

CURRENT AFFAIRS

THE BEST MAGAZINE FOR GEOGRAPHY, ENVIRONMENT AND SCIENCE CURRENT AFFAIRS

GES REPORTER



Presented by

Vishali Sharma

Assistant Professor

Pursuing PhD in ECE

Specialisation: Wireless communications networks and Science and Technology

Contents

Intense Heat	4
What impact do heatwaves have over India?.....	5
Why are electric vehicles catching fire?.....	5
Why is the world poised to transition to electric vehicles?.....	5
What goes into a Li-ion battery?	5
Crops and CRISPR Cas9.....	7
Better crops.....	7
What is alpha gal?	7
Allergy-free.....	7
Research ethics	8
Effects of RF-EMF	8
Animal as virus reservoir.....	9
Climate change and risk of new infections	9
Cotton	10
Lapsus\$	10
What do we know about Lapsus\$?	10
World food prize.....	11
Australia and Solomon Island.....	12
Naini mines	12
STARLINKS.....	13
About Starlink.....	13
NFHS.....	13
Rise in obesity.....	14
Increasing heat waves	14
High economic losses	15
Adaptation is essential	15
Collaboration for insurance	16
A priority	16
La Nina and Heat wave.....	16
Periodic pattern.....	16
Symmetric body structure	17
L452R mutation.....	17
Hearing loss and TBX2	18
L452R mutation	18

Pulsar	19
Pulsar	19
PORCINE VIRUS.....	19
Wheat crisis	20
The story so far:	20
Why has wheat production dwindled?.....	20
How will this impact the public distribution of grain?	20
Food labelling	21
Why do we need front-of-package labelling?	21
Asani-Naming of cyclone	22
Global study on birds	24
Shallow and deep ecologism.....	25
Sagittarius A* (SgrA*).....	26
About Black hole	26
The event horizon	27
Event Horizon Telescope (EHT)	27
mRNA Vaccine.....	27
mRNA Vaccine working	28
RNA granule	28
Protein synthesis	29
Pullulan polymer	30
butyrylcholinesterase (BChE).....	30
Lunar regolith.....	30
Pangong Lake.....	31
South Asia biodiversity.....	32
Biosphere reserves are key	33
Long Covid.....	34
What is long COVID?	34
How long does long COVID last for?	35
Cold system and vaccination	35
Pollution and NHRC	36
Pangong Lake.....	37
Holes in biodiversity bill.....	38
What are Mr. Ramesh's objections?	39
Monkey pox virus genome	39
India Hypertension Control Initiative (IHCI)	40

The project was built on five scalable strategies:	41
Yarara.....	41
MYOPIA.....	41
AI Chips	42
Disaster struck Dima Hasao.....	44
How severe has the rain been in Assam?.....	44
Why is the railway in focus post-disaster?	44
Mutant tomatoes	46
Mutant tomatoes.....	46
Heatwaves and Inflation.....	46
Draft notification on e waste	47
'Move away from coal'	48
What is the extent of India's dependence on coal?.....	49
Nagorno karabakh	50
The Azeri-Armenian war of 1991	50
5G.....	51
H5N1	53
Phytoplankton and global warming.....	54
Ankylosing spondylitis (AS).....	54
Bacteria in Antarctica	55
Nanorobots	55
Sela macaque.....	56
Sela pass	57
AKRUTI.....	57
Measles Rubella elimination.....	58
Global chip shortage	59
Green Hydrogen	59
The story so far:	59
How much green hydrogen is India producing?	60
What are the advantages of hydrogen as a fuel?.....	61

Intense Heat

How are heat waves defined?

- A heatwave is declared when the maximum temperature is over 40°C and at least 4.5 notches above normal.
- A severe heatwave is declared if the departure from normal temperature is more than 6.4 degrees, according to the IMD.
- Based on absolute recorded temperatures, a heatwave is declared when an area logs a maximum temperature of 45°C.
- A severe heatwave is declared if the maximum temperature crosses 47 degrees.

Is climate change responsible?

- The heat-trapping consequences of global warming imply that climate extremes such as heatwaves are expected to rise in frequency.
- Instances of extreme rainfall, as well as longer rainless spells are expected, according to assessments by the Intergovernmental Panel on Climate Change.
- The main reason for the scorching heat in the northern parts of the country is lack of rainfall.
- Usually, periods of high temperature are punctuated by periodic episodes of rain but this was largely absent during March and April.
- Ironically, April also saw maximum instances of extreme rainfall since 2018 though it was concentrated in the south and north-eastern India.
- The rain-bearing western disturbances originate because of temperature gradients between the northernmost parts of the globe and the latitudes passing through West Asia.
- Weaker gradients mean weaker rains.
- This March and April, cooler than normal conditions in the Pacific Ocean failed to aid rainfall in north India

What impact do heatwaves have over India?

- Research through the year's shows that the number of heatwave days in India is increasing every decade.
- From 413 in 1981-90 to 575 in 2001-10 and 600 in 2011-20, the number of days that see extremely hot days is persistently increasing at 103 weather stations. Some parts along eastern India, such as Andhra Pradesh, Telangana and Odisha, also register higher humidity along with high temperatures, leading to the rise in a condition called 'wet bulb' temperature, that at its mildest can cause extreme discomfort and at its worst cause dehydration and death.
- Heatwaves have killed more than 17,000 people in 50 years in India, according to a research study by IMD scientists

Why are electric vehicles catching fire?

Why is the world poised to transition to electric vehicles?

- The growing concern over climate change has led to global efforts to electrify the transportation sector.
- In parallel, cost of Li-ion (Lithium-ion) battery technology has decreased by a staggering order of magnitude in the past decade.
- Li-ion batteries are complex devices requiring a level of sophistication that can takes years to perfect.
- Hurrying the development of this complex technology without careful safeguards can lead to increasing safety incidents, as evidenced recently on Indian roads

What goes into a Li-ion battery?

- Every Li-ion battery consists of three active components: the anode, typically graphite; the cathode, typically based on a nickel, cobalt, and manganese-based oxide; and an electrolyte, typically a salt of lithium in an inorganic solvent.
- Battery manufacturing is a complex operation involving forming sheets of the anode and cathode and assembling them into a sandwich structure held apart by a thin separator.
- Separators, about 15 microns in thickness about a fifth of the thickness of the human hair perform the critical function of preventing the anode and cathode from shorting.

- Accidental shorting of the electrodes is a known cause of fires in Li-ion cells.
- It is important that the various layers are assembled with high precision with tight tolerances maintained throughout the manufacturing process.
- Safety features, such as thermal switches that turn off if the battery overheats, are added as the sandwich is packaged into a battery cell.
- Battery cells are assembled into modules and then further assembled into packs. Li-ion batteries require tight control on the state of charge and the temperature of operation to enhance safety and increase usable life, achieved by adding multiple sensors.
- Packs are designed to ensure uniform temperature profile with minimal thermal variation during operation.
- Battery packs are integrated into the vehicle in unique form factors depending on the design of the vehicle.
- The location of the battery should protect it from external penetration, ensure passenger safety while taking into consideration the overall weight distribution.
- Close interaction between vehicle manufacturers and battery manufacturers is essential so that the whole is greater than the sum of the parts.
- There are multiple trade-offs in this complex ecosystem: engineering higher safety often results in higher costs and lower driving range.
- In this competitive landscape where companies are vying for market share, a race to the bottom can compromise safety
- The energy density of petrol is five hundred times that of a typical Li-ion battery, therefore safety should be manageable if robust controls are in place.
- However, batteries do store energy in a small package and if the energy is released in an uncontrolled fashion, the thermal event can be significant.
- Battery fires, like other fires, occur due to the convergence of three parts of the “fire triangle”: heat, oxygen, and fuel.
- If an adverse event such as a short circuit occurs in the battery, the internal temperature can raise as the anode and cathode release their energy through the short.
- This, in turn, can lead to a series of reactions from the battery materials, especially the cathode, that release heat in an uncontrolled manner, along with oxygen
- Engineering safety requires commitment from all parts of the battery supply chain and tight integration between vehicle companies and battery companies.

- Further, regulators play an important role, providing the testing and certification needed to ensure that technology innovations perform at the level that is promised.
- Li-ion batteries are not forgiving of shoddy engineering and approaches that rely on cutting corners.
- Companies with tightly controlled manufacturing with years of experience can maintain the number of adverse safety incidents to a minimum.

Crops and CRISPR Cas9

Better crops

- Plant scientists are turning to strategies adapted from the gene-editing tool CRISPR-Cas9 to improve the yield, robustness and consumer appeal of commercial cereals, fruit and vegetables.
- Sweeter strawberries are a nice start, but the same capabilities are being harnessed to generate crops with greater disease resistance and higher nutritional content.

What is alpha gal?

Allergy-free

- A company that genetically modifies pigs to create organs for humans has been sending free packages of ground pork, steaks and chops to people allergic to meat.
- The company removes the sugar molecule alpha-gal, which causes the human immune system to reject pig organs and causes a red-meat allergy in people

What is alpha-gal?

- Alpha-gal (galactose- α -1, 3-galactose) is a sugar molecule found in most mammals.
- Alpha-gal is not found in fish, reptiles, birds, or people.
- Alpha-gal can be found in meat (pork, beef, rabbit, lamb, venison, etc.) and products made from mammals (including gelatin, cow's milk, and milk products).

What is alpha-gal syndrome (AGS)?

- Alpha-gal syndrome (AGS) (also called alpha-gal allergy, red meat allergy, or tick bite meat allergy) is a serious, potentially life-threatening allergic reaction. AGS is not caused by an infection.

- AGS symptoms occur after people eat red meat or are exposed to other products containing alpha gel.

Research ethics

- China's powerful State Council is calling on research institutions to expand and improve their ethics training.
- The directive, one of several detailed in a comprehensive ethics statement, is intended to address gaps in oversight exposed when Chinese researcher, He Jiankui, shocked the world by creating the first babies with edited genomes in 2018.

