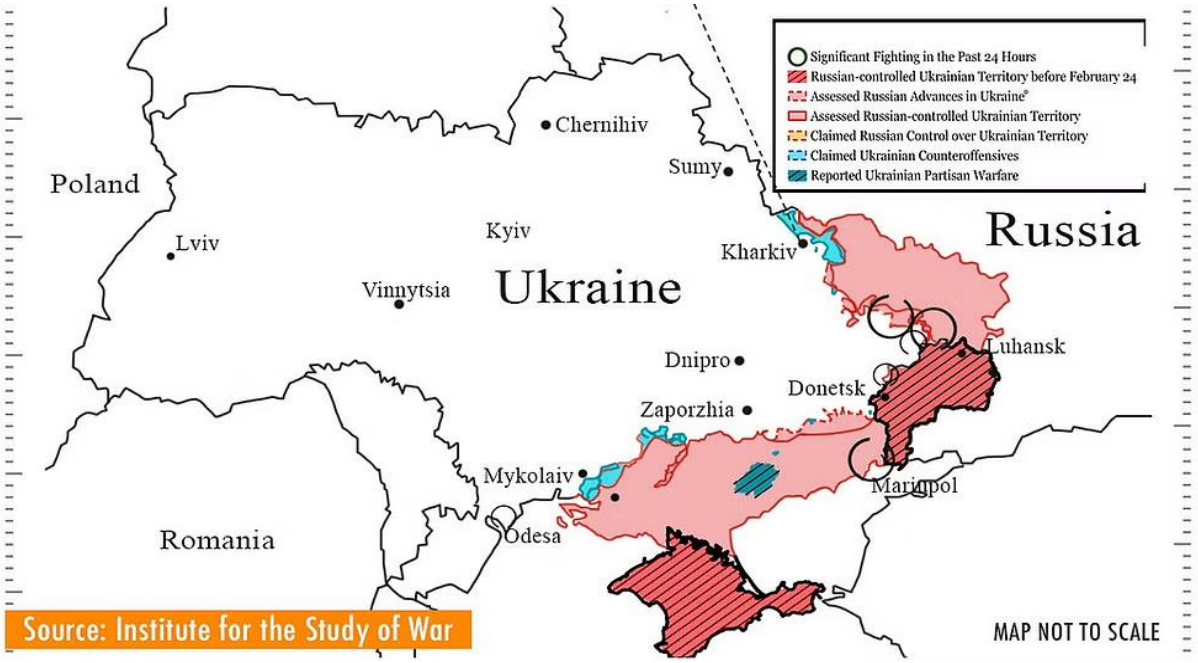
- Type 2: Limited memory. These AI systems have memory, so they can use past experiences to inform future decisions. Some of the decision-making functions in self driving car are designed this way.

- Type 3: Theory of mind. Theory of mind is a psychology term. When applied to AI, it means that the system would have the social intelligence to understand emotions. This type of AI will be able to infer human intentions and predict behavior, a necessary skill for AI systems to become integral members of human teams.

- Type 4: Self-awareness. In this category, AI systems have a sense of self, which gives them consciousness. Machines with self-awareness understand their own current state. This type of AI does not yet exist.

Severodonetsk

- Ukrainian forces will retreat from Severodonetsk after weeks of fierce fighting over the key city, a senior Ukrainian official said, in a major boost to Russia's goal of seizing a swathe of eastern Ukraine.
- The announcement came shortly after the EU granted Ukraine candidate status in a show of support for the former Soviet republic, although there is still a long path ahead to membership



National Mobile Monitoring Software (NMMS)

- In May 2021, the Ministry of Rural Development (MoRD) launched the National Mobile Monitoring Software (NMMS) app, a new application meant for "improving citizen oversight and increasing transparency" in National Rural Employment Guarantee Act (NREGA) works.
- It is to be deployed by NREGA Mates, local women at the panchayat level who are selected and trained to monitor NREGA worksites.
- The main feature of the app is the real-time, photographed, geo-tagged attendance of every worker to be taken once in each half of the day.
- . Conditions affecting workers While such an app may be useful in monitoring the attendance of workers who have fixed work timings, in most States, NREGA wages are calculated based on the amount of work done each day, and workers do not need to commit to fixed hours
- The conditions for registering NREGA attendance on the app put Women in a

dilemma where they may end up foregoing NREGA work.