RM EMF and brain tumour

- The latest U.K. Million Women Study on cellular telephone use and the risk of brain tumour published online on March 29, 2021 in Journal of the National Institute of Cancer confirms the accumulating evidence that cellular telephone use under usual conditions does not increase brain tumour incidence.
- The topic has added interest now because phone companies plan to launch 5G technologies soon.
- When we keep cell phones very close to our head, the RFEMF emitted by cell phones penetrate several centimeters into our head.
- The energy gets absorbed in the tissues in the temporal and parietal lobes of the brain.
- The well-established biological effect of RF-EMF on tissue is heating.
- "Radiofrequency Electromagnetic Fields" (RF EMFs) is the term used to describe the part of the electromagnetic spectrum comprising the frequency range from 100 kHz to 300 GHz
- When researchers developed limits for human exposure to RF-EMF for cellular telephones, the prime consideration was to prevent any substantial heating that could lead to adverse health effect

Effects of RF-EMF

- There were legitimate concerns that there may be adverse biological effects from RF-EMF exposure below those limits, possibly caused through mechanisms other than heat.

- Researchers added a safety factor of fifty to take care of such unknown mechanisms

Animal as virus reservoir

- The role of “animal reservoirs” in the spread of COVID-19 is still being studied but evidence of zoonosis, or the virus jumping from animals to humans, is growing and scientists are concerned that this new frontier could potentially spawn dangerous, and difficult to monitor mutants.
- Some experts supported the theory that the highly mutated Omicron variant, which caused a deluge of cases globally, including India, emerged from animals, potentially rodents, rather than an immune-compromised human.
- “As the virus multiplies in infected hosts, it can mutate slightly, and the worry is that over time, minor genomic tweaks in hundreds or thousands, if not millions, of animals, could eventually add up to changes that make the virus more contagious or deadlier in people, or able to evade treatments and vaccines.

Climate change and risk of new infections

- Climate change will result in thousands of new viruses spread among animal species by 2070 and that is likely to increase the risk of emerging infectious diseases jumping from animals to humans, according to a new study.
- This is especially true for Africa and Asia, continents that have been hotspots for deadly disease spread from humans to animals or vice versa over the last several decades, including the flu, HIV, Ebola and COVID-19
- Researchers, who published their findings on April 28 in the journal Nature, used a model to examine how over 3,000 mammal species might migrate and share viruses over the next 50 years if the world warms by 2°C, which recent research shows is possible.
- They found that cross-species virus spread will happen over 4,000 times among mammals alone. Birds and marine animals were not included in this study.
- Researchers said that not all viruses will spread to humans or become pandemic like the scale of the coronavirus but the number of cross species viruses increases the risk of spread to humans

Cotton

- With some textile mills raising cotton yarn prices on Monday, garment manufacturers in Tiruppur have called for a ban on export of cotton and cotton yarn.
- Textile mills have, meanwhile, urged the Union Government to come out with a system to collect accurate data on cotton production and consumption
- “Textile mills are adding spindles and cotton consumption is increasing. Only with proper data can the government take decisions that will help the industry,”
- It is estimated that at least two lakh spindles are added every month leading to higher demand for cotton.
- Textile mills have started contracting cotton from overseas suppliers though international prices are at present slightly higher than domestic prices.
- If cotton and yarn exports are banned, prices will crash and the mills will incur losses.
- Cotton prices reduced slightly when the government removed the import duty.
- However, prices have started rising since. The government should announce a technology mission on cotton to increase productivity and introduce a system to collect proper data on cotton.

Lapsus\$

Remote Desktop Protocol (RDP) is a protocol or technical standard that provides a user with a graphical interface to connect to a desktop computer remotely.

What do we know about Lapsus\$?

- The cyber-crime group Lapsus\$ is said to be based in South America.
- The group is relatively new but has successfully breached major firms like Microsoft.
- It has also publicly taunted their victims, leaking their source code and internal documents.
- They have even gone to the extent of joining Zoom calls of companies they breached, taunting employees and consultants who are trying to clean up their hack
- Their tactics include phone-based social engineering, SIM-swapping to facilitate account takeover, accessing personal email accounts of employees at target organizations, and paying employees, suppliers, or business partners of their targets to get their credentials and

multifactor authentication (MFA) approval

- Social engineering efforts include gathering data about a target's business operations, employees, team structures, help desks, crisis response workflows, and supply chain relationships.
- They spam a target with MFA prompts and call the organization's help desk to reset a target's credentials.
- The group can also perform SIM-swapping attacks to access a user's phone number and handle phone-based authentication prompts to sign into the corporate network.

World food prize

- A NASA climate research scientist who has spent much of her career explaining how global food production must adapt to a changing climate was awarded the World Food Prize
- Cynthia Rosenzweig, an agronomist and climatologist, was awarded the \$2,50,000 prize in recognition of her innovative modelling of the impact of climate change on food production.
- She is a senior research scientist at the NASA Goddard Institute for Space Studies and serves as adjunct senior research scientist at the Columbia Climate School at Columbia University, both in New York.
- A NASA climate research scientist who has spent much of her career explaining how global food production must adapt to a changing climate was awarded the World Food Prize
- Cynthia Rosenzweig, an agronomist and climatologist, was awarded the \$2,50,000 prize in recognition of her innovative modelling of the impact of climate change on food production.
- She is a senior research scientist at the NASA Goddard Institute for Space Studies and serves as adjunct senior research scientist at the Columbia Climate School at Columbia University, both in New York.
- Since 1987, the prize has been awarded annually to recognize contributions in any field involved in the world food supply, such as animal science, aquaculture, soil science, water conservation, nutrition, health, plant science, seed science, plant pathology, crop protection, food technology, food safety, policy, research, infrastructure, emergency relief, and poverty alleviation and hunger.
- Laureates are honored and officially awarded their prize in Des Moines, Iowa, in an award ceremony held at Iowa State Capitol.
- Laureates are presented with a diploma, a commemorative sculpture designed by Saul Bass

and a monetary award of \$250,000.

Australia and Solomon Island

- Australia will respond calmly to the Solomon Islands after it signed a security pact with China, Prime Minister Scott Morrison said, dismissing a furious response by the leader of the Pacific nation to Western criticism of the deal
 - In a fiery speech to Parliament on Tuesday, Prime Minister Manasseh Sogavare said “we are threatened with invasion” but he did not name any countries or give evidence for his claim
 - Defence Minister Peter Dutton said he didn’t believe the comments were directed at Australia, which had defence forces and police personnel in the Solomon Islands at Mr. Sogavare’s request
 - The security pact has become a major election issue for Mr. Morrison, who faces Opposition criticism that it made Australia “less safe” and was a major failing of diplomacy by his government.
-

Naini mines

- The Union Coal Ministry has sought to rush through the forest diversion process for proposed opencast coal mining in Angul district of Odisha which would require the felling of more than one lakh standing trees in a reserve forest and cause significant disturbance to the elephant herds.
- Singareni Collieries Company Limited (SCCL), a joint venture company of the Government of India and Telangana, has proposed to mine coal at the Naini mine in Chhendipada tehsil of the district.
- The total requirement of land for the project is 912.799 hectares, of which 643.095 hectares is reserve forestland and 140.18 hectares is village forestland. The remaining is non-forestland
- The important issue flagged by the site inspection team was the threat to wild animals, especially elephants.
- Though the area for coal mining is not a part of any national park, wildlife sanctuary or biosphere, movement of wild elephants is often witnessed in the northern and southern parts of the lease area.
- The division wanted a plan for safe passage to elephants.

STARLINKS

- SpaceX brought four astronauts home with a midnight splashdown in the Gulf of Mexico
- Elon Musk's company has now launched 26 people into orbit in less than two years, since it started ferrying astronauts for NASA. Eight of those 26 were space tourists.
- Barely five hours after splashdown, SpaceX launched a fresh batch of its own internet satellites known as Starlinks from Cape Canaveral

About Starlink

- Starlink is a satellite internet constellation operated by SpaceX.
- It provides satellite Internet access coverage to 32 countries where its use has been licensed, and aims for global coverage.
- As of April 2022 Starlink consists of over 2,100 mass-produced small satellites in low Earth orbit (LEO), which communicate with designated ground transceivers.
- The SpaceX satellite development facility in Redmond, Washington, houses the Starlink research, development, manufacturing, and orbit control teams.

NFHS

- The Total Fertility Rate (TFR), an average number of children per woman, has further declined from 2.2 to 2.0 at the national level between National Family Health Survey (NFHS) 4 and 5.
- There are only five States Bihar (2.98), Meghalaya (2.91), Uttar Pradesh (2.35), and Jharkhand (2.26) Manipur (2.17) in India which are above replacement level of fertility of 2.1 as per the national report of the NFHS-5, released by the Union Health Ministry.
- The main objective of successive rounds of the NFHS has been to provide reliable and comparable data relating to health and family welfare and other emerging areas in India
- The other key highlights of the survey include institutional births increased from 79% to 89% across India and in rural areas around 87% births being delivered in institutions and the same is 94% in urban areas.
- As per results of the NFHS-5, more than three fourths (77%) children aged between 12 and 23 months were fully immunized, compared with 62% in NFHS-4.
- The level of stunting among children under five years has marginally declined from 38% to 36% in the country since the last four years.

- Stunting is higher among children in rural areas (37%) than urban areas (30%) in 2019-21.
- Additionally, NFHS-5 shows an overall improvement in Sustainable Development Goals indicators in all States/Union Territories (UTs).
- The extent to which married women usually participate in three household decisions (about health care for herself; making major household purchases; visit to her family or relatives) indicates that their participation in decision-making is high, ranging from 80% in Ladakh to 99% in Nagaland and Mizoram.
- Rural (77%) and urban (81%) differences are found to be marginal.
- The prevalence of women having a bank or savings account has increased from 53% to 79% in the last four years.

Rise in obesity

- Compared with NFHS-4, the prevalence of overweight or obesity has increased in most States/UTs in NFHS-5.
- At the national level, it increased from 21% to 24% among women and 19% to 23% among men.
- More than a third of women in Kerala, Andaman and Nicobar Islands, Andhra Pradesh, Goa, Sikkim, Manipur, Delhi, Tamil Nadu, Puducherry, Punjab, Chandigarh and Lakshadweep (34-46 %) are overweight or obese.

Increasing heat waves

- To get to grips with this predicament, India must initiate safety nets a combination of targeted transfers and insurance schemes to improve the resilience of outdoor workers.
- Transfers are best linked to the beneficiaries' own efforts to build resilience, for example, adapting agricultural practices to the uptick in heatwaves
- Over the last 100 years, global temperatures have risen by 1.5°C and, at the current rate, could reach 4°C by 2100 an unthinkable scenario. So far in the year, 2022 has been the fifth-warmest year on record.
- The prevalence of extreme temperatures around the world suggests that India's warming is the result not only of local factors but also global warming.
- In fact, scientists have made clear how greenhouse gas (GHG) emissions exacerbate

temperatures in the oceans, leading to soaring temperatures.