- A stable network is a must for real-time monitoring; unfortunately, it remains patchy in much of rural India.
- This could lead to workers not being able to mark their attendance, and consequently lose a day of wages
- The app claims to "increase citizen oversight" by "bringing more transparency and ensuring proper monitoring of the schemes, besides potentially enabling processing payments faster.
- Corruption has been a rising problem in NREGA, with funds being siphoned off by faking attendance records.
- While ostensibly the NMMS's focus on real-time, geo-tagged attendance could be one way of addressing this corruption.

Climate change and crops

- Climate change may actually benefit some plants by lengthening growing seasons and increasing carbon dioxide. Yet other effects of a warmer world, such as more pests, droughts, and flooding, will be less benign
- Some farmlands may benefit from warming, but others won't
- North America No place grows more corn than the Midwestern United States. Despite a 20 percent drop in production, the region will remain a global supplier.
- South America Many crops will suffer in Brazil. Corn farmers will see crops decline by nearly 16 percent.
- Northern European potato farmers will see longer growing seasons. Fields farther south will become increasingly dry.

- West Africa's rich soil and abundant water may support more rice. Parts of East Africa are believed to have great potential to expand production.
- Changes in Asia, with its large population and land area, will affect the most people. India and China will experience major losses of arable land.
- Indonesia's rice production will be largely spared by climate change, but corn will decline as much as 20 percent.
- New parts of Australia will become arable, but droughts will require efficient farming if growing wheat is to continue.

SAR COV2 Transmission

- The transmission of SARSCoV-2 through the air has been studied at various places around the world.
- Researchers led by those at CSIR-Centre for Cellular and Molecular Biology (CCMB), Hyderabad, and Tata institute for Genetics and Society (TIGS), Bengaluru carried out a study to get further insight into the transmission characteristics of the novel coronavirus in air in hospital settings and in residential areas and public places.
- The researchers detected the virus even 20-25 feet away from infected persons.
- "This means it is in the air for quite some time. That is why this study confirms that this virus is spreading through air. It is not only with close proximity but also it can hang in the air for quite some time in the droplets.
- The study further observes that in a closed space, physical distancing alone is not helpful, because the virus borne on droplets can travel upto 20-25 feet.

Drug resistant

- The bacteria causing typhoid fever is becoming increasingly resistant to some of the most important antibiotics for human health, according to a study published in The Lancet Microbe journal.
- The largest genome analysis of Salmonella Typhi (S. Typhi) also shows that resistant strains almost all originating in South Asia have spread to other countries nearly 200 times since 1990.
- The researchers noted that typhoid fever is a global public health concern, causing 11 million infections and more than 1,00,000 deaths per year.
- Antibiotics can be used to successfully treat typhoid fever infections, but their effectiveness is threatened by the emergence of resistant S. Typhi strains
- The authors traced the presence of genes conferring resistance to macrolides and quinolones, which are among the most critically important antibiotics for human health

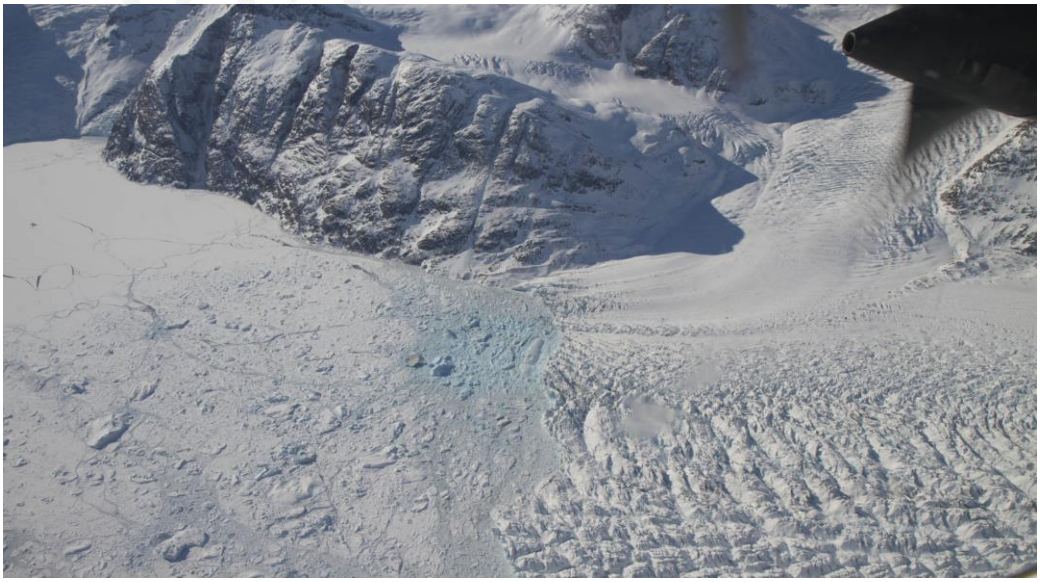
Types of Diabetes

- The International Diabetes Foundation estimates that 537 million people across the world are afflicted with diabetes. The site in the United States points out that over 37 million people (about 10%) in the United States are diabetic.
- There are two types of diabetes Type 1 and Type 2. Types of diabetes Type 1 is generally genetic in origin, and is easier handled by taking the molecule insulin.
- Injection of insulin helps your body use the sugar in your blood for the energy it needs, and then store the rest in the liver and other organs for future use.
- Type 2 diabetes, which does not need insulin injection, is largely lifestyle-based, and is seen more among people in the urban areas than in rural populations.

- Type 2 diabetes is age-related; it often develops at the age of 45 and beyond. Type 1 diabetes is largely genetic in nature, while Type 2 depends on the lifestyle of the individual.

Polar bear and climate change

- An isolated population of 27 polar bears has been discovered in southeast Greenland, which is free of sea ice for most part of the year.
- Polar bears typically need sea ice to survive, so the discovery is raising hopes that some polar bears might survive in the absence of ice.
- They have adapted to hunting on glacial mélange.
- Ice mélange refers to a mixture of sea ice types, icebergs, and snow without a clearly defined floe that forms from shearing and fracture at the ice front.
- Ice mélange is commonly the result of an ice calving event where ice breaks off the edge of a glacier.



COP 15 and CBD

- The United Nations (UN) has announced that a pivotal summit to finalize a new

global agreement on protecting the environment will go ahead in December this year, after a two-year delay due to COVID-19 pandemic.

- The 15th Conference of the Parties to the United Nations Convention on Biological Diversity, will move from Kunming in China to Montreal, Canada.

About CBD

- The Convention on Biological Diversity (CBD) is the international legal instrument for "the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources" that has been ratified by 196 nations.
- Its overall objective is to encourage actions, which will lead to a sustainable future.
- The conservation of biodiversity is a common concern of humankind. The Convention on Biological Diversity covers biodiversity at all levels: ecosystems, species and genetic resources.
- It also covers biotechnology, including through the Cartagena Protocol on Biosafety.
- In fact, it covers all possible domains that are directly or indirectly related to biodiversity and its role in development, ranging from science, politics and education to agriculture, business, culture and much more.
- The CBD’s governing body is the Conference of the Parties (COP). This ultimate authority of all governments (or Parties) that have ratified the treaty meets every two years to review progress, set priorities and commit to work plans.
- The Secretariat of the Convention on Biological Diversity (SCBD) is based in Montreal, Canada.