- The culprit in the current plight from intense weather is not Mother Nature but anthropogenic GHG emissions.

High economic losses

- India faces the largest heat exposure impacts in South Asia.
- One study finds that 1,41,308 lives were claimed by acute weather in India during 1971-2019, of which the loss of 17,362 lives was due to unrelenting heat, with mortality rates rising by two-thirds during the time period.
- Worldwide economic losses, by one estimate, could reach U.S.\$1.6 trillion (₹1.6 lakh crore) annually if global warming exceeds 2°C.
- India, China, Pakistan, and Indonesia, where large numbers of people work outdoors, are among the most vulnerable.
- India's outdoor workers, reeling under daily temperatures more than 40°C, are on the frontlines of the climate catastrophe.
- The wellbeing of outdoor workers will be fundamentally determined by the ability to keep the temperature rise to well below 2°C
- Climate mitigation or decarbonisation of economies on the part especially of the big emitters, such as the United States, the European Union, China, and India remains an imperative. But temperatures are set to rise regardless of mitigation, based on the emission damage already done.

Adaptation is essential

- A crucial aspect of adaptation is better environmental care that can contribute to cooling.
- Heatwaves are rooted in degraded land and relentless deforestation, which exacerbate wildfires.
- Agriculture, being water-intensive, does not do well in heat wave prone areas. A solution is to promote better agricultural practices which are not water-intensive, and to support afforestation that has a salutary effect on warming.

Collaboration for insurance

- Insurance schemes can help transfer some of the risks of severe heat faced by industrial, construction and agricultural workers to insurers.
- Insurance against natural hazards is minimal not only in India but also Asia where less than 10% of the losses are typically covered. Government and insurers need to collaborate in providing greater coverage of losses from extreme weather events, including for calamities from brutal heat

A priority

- India offers a range of food and fuel subsidies, but most of them are poorly targeted.
- For example, kerosene subsidies provide modest financial benefit to disadvantaged rural households, with only 26% of the subsidy value estimated to reach the poor directly.
- As the efficiency and the equity of existing subsidies are re-examined, the provision of transfers and insurance linked to building climate resilience should become a priority.

La Nina and Heat wave

- In most years, meteorologists consider the La Nina to be a friend of India.
- The phenomenon associated with below normal sea surface temperatures in the eastern and central Pacific Ocean, makes the summer monsoon wetter and the winter colder unlike its evil twin, the El Nino, or a warming phenomenon that frequently dries up monsoon rains over India.
- This year, however, the La Nina is being blamed for worsening perhaps the longest spell of heatwaves from March to April in north, west and Central India.

Periodic pattern

- Formally known as the El Nino Southern Oscillation (ENSO), the La Nina-El Nino phenomenon follows a periodic pattern that roughly lasts three years.
- During a La Nina winter, a north-south pressure pattern sets up over India and normally this influences the trade winds that bring rains to India.
- However, because the La Nina didn't peak, the sea surface temperatures continued to be cold

and this drove hot westerly winds and blasts of hot air from the Middle East into Pakistan and India.

- “The north-south pressure pattern has been persisting over India, with La Nina extending its stay over the Pacific.
- This has definitely impacted the weather over India, which has been seen even during 1998-2000 when La Nina had persisted for three years
- While land temperatures over India begin rising in March, they are usually punctuated by western disturbances, or moisture from the Mediterranean region that fall as rain over north and western India.
- For these currents to make it as far as India, they need a significant difference in temperature between Europe and the latitudes over India.
- “Partly due to La Nina, this temperature difference was absent and so the western disturbances that came to India were weak with hardly any rain,”

Symmetric body structure

- Having a vertebral column endows vertebrates with many similar characteristics and one of these is a bilateral or left–right symmetry.
- For instance, if we draw an imaginary line dividing a vertebrate’s body from head to tail through the centre, we will see symmetrically placed eyes, limbs, etc.
- To ask how this symmetric body structure comes into being means going to the embryonic stage and see how the precursors of skeleton and muscles, known as somites, develop
- A group of researchers studying zebrafish model embryos find that it is in fact surface tension that shapes these cells and not any genetic regulatory mechanism.

L452R mutation

- Having a vertebral column endows vertebrates with many similar characteristics and one of these is a bilateral or left–right symmetry.
- For instance, if we draw an imaginary line dividing a vertebrate’s body from head to tail through the centre, we will see symmetrically placed eyes, limbs, etc.
- To ask how this symmetric body structure comes into being means going to the embryonic stage and see how the precursors of skeleton and muscles, known as somites, develop

- Preliminary evidence emerging in a preprint from South Africa also suggests that vaccines are potentially better in protecting against infection as compared to previous infection with BA.1.
- More evidence is required to understand the clinical outcomes of the new lineages.
- The L452 mutations in the spike protein are not unique to BA.4 and BA.5 Omicron lineages but have also emerged independently in other Omicron sub lineages in different countries.
- This includes the mutation L452Q in lineage BA.2.12.1, a sublineage of BA.2, which is recently seen to dominate COVID-19 cases in New York.

Hearing loss and TBX2

L452R mutation

- Mutations at position L452R were found in Delta along with Kappa and Epsilon, while variant Lambda had L452Q.
- These mutations have been previously reported to be associated with increased infectivity of the virus and also has the ability to evade neutralization by monoclonal antibodies.
- Preliminary research shows that BA.4 and BA.5 lineages may be capable of escaping immunity gained by a previous BA.1 infection.
- Preliminary evidence emerging in a preprint from South Africa also suggests that vaccines are potentially better in protecting against infection as compared to previous infection with BA.1.
- More evidence is required to understand the clinical outcomes of the new lineages.
- The L452 mutations in the spike protein are not unique to BA.4 and BA.5 Omicron lineages but have also emerged independently in other Omicron sub lineages in different countries.
- This includes the mutation L452Q in lineage BA.2.12.1, a sublineage of BA.2, which is recently seen to dominate COVID-19 cases in New York
- Hearing loss due to aging, noise and certain cancer therapy drugs and antibiotics has been irreversible because scientists have not been able to reprogramme existing cells to develop into the outer and inner ear sensory cells essential for hearing once they die.
- The Northwestern Medicine scientists have now discovered a single master gene that programmes ear hair cells into either outer or inner ones, overcoming a major hurdle that had prevented the development of these cells to restore hearing (Nature).
- The master gene switch Northwestern scientists discovered that programmes the ear hair cells

is TBX2.

- When the gene is expressed, the cell becomes an inner hair cell. When the gene is blocked, the cell becomes an outer hair cell.

Pulsar

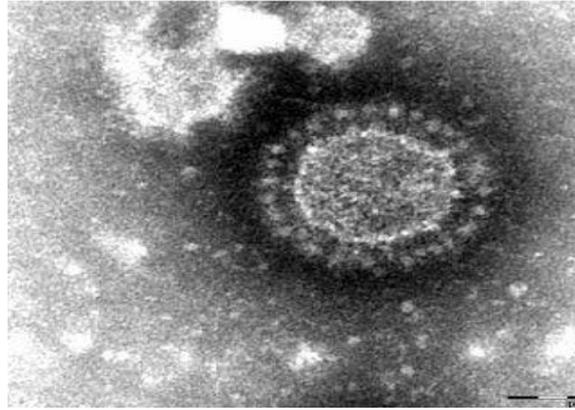
An object that astronomers thought was a distant galaxy has now been discovered as the brightest extra-galactic pulsar ever seen

Pulsar

- A pulsar (from *pulsating radio source*) is a highly magnetized rotating neutron star that emits beams of electromagnetic radiation out of its magnetic poles.
- This radiation can be observed only when a beam of emission is pointing toward Earth (similar to the way a lighthouse can be seen only when the light is pointed in the direction of an observer), and is responsible for the pulsed appearance of emission. Neutron stars are very dense and have short, regular rotational periods.
- This produces a very precise interval between pulses that ranges from milliseconds to seconds for an individual pulsar. Pulsars are one of the candidates for the source of ultra-high-energy cosmic rays.

PORCINE VIRUS

- In January, a person in the United States became the first recipient of a pig-heart transplant.
- He died two months later, and doctors now say the genetically edited pig heart carried a porcine virus that could have contributed to his death.
- The main concern is that the virus can damage the heart.
- Porcine circovirus is a group of four single-stranded DNA viruses that are non-enveloped with an unsegmented circular genome.
- They are members of the genus *Circovirus* that can infect pigs.



Wheat crisis

The story so far:

- On May 4, the government lowered its wheat production estimates by 5.7% to 105 million tonnes (MT) from the projected 111.32 MT for the crop year ending June.
- The production is expected to fall on account of unusually warm weather conditions that persisted during March to April in most parts of the key grain-producing States of Punjab, Haryana, Madhya Pradesh as well as Uttar Pradesh

Why has wheat production dwindled?

- India is the second largest producer of wheat in the world, with China being the top producer and Russia the third largest Ukraine is the world's eighth largest producer of wheat
- Unprecedented heatwaves across the north, west and central parts of the country, and March and April being the hottest in over 100 years, have caused substantial loss to the yield at 6%, with 20% of the wheat grain shriveling up

How will this impact the public distribution of grain?

- Wheat procurement is undertaken by the state-owned Food Corporation of India (FCI) and other agencies at MSP to meet the requirements under the Public Distribution System (PDS) and other welfare schemes such as the Pradhan Mantri Garib Kalyan Anna Yojana (PMGKAY) introduced during the pandemic.
- The government has revised the grain allocation under PMGKAY for May to September 2022.

- According to the new guidelines, the FCI will fill the gap left by wheat with an increased allocation of rice.
- An additional 5.5 MT rice is being allocated to the States to fill the gap in supplying wheat grain.

Food labelling

The story so far:

- The Food Safety and Standards Authority of India (FSSAI) is expected to issue a draft regulation for labels on front of food packets that will inform consumers if a product is high in salt, sugar and fat.
- It is expected to propose a system under which stars will be assigned to a product

Why do we need front-of-package labelling?