- Its main function is to assist governments in the implementation of the CBD and its programmes of work, to organize meetings, draft documents, and coordinate with other international organizations and collect and spread information. The Executive Secretary is the head of the Secretariat.

How has the monsoon been so far this year?

- The country received 2% less rain this year than it usually does between June 1 and June 23 every year.
- The total rainfall was brought down by 34% over central India and 15% over peninsular India compared to the 32% more received by the east and northeast and 7% more by northwest India
- During the monsoons, whenever moisture-laden southerly or south-westerly winds from the Bay of Bengal hit the region's east-west oriented mountain ranges, Arunachal Pradesh, Assam, and Meghalaya receive more rainfall in comparison to other States of the north-eastern region.
- Meteorologists said the recent episode of heavy rainfall underlined the presence of the east-west trough in the lower levels of the atmosphere over the region and the incursion of large-scale moisture due to strong southerly and south-westerly winds from the Bay of Bengal.

What are the factors determining rainfall pattern?

- Assam, which receives rainfall beyond the June-September monsoon phase, does not always get above-normal or excess rain.
- But this year, according to the IMD, it received 41% above normal rainfall during the pre-monsoon season (March to May), and it has received 71% more than normal rainfall up to June 25

- Assam's valleys experience both excessive and insufficient rainfall from time to time "due to ecological and climate differences from one place to another".
- Climate change is said to have increased the water and surface temperature of the Arabian Sea and the Bay of Bengal by up to 2 degrees, causing the frequent formation of low-pressure areas and cyclonic circulations, resulting in heavy rains.
- A recent study by the Indian Institute of Technology, Guwahati said aerosols, including black carbon, released by biomass burning, influence the western part of northeast India close to the Indo-Gangetic Plain the most.
- Rising black carbon emissions, it said, leads to a decrease in low-intensity rainfall while pushing up severe rain in the pre-monsoon season in northeast India.

Amaranthus

- Efforts are under way to popularize the inclusion of Amaranthus a wide variety of leafy vegetables as part of mixed cropping among farmers in Mysuru.
- Though known to be highly nutritious and still consumed but in a limited quantity it has economic benefits too and farmers can have multiple harvests to supplement their income.
- "Amaranthus refers to a wide variety of leafy vegetables including Kirkire Soppu and Dantina Soppu

- Amaranthus was an excellent source of calcium, magnesium, potassium, vitamin A, B and C, and an incredible source of vitamin K and the crop offered the most nutrition per calorie than most foods
- *Amaranthus* is a cosmopolitan genus of annual or short-lived perennial plants collectively known as amaranths.
- Some amaranth species are cultivated as leaf vegetables, pseudo cereals, and ornamental plants.
- Most of the *Amaranthus* species are summer annual weeds and are commonly referred to as pigweeds.

Payment for ecosystem service

- Incentives for biodiversity protection and sustainable use include biodiversity-relevant taxes, fees, levies, tradeable permits, and Payments for Ecosystem Services (PES
- Mobilization of biodiversity finance through pesticide levies, admission fees to natural parks, hunting and fishing permit fees, and the trade-in energy-saving

certificates has gained governmental support and political will

PES

- PES is one way to conserve and increase ecosystem services. It works through the establishment of performance contracts.
- People who can help provide the desired ecosystem service are rewarded based on their actions, or the quantity and quality of the services themselves. PES presents a unique scope for incentivizing local land stewards to manage threatened ecosystems.
- It has the potential to achieve the dual goals of conservation and poverty alleviation towards the achievement of Sustainable Development Goals
- Kitengela, Kenya's Wildlife Conservation Lease Programme, maintains open areas for wildlife and grazing on personal grounds.
- In terms of raising money, PES programmes such as Costa Rica's Pago Por Servicios and Ecuador's Socio Bosque were among the few to mobilize significant finances.
- A local monitoring mechanism is the key to successfully implementing a PES programme.
- A study (Sardana 2019) conducted in the Kodagu district of Karnataka to restore native trees that grow in the understory of coffee plantations shows a successfully designed local institutional mechanism for PES implementation

TERMS

Ecosystem services

Ecosystems provide many of the basic services that make life possible for people.