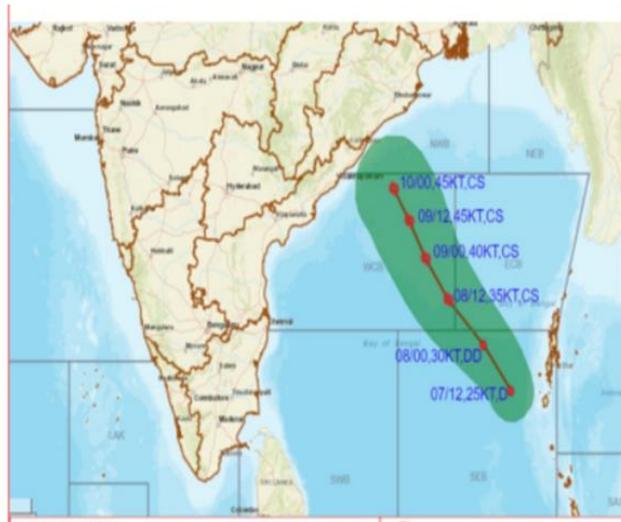
- In the past three decades, the country's disease patterns have shifted.
- While mortality due to communicable, maternal, neonatal, and nutritional diseases has declined and India's population is living longer, non-communicable diseases (NCDs) and injuries are increasingly contributing to the overall disease burden.
- In 2016, NCDs accounted for 55% of premature death and disability in the country.
- Indians also have a disposition for excessive fat around the stomach and abdomen which leads to increased risk of cardiovascular disease and type 2 diabetes.
- According to the National Family Health Survey-5 (2019-2021), 47.7% of men and 56.7% of women have high risk waist-to-hip ratio.
- An increased consumption of packaged and junk food has also led to a double burden of undernutrition and over nutrition among children

Why is there opposition to the rating system?

- In a health-star rating system, introduced in 2014 in Australia and New Zealand, a product is assigned a certain number of stars using a calculator designed to assess positive (e.g., fruit, nut, protein content, etc.) and risk nutrients in food (calories, saturated fat, total sugar, sodium).
- Scientists have said that such a system misrepresents nutrition science and the presence of fruit in a fruit drink juice does not offset the impact of added sugar.
- Experts say that so far there is no evidence of the rating system impacting consumer behaviour.

Asani-Naming of cyclone

- Severe cyclonic storm 'Asani', which is moving towards the east coast, packing winds above 105 kmph and setting off heavy rain, is likely to recurve in a north-eastward direction and weaken gradually into a cyclonic storm, the India Meteorological Department (IMD) said on Monday.
- According to the IMD, the storm, lying over west-central and adjoining South Bay of Bengal, moved nearly north-westwards with a speed of 16 kmph in six hours and lay centered over west-central Bay of Bengal



- It is the first cyclonic storm of the season and was named by Sri Lanka.
- Asani means “wrath” in Sinhalese. A list of names for cyclones was released in 2020 with 169 names, including 13 names each from 13 countries



- The cyclone that will form after Asani will be called Sitrang, and the name has been given by Thailand.

- Ghurni, Probaho, Jhar and Murasu are the upcoming names from India.
- Other cyclonic storms' names include Biparjoy (Bangladesh), Asif (Saudi Arabia), Diksam (Yemen) and Toofan (Iran) and Shakhti (Sri Lanka)
- There is a process behind each cyclone's naming process. There are six Regional Specialized Meteorological Centres (RSMCs) worldwide and five regional Tropical Cyclone Warning Centres, which are mandated for issuing advisories and naming of cyclonic storms.
- The list is arranged according to names given by alphabetically-arranged countries that are neutral to gender, politics, religious beliefs and cultures. It is used sequentially, column wise.
- The designation should not be present in the existing list of the six RSMCs. The name of a storm that may pass on from one waterbody to another will not be changed.
- The name is never re-used again. All the names that are used can have a maximum eight-letters and should not offend any country or group of people or customs.
- The naming of cyclones in the Bay of Bengal and Arabian Sea started in September 2004.
- Before this, from the mid-1900s, feminine names were picked up for storms before switching to a list for a better organized process.

Food labelling

- The classification of foods, as healthy or unhealthy, is a technical or professional step.
- This should be decided by a governance body such as the FSSAI or food and nutrition experts or professionals.
- The consumption of junk foods that are high in calories, sugar, fat and salt lead to the early onset of obesity among adolescents, insulin insufficiency, and in adulthood results in diabetes, hypertension, cardiac and renal diseases.
- The World Health Organization (WHO) has issued a threshold for sugar, salt, fat, and calories per 100 grams of processed food packaged or 100 ml of liquid beverages bottled.
- Unless we generate competing technical data for the Indian population, we have to abide by WHO norms.
- A technical group set up by the FSSAI has undertaken an evaluation of processed foods on the racks of Indian supermarkets and found 96% of products for one component and 62.8% for three components are above WHO threshold
- It would be ideal to provide the crystallized information in the best acceptable way for consumption and leave it open for the consumer to decide. We have done it with tobacco packs and alcohol bottles

- Its decision to stick to a Health Star Rating based on an algorithm known to the food industry only, as a front of pack labelling, is without sound logic or evidence.

Global study on birds

The story so far:

- The State of the World's Birds, an annual review of environmental resources published on May 5 by nine natural sciences and avian specialists across the globe, has revealed that the population of 48% of the 10,994 surviving species of birds is declining.
- The report led by the Manchester Metropolitan University gives an overview of the changes in the knowledge of avian biodiversity and the extent to which it is imperiled

What are the key findings of the study?

- The study found that 5,245 or about 48% of the existing bird species worldwide are known or suspected to be undergoing population declines.
- While 4,295 or 39% of the species have stable trends, about 7% or 778 species have increasing population trends shows 1,481 or 13.5% species are currently threatened with global extinction.
- These include 798 species classified as vulnerable, 460 as endangered and 223 as critically endangered while 52 species were considered to be data deficient.
- About 73% species are estimated to have fewer than 10,000 mature individuals, 40% have fewer than 2,500 mature individuals, and almost 5% have fewer than 50 mature individual
- The more threatened bird species (86.4%) are found in tropical than in temperate latitudes (31.7%), with hotspots for threatened species concentrated in the tropical Andes, southeast Brazil, eastern Himalayas, eastern Madagascar, and Southeast Asian islands

What is the importance of birds to ecosystems and culture?

- Birds contribute toward many ecosystem services that either directly or indirectly benefit humanity.
- These include provisioning, regulating, cultural, and supporting services.
- The functional role of birds within ecosystems as pollinators, seed-dispersers, ecosystem engineers, scavengers and predators not only facilitate accrual and maintenance of biodiversity but also support human endeavors such as sustainable agriculture via pest control besides aiding other animals to multiply.
- For instance, coral reef fish productivity has been shown to increase as seabird colonies

recovered following rat eradication in the Chagos archipelago.

- Wild birds and products derived from them are also economically important as food (meat, eggs).
- Approximately 45% of all extant bird species are used in some way by people, primarily as pets (37%) and for food (14%).
- The cultural role of birds is perhaps more important than any other taxonomic group, the study says. Beyond its symbolic and artistic values, birdwatching is a global pastime practiced by millions of people.
- Garden bird-feeding is valued at \$5-6 billion per year and growing by four per cent annually

What are the threats contributing to avian biodiversity loss?

- The study lists eight factors, topped by land cover and land-use change.
- The continued growth of human populations and of per capita rates of consumption lead directly to conversion and degradation of primary natural habitats and consequent loss of biodiversity.
- The other factors are habitat fragmentation and degradation, especially in the tropics;
- hunting and trapping with 11 to 36 million birds estimated to be killed or taken illegally in the Mediterranean region alone;
- the impact of invasive alien species and disease (971 alien bird species introduced accidentally or deliberately to 230 countries over the centuries have affected the native species);
- infrastructure, energy demands and pollution; agrochemical and pharmaceutical usage (pesticide ingestion kills an estimated 2.7 million birds annually in Canada alone); global trade teleconnections; and climate change
- Emerging concepts of conservation social science can inform efforts to address biodiversity loss and to achieve more effective and sustainable conservation outcomes, linking birds to human well-being, sustainability, climate resilience, and environmental justice.

Shallow and deep ecologism

- The fashionable fight against pollution and resource depletion is shallow ecologism. Exponents of this philosophy believe in continuing our present lifestyle, but with specific tweaks aimed at minimizing the damage to the environment.
- The concepts emerged in the 1970s, when Norwegian philosopher Arne Næss sought to look

beyond the popular pollution and conservation movements of his milieu to address environmental degradation

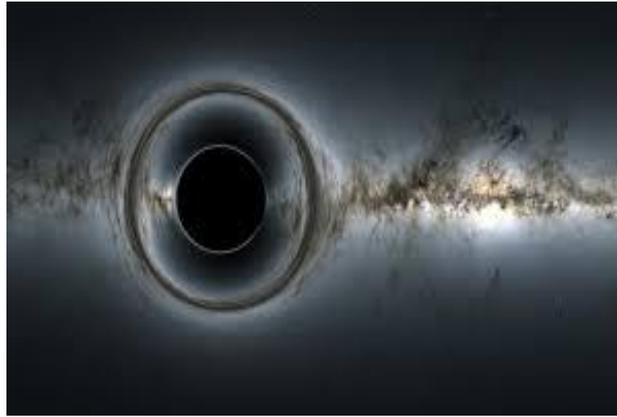
- Deep ecology believes that humans should radically change their relationship with nature. Its proponents reject shallow ecology for prioritizing humans above other forms of life, and subsequently preserving the environmentally destructive way of life in modern societies.

Sagittarius A* (SgrA*)

- Scientists from the Event Horizon Telescope (EHT) facility, at press conferences held simultaneously at several centres around the world, revealed the first image of the black hole at the centre of the Milky Way.
- The image of Sagittarius A* (SgrA*) gave further support to the idea that the compact object at the centre of our galaxy is indeed a black hole, strengthening Einstein's general theory of relativity.
- In 2019, the Event Horizon Telescope facility, a collaboration of over 300 researchers, made history by releasing the first-ever image of a black hole, M87* the black hole at the centre of a galaxy Messier 87, which is a supergiant elliptical galaxy

About Black hole

- A black hole is a location in space with a gravitational pull so strong that nothing, not even light, can escape it.
- A black hole's outer edge, called its event horizon, defines the spherical boundary where the velocity needed to escape exceeds the speed of light.
- Matter and radiation fall in, but they can't get out. Because not even light can escape, a black hole is literally black.
- Contrary to their name's implication, black holes are not empty. In fact, a black hole contains a great amount of matter packed into a relatively small space.
- Black holes come in various sizes and can exist throughout space.



The event horizon

- The event horizon of a black hole is linked to the object's escape velocity the speed that one would need to exceed to escape the black hole's gravitational pull.
- The closer someone came to a black hole, the greater the speed they would need to escape that massive gravity.
- The event horizon is the threshold around the black hole where the escape velocity surpasses the speed of light.

Event Horizon Telescope (EHT)

- The Event Horizon Telescope (EHT) is a large telescope array consisting of a global network of radio telescopes. The EHT project combines data from several very-long-baseline interferometry (VLBI) stations around Earth, which form a combined array with an angular resolution sufficient to observe objects the size of a supermassive black hole's event horizon.
- The project's observational targets include the two black holes with the largest angular diameter as observed from Earth: the black hole at the centre of the supergiant elliptical galaxy Messier 87 (M87*, pronounced "M87-Star"), and Sagittarius A* (Sgr A*, pronounced "Sagittarius A-Star") at the centre of the Milky Way.
- On 12 May 2022, astronomers announced the image, for the first time, of Sagittarius A*.
- The Event Horizon Telescope project is an international collaboration launched in 2009 after a long period of theoretical and technical developments.

mRNA Vaccine

- The Centre for Cellular and Molecular Biology (CCMB) here has established the “proof of

principle” of the first indigenous mRNA vaccine technology coming from a scientific institution in India.

- While vaccines work by training the immune system to identify disease-causing micro-organisms and eliminate them quickly when they encounter them, in the mRNA technology, the host cell’s immune system is trained to evade the real infection.
- This is done by introducing mRNA of the micro-organism of concern into the host.
- The home-grown mRNA vaccine platform holds promise to deal with other infectious diseases such as TB, dengue, malaria, chikungunya, rare genetic diseases and others

mRNA Vaccine working

- The mRNA will enter the muscle cells and instruct the cells’ machinery to produce a harmless piece of what is called the spike protein. The spike protein is found on the surface of the virus that causes COVID-19. After the protein piece is made, our cells break down the mRNA and remove it.
- Next, our cells display the spike protein piece on their surface. Our immune recognizes that the protein doesn’t belong there. This triggers our immune system to produce antibodies and activate other immune cells to fight off what it thinks is an infection. This is what your body might do to fight off the infection if you got sick with COVID-19.
- At the end of the process, our bodies have learned how to protect against future infection from the virus that causes COVID-19. The benefit of COVID-19 mRNA vaccines, like all vaccines, is that those vaccinated gain this protection without ever having to risk the potentially serious consequences of getting sick with COVID-19.

RNA granule

- Dive into the cytoplasm of any cell and one comes across structures made of messenger RNA (mRNA) and proteins known as RNA granules, in general.
- Unlike other structures in the cell (such as mitochondria), the RNA granules are not covered and confined by a membrane.
- This makes them highly dynamic in nature, thereby allowing them to constantly exchange components with the surrounding.
- RNA granules are present in the cytoplasm at low numbers under normal conditions but increase in number and size under stressful conditions including diseases.

- A defining feature which does not change from one organism to another (conserved) of the RNA granule protein components is the presence of stretches containing repeats of certain amino acids.
- Such stretches are referred to as low complexity regions. Repeats of arginine (R), glycine (G) and glycine (G) known as RGG are an example of low complexity sequence.

Protein synthesis

- Messenger RNAs are converted to proteins (building blocks of the cell) by the process of translation.
- RNA granules determine messenger RNA (mRNA) fate by deciding when and how much protein would be produced from mRNA.
- Protein synthesis is a multi-step and energy expensive process.
- Therefore, a common strategy used by cells when it encounters unfavorable conditions is to shut down protein production and conserve energy to deal with the stressful situation.
- RNA granules help in the process of shutting down protein production.
- Some RNA granule types (such as Processing bodies or P-bodies) not only regulate protein production but also accomplish degradation and elimination of the mRNAs, which in turn helps in reducing protein production.

Link found

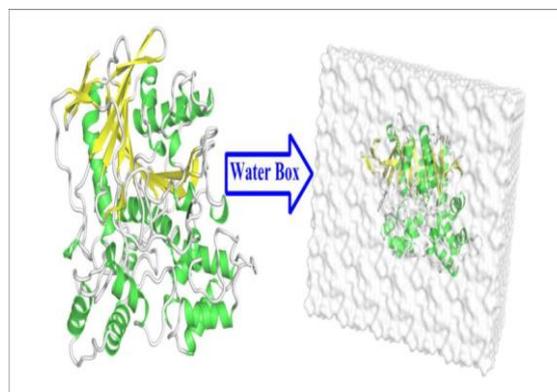
- In recent years, a strong link has emerged between RNA granules and neurodegenerative disorders such as Amyotrophic Lateral Sclerosis (ALS) and Frontotemporal Dementia (FTD).
- The proteins implicated in these diseases such as Ewing sarcoma breakpoint region 1 (EWSR1) and fused in sarcoma (FUS) are RNA binding proteins that can reside in RNA granules.
- In fact, these proteins are deposited as insoluble granules/aggregates in the neurons of ALS and FTD patients which are believed to contribute to the pathophysiology of these diseases.
- Finding ways of solubilizing these aggregates could provide a breakthrough in treating these diseases.
-

Pullulan polymer

- The biomaterial is derived from the polymer pullulan which is secreted by the fungus *Aureobasidium pullulans*.
- It is an exopolysaccharide, that is, this polymer is secreted by the fungus itself into the medium on which it is growing
- Pullulan as a biomaterial is already successful and widely used commercially.
- It is exploited in food, cosmetics and pharmaceutical industry because of its nontoxic, non-mutagenic and non-immunogenic properties.

butyrylcholinesterase (BChE)

- A team of Australian researchers have identified a biochemical marker in the blood that could help identify newborn babies at risk for sudden infant death syndrome (SIDS), a breakthrough they said creates an avenue to future tragedy preventing interventions.
- In their study, babies who died of SIDS had lower levels of an enzyme called butyrylcholinesterase (BChE) shortly after birth, the researchers said.
- BChE plays a major role in the brain's arousal pathway, and low levels would reduce a sleeping infant's ability to wake up or respond to its environment.
- The fact that levels of the enzyme were significantly lower in the infants who subsequently died of SIDS suggests the SIDS babies were inherently vulnerable to dysfunction of the autonomic nervous system, which controls unconscious and involuntary functions in the body.



Lunar regolith

- Scientists have grown plants in soil from the Moon, a first in human history.

- University of Florida researchers showed (Communications Biology) that plants can successfully sprout and grow in lunar soil.
- Their study also investigated how plants respond biologically to the Moon's soil, also known as lunar regolith, which is radically different from soil found on Earth.
- To grow their tiny lunar garden, the researchers used thimble-sized wells in plastic plates normally used to culture cells.
- Each 'pot' was filled with nearly a gram of lunar soil, the soil was moistened with a nutrient solution and a few seeds from the Arabidopsis plant was added
- The plants were grown in non-lunar soils as a control group.
- All the seeds planted in the lunar soils sprouted but plants were smaller, grew more slowly or were more varied in size than their counterparts.
- These were all physical signs that the plants were working to cope with the chemical and structural make-up of the Moon's soil.

Pangong Lake

- Pangong Lake is a long boomerang-shaped endorheic (landlocked) water body.
- It is located at an elevation of roughly more than 4,200 meters (13,800 ft) above sea level.
- It is a trans-border lake spanning across eastern Ladakh and western Tibet, with a length of more than 135 km.
- It is around 5 km wide at its broadest point.
- Around 40% of the lake lies within Indian Territory, 50% in Tibet (China), and the rest 10% is reportedly disputed between the two and is a de facto buffer zone.
- Practically China controls 2/3rd of the total length while the rest is controlled by India





- The lake is considered brackish (saline) with no life in it, however, it is the western part of the lake (In India) which is saline, and the eastern part of the lake (In China) is freshwater.
- There are certain fishes that are found in Pangong Tso, contrary to the belief that it doesn't support life.
- India holds one-third of the 135-km-long Boomerangshaped Lake located at an altitude of over 14,000 feet.
- The lake, a glacial melt, has mountain spurs of the Chang Chenmo range jutting down, referred to as fingers.
- Approximately 60% of the length of the lake lies within the Tibetan Autonomous Region. The lake is 5 km (3.1 mi) wide at its broadest point. All together it covers 604 km².
- During winter the lake freezes completely, despite being saline water. It is not a part of the Indus river basin area and geographically a separate landlocked river basin.

South Asia biodiversity

- According to the Global Assessment Report on Biodiversity and Ecosystem Services released in 2019 by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) at the UNESCO headquarters in Paris, the main global drivers of biodiversity loss are climate change, invasive species, and over-exploitation of natural resources, pollution and urbanization.
- The earth is under strain Because of our collective excesses, the ecological carrying capacity of planet earth has largely been exceeded.
- This trend needs to be redressed, with cleaner air, high quality drinking water, and enough food and healthy habitats to ensure that ecosystem services continue to benefit humanity without critically affecting nature's balance.

Biosphere reserves are key

- One of the best mechanisms that has been created is the World Network of Biosphere Reserves, created in 1971 by UNESCO.
- Biosphere reserves are places where humans live in harmony with nature, and where there is an effective combination of sustainable development and nature conservation.
- They represent pockets of hope and proof that we are not inexorably headed towards a doomsday ecological scenario, provided we take appropriate action. In South Asia, over 30 biosphere reserves have been established.
- The first one was the Hurulu Biosphere Reserve in Sri Lanka, which was designated in 1977 and comprises 25,500 hectares within the tropical dry evergreen forest.
- In India, the first biosphere reserve was designated by UNESCO in 2000 within the blue mountains of the Nilgiris

Diverse systems

- South Asia has a very diverse set of ecosystems. To begin with, Bhutan, India and Nepal combined have thousands of glaciers, surrounded by lakes and alpine ecosystems.
- The Khangchendzonga Biosphere Reserve, established in 2018, is a good model.
- It includes some of the highest ecosystems in the world, with elevations up to 8,586 meters.
- The reserve is home to orchids and rare plant species. At the same time, more than 35,000 people live there.
- Their main economic activities are crop production, animal husbandry, fishing, dairy products and poultry farming.
- Bangladesh, India, the Maldives, and Sri Lanka all have extensive coastlines, with coral reefs and mangrove forests.
- These areas are exposed to extreme weather events (storms, floods, droughts), and sea-level rise.
- The Maldives are recognized as the lowest-lying country in the world, with a mere elevation of 1.5 meters above the high tide mark. Together with UNESCO,
- Run on science-based plans UNESCO Biosphere Reserves have all developed science-based management plans, where local solutions for sustainable human living and nature conservation are being tested and best practices applied.
- Issues of concern include biodiversity, clean energy, climate, environmental education, and

water and waste management, supported by scientific research and monitoring.