Plants clean air and filter water, bacteria decompose wastes, bees pollinate flowers, and tree roots hold soil in place to prevent erosion.

TEEB Initiative

- The Economics of Ecosystems and Biodiversity (TEEB) is a global initiative focused on "making nature's values visible".
- Its principal objective is to mainstream the values of biodiversity and ecosystem services into decision-making at all levels.
- It aims to achieve this goal by following a structured approach to valuation that helps decision-makers recognize the wide range of benefits provided by ecosystems and biodiversity, demonstrate their values in economic terms and, where appropriate, capture those values in decision-making.

TEEB advocates a three-step approach to analyzing and structuring valuation of biodiversity and ecosystem services, guided by three principles:

- *Recognizing value* in ecosystems, landscapes, species and other aspects of biodiversity is a feature of all human societies and communities and is sometimes sufficient to ensure conservation and sustainable use.
- For example, the existence of sacred groves in some cultures has helped to protect natural areas and the biodiversity they contain.
- *Demonstrating value* in economic terms is often useful for decision-makers to consider the full costs and benefits of nature rather than just those that enter the markets in the form of private goods. An example would include calculating the values of conserving the ecosystem services provided by wetlands in controlling floods, as compared to building flood defences.
- *Capturing value* involves the introduction of mechanisms that incorporate the

values of biodiversity and ecosystems into decision-making through incentives and price signals. This can include payments for ecosystem services, reforming environmentally harmful subsidies or introducing tax breaks for conservation.

World's largest plane soars to its highest altitude yet

The world's largest flying aircraft has reached new heights, with Stratolaunch today completing the seventh test flight of its gigantic Roc carrier plane and logging a record altitude for the huge aircraft in the process. The exercise was also used to test the in-flight performance of recently installed pylon hardware, which will launch smaller hypersonic aircraft from altitude and send them across the skies at speeds of over Mach 5.

California's Stratolaunch originally designed Roc to carry rockets and satellites into the stratosphere from where they would then be fired into low-Earth orbit. A recent shift in strategy has seen the massive plane, which features six Boeing 747 engines, two side-by-side fuselages and a wingspan of 385 ft (117 m), repurposed as a carrier for hypersonic research vehicles.

In 2020, the company offered a first look at what these vehicles will look like,

revealing a concept called the Talon-A. It is designed for swift and repeatable hypersonic flights with an ability to take off and land itself on a runway, in addition to being launched from the Roc carrier aircraft. The company unveiled a test version of this hypersonic vehicle last moth, called the TA-O.

Meanwhile, Stratolaunch has been busy fitting out the Roc aircraft with the pylon hardware needed to carry Talon-A into the air. Made from aluminium and carbon fiber skins, the pylon features a winching system to lift the Talon-A into place and weighs around 8,000 lb (3,629 kg), while occupying 14 ft (4.3 m) of the Roc's centre wingspan.

The first exascale computer has officially arrived

The world’s fastest supercomputer performed more than a quintillion calculations per second, entering the realm of exascale computing. That’s according to a ranking of the world’s speediest supercomputers called the TOP500, announced on May 30. The computer, known as Frontier, is the first exascale computer to be included on the biannual list.

Exascale computing is expected to allow for new advances in a variety of scientific fields that depend on vastly complex calculations. The exascale milestone “represents an unprecedented capability for researchers around the world to use the computer to ask their specific scientific questions,” says Frontier’s project director Justin Whitt of Oak Ridge National Laboratory in Tennessee.