- The aim is to detect changes and find solutions to increase climate resilience. All biosphere reserves are internationally recognized sites on land, at the coast, or in the oceans.
- Governments alone decide which areas to nominate. Before approval by UNESCO, the sites are externally examined.
- If approved, they will be managed based on an agreed plan, reinforced by routine checks to ensure credibility, but all remain under the sovereignty of their national government
- The priority countries Bangladesh, Bhutan, and Nepal are on the priority list of UNESCO, because they do not yet have any biosphere reserves.
- Their governments are already working on their first nomination files.
- Our organization also believes that it would be important to increase the number of biosphere reserves in India, the Maldives and Sri Lanka.

Long Covid

The story so far:

- Months after the first cases of COVID-19 were detected in the world outside China, concerns about persistent symptoms post infection cropped up

What is long COVID?

- With the ongoing COVID-19 pandemic, evidence showed that a considerable proportion of people who have recovered from COVID-19 continue to face long-term effects on multiple organs and system
- In the absence of a universally-accepted definition, post-COVID Syndrome, by consensus, is defined as signs and symptoms that develop during or after an infection consistent with COVID-19 which continue for more than 12 weeks and are not explained by alternative diagnosis.
- Technically, post-COVID defines symptoms that persist four weeks after infection and Long COVID, 12 weeks past a COVID-19 infection

How long does long COVID last for?

- The study, perhaps for the first time, described Long COVID for the longest time possible two years

What is the status in India?

- The government of India developed its own National Comprehensive Guidelines for the management of post-COVID sequelae.
- This document sets out detailed techniques to treat post-COVID complications affecting cardiovascular, gastrointestinal, nephrological, and neurological and respiratory systems.
- Several hospitals set up COVID wards to treat persons who complain of what seemed like post-COVID symptoms.

Cold system and vaccination

- India's Universal Immunization Programme (UIP), launched in 1985 to deliver routine immunization, showcased its strengths in managing large-scale vaccine delivery.
- This programme targets close to 2.67 crore newborns and 2.9 crore pregnant women annually.
- To strengthen the programme's outcomes, in 2014, Mission Indradhanush was introduced to achieve full immunization coverage of all children and pregnant women at a rapid pace — a commendable initiative.
- But the pandemic reminded us that vaccines alone do not save lives, vaccination does.
- While we have, over the years, set up a strong service delivery network, the pandemic showed us that there were weak links in the chain, especially in the cold chain, which needs to be robust and seamless.
- Cold chain management: The success of any sustainable vaccination programme relies on many factors.
- A key factor is cold chain management because when this fails, the potency or effectiveness of the vaccine is wasted.
- Nearly half the vaccines distributed around the world go to waste, in large part due to a failure to properly control storage temperatures.
- In India, close to 20% of temperature-sensitive healthcare products arrive damaged or degraded because of broken or insufficient cold chains, including a quarter of vaccines
- The Health Ministry has been digitizing the vaccine supply chain network in recent years

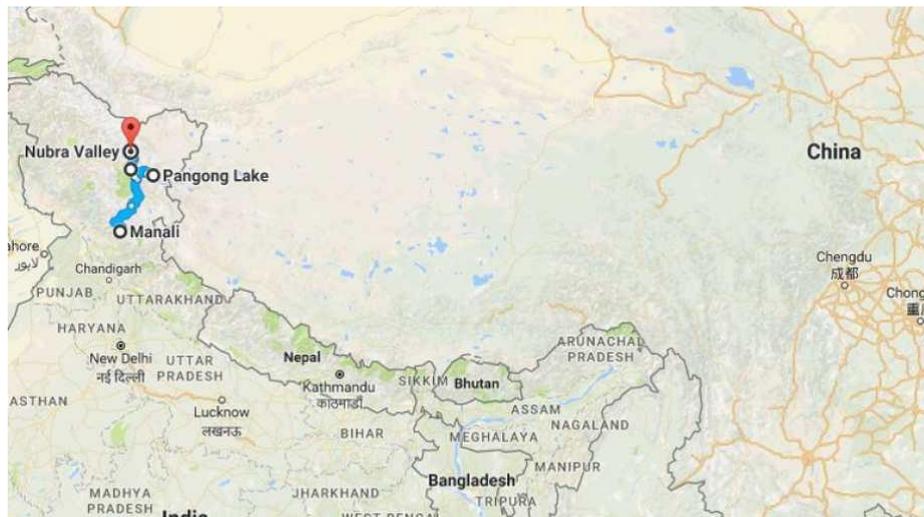
through the use of cloud technology, such as with the Electronic Vaccine Intelligence Network (eVIN).

- Developed with support from Gavi, the Vaccine Alliance, and implemented by the UN Development Programme through a smartphone-based app, the platform digitizes information on vaccine stocks and temperatures across the country.
- The role played by supportive infrastructure for cold chain such as a regular supply of electricity cannot be underplayed.
- In this regard, there is a need to improve electrification, especially in the last mile, for which the potential of solar-driven technology must be explored to integrate sustainable development
- Robust cold chain systems are an investment in India's future pandemic preparedness; by taking steps towards actionable policies that improve the cold chain, we have an opportunity to lead the way in building back better and stronger.

Pollution and NHRC

- The National Human Rights Commission (NHRC) on Wednesday said it had issued an advisory to the Centre and State governments on preventing, minimizing and mitigating the impact of environmental pollution and degradation on human rights.
- The NHRC said that despite “having one of the world’s best statutory and policy framework for environment protection”, India was facing a serious problem of pollution and ecological degradation preventing the enjoyment of basic human rights
- The advisory focuses on the punishment of polluters; prevention and mitigation of vehicular pollution; and transparent processing of approvals and clearances under environmental laws.
- “The Union and State governments should make efforts to ensure effective and expeditious punishment of polluters and violators of environmental laws.
- These efforts should include strengthening of Pollution Control Boards (PCBs) and other regulatory authorities,”
- The commission said PCBs should create separate investigation and prosecution wings, as well as carry out regular training sessions for staff
- It also recommended that “High Courts should establish Special Environmental Courts and ensure speedy trial of the cases involving violation of environmental laws”

Pangong Lake



- Pangong Lake is a long boomerang-shaped endorheic (landlocked) water body.
- It is located at an elevation of roughly more than 4,200 meters (13,800 ft) above sea level.
- It is a trans-border lake spanning across eastern Ladakh and western Tibet, with a length of more than 135 km.
- It is around 5 km wide at its broadest point.
- Around 40% of the lake lies within the Indian Territory, 50% in Tibet (China), and the rest 10% is reportedly disputed between the two and is a de facto buffer zone.
- Practically China controls 2/3rd of the total length while the rest is controlled by India
- The lake is considered brackish (saline) with no life in it, however, it is the western part of the lake (In India) which is saline, the eastern part of the lake (In China) is freshwater
- There are certain fishes that are found in Pangong Tso, contrary to the belief that it doesn't supports life
- India holds one-third of the 135-km-long boomerang shaped lake located at an altitude of over

14,000 feet.

- The lake, a glacial melt, has mountain spurs of the Chang Chenmo range jutting down, referred to as fingers
- Approximately 60% of the length of the lake lies within the Tibetan Autonomous Region. The lake is 5 km (3.1 mi) wide at its broadest point. All together it covers 604 km².
- During winter the lake freezes completely, despite being saline water. It is not a part of the Indus river basin area and geographically a separate landlocked river basin.

Holes in biodiversity bill

- The Biological Diversity Act, 2002 was framed to give effect to the United Nations Convention on Biological Diversity (CBD), 1992, that strives for sustainable, fair and equitable sharing of benefits arising out of the utilization of biological resources and associated traditional knowledge.
- To do this, it formulates a three-tier structure consisting of a National Biodiversity Authority (NBA) at the national level, State Biodiversity Boards (SBBs) at the State level and Biodiversity Management Committees (BMCs) at local body levels.
- The primary responsibility of the BMCs is to document local biodiversity and associated knowledge in the form of a People's Biodiversity Register.
- The amended Bill was drafted in response to complaints by traditional Indian medicine practitioners, the seed sector, and industry and researchers that the Act imposed a heavy "compliance burden" and made it hard to conduct collaborative research and investments and simplify patent application processes.
- The text of the Bill also says that it proposes to "widen the scope of levying access and benefit sharing with local communities and for further conservation of biological resources."
- The Bill seeks to exempt registered AYUSH medical practitioners and people accessing codified traditional knowledge, among others, from giving prior intimation to State biodiversity boards for accessing biological resources for certain purposes.
- Environmentalist organizations such as Legal Initiative for Forests and Environment (LIFE) have said that the amendments were made to "solely benefit" the AYUSH (Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homoeopathy) Ministry and would pave the way for "bio piracy."
- The modifications will exempt AYUSH manufacturing companies from needing approvals

from the NBA and thus will go against one of the core provisions of the Act

What are Mr. Ramesh's objections?

- Mr. Ramesh contended that the Environment Ministry was drawing a distinction between a registered AYUSH practitioner and a company, and exempting the former from the Act.
- He said this was an “artificial distinction” as nothing prevented a registered AYUSH practitioner from having informal links with a company structure. These paved the way for potential “abuse of the law,
- The provision of requiring companies to seek the approval of the NBA only at the time of commercialization, and not when applying for a patent, was of concern. The Bill also decriminalized violations, such as bio-piracy and made them civil offences, and this defeated the Act's “deterrent powers

Are there other shortcomings in the Bill?

- An analysis by the Centre for Science and Environment (CSE) and the Down To Earth magazine on how the Biodiversity Act was being practically implemented, pointed out serious shortcomings.
- There was no data available barring a few States on the money received from companies and traders for access and benefit-sharing from use of traditional knowledge and resources. It was unclear if companies had even paid communities despite commitments
- As of now, the funds were lying unutilized, according to State boards. As per law, Indian pharmaceutical companies are required to pay between 3-5% on the extracted bio resources or between 0.01-0.05percent on the annual gross ex-factory sales. But companies have resisted paying.

Monkey pox virus genome

- Researchers from the National Institute of Health Doutor Ricardo Jorge (INSA), Lisbon, Portugal have shared the draft genome sequence of the monkey pox virus that is rapidly spreading in many European countries
- Monkey pox is a zoonotic Virus which transmits disease from animals to humans. Cases typically occur near tropical rainforests, where animals that carry the virus live.
- The monkey pox virus is a member of the orthopoxvirus family

- Monkey pox is not endemic in Europe or the U.S. but is endemic in a few Central and West African countries. The virus is transmitted from one person to another by close contact with lesions, body fluids, respiratory droplets and contaminated materials
- The increased number of cases from multiple countries have raised concerns about enhanced human-to-human transmission of the virus.
- Evidence about increased human-to-human transmission, which is possible only if the virus has undergone any changes to make it easily transmissible among humans, will come from detailed genome sequence analysis.
- Monkey pox usually causes very visible skin lesions and hence cannot go unnoticed.
- The silent spread, if true, might mean that the virus is able to also spread without causing symptoms in some infected people
- If monkey pox can indeed spread asymptotically then it would make it harder to track the virus.

India Hypertension Control Initiative (IHCI)

- Cardiovascular diseases (CVD) are the leading cause of death among adults in India. One of the major drivers of heart attack and stroke is untreated high blood pressure or hypertension.
- Hypertension is a silent killer as most patients do not have any symptoms. India has more than 200 million people with hypertension, and only 14.5% of individuals with hypertension are on treatment
- Unlike many other diseases, hypertension is easy to diagnose and can be treated with low-cost generic drugs.
- India Hypertension Control Initiative (IHCI) is a multi-partner initiative involving the Indian Council of Medical Research, WHO-India, Ministry of Health and Family Welfare, and State governments to improve blood pressure control for people with hypertension.
- The project initiated in 26 districts in 2018 has expanded to more than 100 districts by 2022.
- More than two million patients were started on treatment and tracked to see whether they achieved BP control.
- The project demonstrated that blood pressure treatment and control are feasible in primary care settings in diverse health systems across various States in India

The project was built on five scalable strategies:

- First, a simple treatment protocol with three drugs was selected in consultation with the experts and non-communicable disease programme managers.
- Second, the supply chain was strengthened to ensure the availability of adequate antihypertensive drugs.
- Third, patient-centric approaches were followed, such as refills for at least 30 days and assigning the patients to the closest primary health centre or health wellness centre to make follow up easier.
- Fourth, the focus was on building capacity of all health staff and sharing tasks such as BP measurement, documentation, and follow-up.
- Finally, there was minimal documentation using either paper-based or digital tools to track follow up and BP control
- One of the unique contributions of the project was a data-driven approach to improving care and overall programme management.

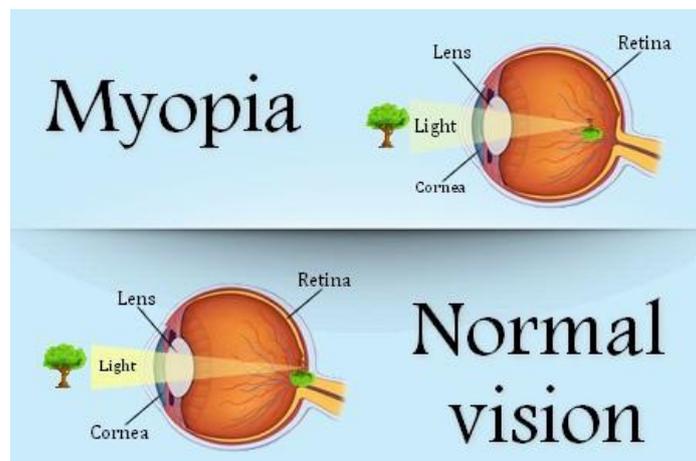
Yarara

- A substance found in fruits and vegetables can neutralize the venom of a poisonous pit viper common in much of South America, Brazilian researchers have discovered.
- In Brazil, the Bothrops jararaca, also called “yarara,” is responsible for most of the country’s 26,000 recorded snake bites each year, according to the online Reptile Database.
- The study, conducted by Sao Paulo’s Butantan Institute and published in the journal Frontiers in Pharmacology, found that a modified version of the compound rutin, the water soluble succinyl rutin, can delay the effect of a poisonous bite.
- The finding could complement standard treatment with anti bothropic serum.

MYOPIA

- Millions of young children are growing up shortsighted every year because of myopia.
- The World Health Organization (WHO) estimates that there were nearly two billion people with myopia in 2010 a quarter of the human population. By 2030, they project myopia prevalence to reach 3.3 billion people

- Myopia is commonly found in children.
- As they grow and their bodies change, the length of the eyeball and its power to refract light do not always align, leading to vision that is blurry.
- A pair of spectacles is enough to correct this mismatch. However, spectacles address the symptom and not the cause (eyeball length), so myopia can progress all through childhood.
- Progressive myopia, after a point, leads to ‘high’ myopia, increasing the risk of retinal detachment, glaucoma or macular degeneration that can cause permanent vision loss.
- A host of environmental and genetic factors determine the onset of myopia. It is believed that exposure to sunlight and a healthy balance between distance and near work can arrest myopia onset and progression.
- Many children, especially in urban environments, are spending more time indoors and on near-work.
- Be it at school or at home, the quantum of near-work looking at books, television, phones or laptops has increased over the decades
- Despite a demographic shift towards cities and towns, nearly 65% of India’s population still lives in rural areas.
- As urbanization increases, so does the burden of myopia.
- Myopia can be twice as high among urban children when compared to rural ones.



AI Chips

What are AI chips?

- AI chips are built with specific architecture and have integrated AI acceleration to support deep learning-based applications.

- Deep learning, more commonly known as active neural network (ANN) or deep neural network (DNN), is a subset of machine learning and comes under the broader umbrella of AI.
- It combines a series of computer commands or algorithms that stimulate activity and brain structure.
- DNNs go through a training phase, learning new capabilities from existing data.
- DNNs can then inference, by applying these capabilities learned during deep learning training to make predictions against previously unseen data.
- Deep learning can make the process of collecting, analyzing, and interpreting enormous amounts of data faster and easier.
- These chips, with their hardware architectures and complementary packaging, memory, storage and interconnect technologies, make it possible to infuse AI into a broad spectrum of applications to help turn data into information and then into knowledge.
- There are different types of AI chips such as application-specific integrated circuits (ASICs), field-programmable gate arrays (FPGAs), central processing units (CPUs) and GPUs, designed for diverse AI application

Are they different from traditional chips?

- When traditional chips, containing processor cores and memory, perform computational tasks, they continuously move commands and data between the two hardware components.
- These chips, however, are not ideal for AI applications as they would not be able to handle higher computational necessities of AI workloads which have huge volumes of data.
- In comparison, AI chips generally contain processor cores as well as several AI-optimized cores (depending on the scale of the chip) that are designed to work in harmony when performing computational tasks.

What are their applications?

- Semiconductor firms have developed various specialized AI chips for a multitude of smart machines and devices, including ones that are said to deliver the performance of a data centre-class computer to edge devices.
- Some of these chips support in-vehicle computers to run state-of-the-art AI applications more efficiently.
- AI chips are also powering applications of computational imaging in wearable electronics, drones, and robots.
- Additionally, the use of AI chips for NLP applications has increased due to the rise in demand

for chatbots and online channels such as Messenger, Slack, and others.

- They use NLP to analyse user messages and conversational logic.
- Then there are chipmakers who have built AI processors with on-chip hardware acceleration, designed to help customers achieve business insights at scale across banking, finance, trading, insurance applications and customer interactions.

Disaster struck Dima Hasao

The story so far:

Disaster struck Dima Hasao, central Assam's hill district, in mid-May after incessant heavy rainfall.

The 170 km railway line connecting Lumding in the Brahmaputra Valley's Hojai district and Badarpur in the Barak Valley's Karimganj district was severely affected.

How severe has the rain been in Assam?

- Assam is used to floods, sometimes even four times a year, resultant landslides and erosion.
- But the pre-monsoon showers this year have been particularly severe on Dima Hasao, one of three hill districts in the State.
- Landslips have claimed four lives and damaged roads

Why is the railway in focus post-disaster?

- Dima Hasao straddles the Barail, a tertiary mountain range between the Brahmaputra and Barak River basins.
- The district is on the Dauki fault (the prone-to-earthquakes geological fractures between two blocks of rocks) straddling Bangladesh and parts of the northeast. British engineers were said to have factored in the fragility of the hills to build the railway line over 16 years by 1899.
- The end result was an engineering marvel 221 km long over several bridges and through 37 tunnels, laid along the safer sections of the hills.
- A project to convert the meter gauge track to broad gauge was undertaken in 1996 but the work was completed only by March 2015 because of geotechnical constraints and extremist groups.

- The broad-gauge track was realigned to be straighter, but a 2009-10 audit report revealed that the project had been undertaken without proper planning and visualization of the soil strata behaviour.
- Citing an engineering and geology expert, the report gave the example of the disaster-prone Tunnel 10 on the realigned track that was pegged 8 meters below the bed of a nearby stream.
- Retired railway officials admitted that faulty experiments and the “greed” of a few not only made the track vulnerable to the forces of nature but also escalated the cost of the project from ₹1,677 crore to ₹5,500 crore.

Is only the railway at fault?

- There is a general consensus that other factors have contributed to the situation Dima Hasao is in today.
- Roads in the district, specifically the four-lane Saurashtra-Silchar (largest Barak Valley town) East-West Corridor, have been realigned or deviated from the old ones that were planned around rivers and largely weathered the conditions

How vital are the rail and highway through Dima Hasao?

- Meghalaya aside, Dima Hasao is the geographical link to a vast region comprising southern Assam’s Barak Valley, parts of Manipur, Mizoram and Tripura.
- This region has an alternative, less disaster-prone highway through Meghalaya linking the country beyond and may not thus be impacted by any damage to the four-lane highway through Dima Hasao, once it is completed.
- But the Lumding-Badarpur railway line has been the lifeline for this region since goods trains started operating in March 2015.
- Moreover, this track is vital for India’s Look East policy that envisages shipping goods to and from Bangladesh’s Chittagong port via Tripura’s border points at Akhaura and Sabroom, the last railway station near the Feni River that serves as the India-Bangladesh border.
- The Dima Hasao line also links the ambitious 111 km Jiribam-Imphal railway project in Manipur being built on similar, landslide-prone terrain.
- There are plans to extend the Jiribam-Imphal line, which will have India’s tallest railway bridge and the longest railway tunnel, to Myanmar and beyond.
- Such plans seem distant with Tripura and Mizoram indicating they cannot always rely on the rail connectivity through Dima Hasao.

Mutant tomatoes

- According to estimates made in 2020 nearly 690 million people, who make up close to 8.9% of the world's population, are hungry. One of the main reasons for this hunger is micronutrient malnutrition.
- A paper in Nature Plants by Jie Li et al tries to address vitamin D deficiency by genetically modifying tomato plants so that the fruit contains a significant amount of provitamin D3 which is a precursor from which humans can make vitamin D.
- Vitamin D is needed for a process known as calcium homeostasis which is the maintenance of constant concentration of calcium ions in the body

Mutant tomatoes

- Recently discovered a pathway in tomato plants to produce cholesterol and a substance called steroidal glycoalkaloid (SGA for short) using the CRISPR-Cas9 gene editing tool.
- This inhibits the conversion of 7-DHC to cholesterol and instead the former accumulates in the leaves, green and ripe fruits.
- Usually, in untreated tomato plants, 7-DHC is present in leaves and to a lower extent in green fruit, but not in ripe fruit which is the most consumed of the lot.
- The researchers showed that in their modified plants, the suppression of the activity of a particular gene, "led to substantial increases of 7-DHC levels in leaves and green fruit," and, according to the paper, while levels of 7-DHC were lower in ripe fruits of the mutant, they remained high enough that if converted to Vitamin D3 by shining UVB light, the amount in one tomato would be equivalent to that in two eggs or 28 grams of tuna, both of which are recommended sources of vitamin D.
- In addition, the researchers report that the mutants showed a reduction in their leaves of a substance called alpha-tomatine, and they comment that this may even be beneficial because of alpha-tomatine's reported toxicant or antinutritional activity.

Heatwaves and Inflation

- Moody's Investors Service said on Monday that the prolonged heat waves seen in India this summer were credit negative as they would exacerbate inflation pressures and challenges to growth.

- The agency added that the ban on wheat exports would hurt growth and reflected a missed opportunity to capture the global market.
- Noting that New Delhi experienced its fifth heatwave since March on May 15, Moody's pointed out that such waves usually occurred in May and June.
- "The prolonged high temperatures, which are affecting much of the northwest of the country, will curb wheat production and could lead to extended power outages, exacerbating already high inflation and hurting growth, a credit negative
- Moody's warned of prolonged power outages in industrial and agricultural production if this persisted, leading to significant cuts to output and weighing further on India's economic growth – 'particularly if the heatwaves continue beyond June'.
- Inflation, it noted, will only be partially alleviated by measures such as the central bank's policy rate hikes, cap on power prices in exchanges, and the wheat export ban.
- "Given the prominence of cereals and food more generally in India's consumption, elevated food prices could add to social risks if they persist.

Draft notification on e waste

- Consumer goods companies and makers of electronics goods have to ensure at least 60% of their electronic waste is collected and recycled by 2023 with targets to increase them to 70% and 80% in 2024 and 2025, respectively, according to a draft notification by the Environment Ministry
- The rules bring into effect a system of trading in certificates, akin to carbon credits, that will allow companies to temporarily bridge shortfalls.
- A wide range of electronic goods, including laptops, landline and mobile phones, cameras, recorders, music systems, microwaves, refrigerators and medical equipment, have been specified in the notification
- Along with specifying targets, the rules lay out a system of companies securing extended producer responsibility (EPR) certificates.
- These certificates certify the quantity of e-waste collected and recycled in a particular year by a company and an organization may sell surplus quantities to another company to help it meet its obligations.
- "The earlier rules stressed collection targets. Now we are emphasizing the EPR, recycling and trading. This follows from the government's objective to promote a circular economy,"

- Companies will have to register on an online portal and specify their annual production and e-waste collection targets.
- The chief entity that will coordinate the trade of EPR certificates and monitor if companies are meeting their targets is the Central Pollution Control Board (CPCB).
- Companies that don't meet their annual targets will have to pay a fine or an "environmental compensation", but the draft doesn't specify the quantum of these fines.
- In fact, companies that fall short can meet a year's target, even after three years.
- Those that meet their targets with a year's delay will be refunded 85% of their fine, and 60% and 30% after the second and third year, respectively
- The EPR requires producers to set up e-waste exchange facilities to facilitate collection and recycling, and assign specific responsibility to bulk consumers of electronic products for safe disposal.
- The State governments have been entrusted with the responsibility of earmarking industrial space for e-waste dismantling and recycling facilities, undertaking industrial skill development and establishing measures for protecting the health and safety of workers engaged in the dismantling and recycling facilities for e-waste
- According to the Global E Waste Monitor 2017, India generates about 2 million tonnes (MT) of e-waste annually and ranks fifth among e-waste producing countries, after the U.S., China, Japan and Germany.
- Most of India's e-waste is recycled by the informal sector and under hazardous conditions and a thrust of the e-waste rules is to have more of this waste handled by the formal sector.

'Move away from coal'

Why is the 'move away from coal' so important?

- The threat of global warming looms over the planet, promising to bring about unprecedented natural calamities.
- An effective way to keep the danger at bay is to cut the use of fossil fuels — coal, natural gas and oil. About 80% of the world's energy requirements are met by these three fuels.
- They have likely brought on the climate crisis we now face, as they trigger the emission of carbon dioxide.
- However, the worst culprit of them all is coal, which emits nearly twice as much carbon dioxide

as natural gas and about 60% more than oil, on a kilogram-to-kilogram comparison

- . The consequence of these chemical reactions gains great significance because, the power sector in India accounts for 49% of total carbon dioxide emissions, compared with the global average of 41%

What is the extent of India's dependence on coal?

- As of February 2022, the installed capacity for coal-based power generation across the country was 2.04 lakh megawatt (MW). This accounts for about 51.5% of power from all sources.
- This compares with about 25,000 MW of capacity based on natural gas as fuel, or a mere 6.3% of all installed capacity.
- Renewable power accounted for 1.06 lakh MW or 27%. Coal-based power stations are retired periodically which happens all the time.
- But is not fast enough nor are new additions being halted. And with good reason – coal is still inexpensive compared with other sources of energy.
- For FY20, for example, India added 6,765 MW power capacity based on coal as fuel. But only 2,335 MW was retired.
- According to the IEA's Coal Report 2021, India's coal consumption will increase at an average annual rate of 3.9% to 1.18 billion tonnes in 2024. So, it is not easy to shift away from coal overnight.

How has war made India's move away from coal difficult?

- Natural gas has been dubbed as the transition fuel in India's plans to move away from coal.
- The international cost of natural gas has zoomed in the recent past from a level that was considered already too high to be financially viable
- While renewable energy sources are cheaper than coal, their ability to generate power consistently is subject to the whims of nature the wind and the Sun.
- Coal can give you power on demand. Storage technologies are still not mature enough to help renewable energy sources become reliable generators of power
- As per a letter by the Ministry, Coal India, the country's largest supplier of the dry fuel is set to import coal for the first time since 2015.
- The aim of the exercise is to avoid a repeat of the power outage crisis that India faced in April the worst in more than six years.

- Following the issue of the letter dated May 28 to all state utilities, officials at the States and the Centre, including to the Coal Secretary, the central government has asked States to place import tenders on hold with a view to cut procurement costs using government-to-government channels.
- An internal power Ministry presentation is said to point to a 42.5 million tonne (MT) coal shortage in the quarter ending September on the back of high demand for power supply.
- The shortage is 15% higher than earlier anticipated.
- Domestic supply of coal is expected to be 154.7 MT, compared with the projected requirement of 197.3 MT.

Nagorno karabakh

How did the conflict over Nagorno-Karabakh begin?

- Nagorno-Karabakh is a landlocked, mountainous and forested region, falling within the boundaries of Azerbaijan.
- Nagorno-Karabakh, called Artsakh in Armenian, hosts a predominantly ethnic Armenian population with an Azeri minority.
- It is located in the South Caucasus region and is roughly made up of modern-day Armenia, Azerbaijan, and Georgia.
- Georgia. Nagorno-Karabakh, which was once a part of the Armenian kingdom, has been ruled by several empires over the centuries the Ottomans, the Persians, and the Russians. Armenia, Azerbaijan and Georgia later became separate Republics, with the Azeris incorporating Nagorno-Karabakh into their Republic.
- During the First World War, the Ottomans, aided by Azeris, attacked the south Caucasus, especially targeting ethnic Armenians.
- As the Ottomans retreated at the end of the World War, Azerbaijan and Armenia descended into a full-blown war in 1920.

The Azeri-Armenian war of 1991

- Soon, the Bolsheviks took over the south Caucasus to expand Soviet influence and Azerbaijan, Armenia, and Georgia became Soviet Republics.

- The Soviets officially placed Nagorno-Karabakh as an autonomous Oblast (administrative region) in Azerbaijan's territory, despite the chiefly Armenian population.
- As Soviet power began to wane in the 1980s, the ethnic Armenian population of Nagorno-Karabakh expressed a desire to be reunited with their roots and become a part of Armenia, organizing a vote for the same in 1988
- By 1993, Armenia had taken control of most of Nagorno-Karabakh.
- The war ended in 1994 when both countries entered into a ceasefire brokered by Russia but the borders of Armenia and Azerbaijan were not demarcated
- The Minsk Group, created by the Organization for Security and Cooperation in Europe (OSCE) in early 1990, was co-chaired by Russia, the United States, and France.
- The Minsk Group's proposals were continuously rejected by both Yerevan and Baku.
- The role of the Minsk Group declined during the 2020 war between the two countries, as other negotiating groups entered the scene
- In 2016, a clash started between Azerbaijan and Armenia which lasted for four days.
- A ceasefire signed in Moscow put an end to the war but the Nagorno-Karabakh issue was far from resolved.
- Fresh clashes erupted on the Armenia-Azerbaijan border in September of 2020, which turned into a fierce six-week war in which more than 2,000 people died

Who is organizing the current peace talks and where do they stand?

- Despite the 2020 ceasefire, clashes have not stopped.
- In November last year, seven Azerbaijani and six Armenian soldiers were killed in border clashes.
- With the efforts of the Minsk Group remaining largely unsuccessful, Baku saw an opportunity to introduce its own peace proposal, which calls for the mutual recognition of each State's territorial integrity, meaning the recognition of Nagorno-Karabakh within Azerbaijani territory.
- The European Union, meanwhile, has emerged as a potential peace broker.

5G

- Radio electronics refers to a broad range of technologies that can transmit, receive and process wireless signals.
- While these technologies can utilize electromagnetic spectrum that goes all the way up to

300GHz, the lower frequencies of this spectrum are particularly attractive.

- Lower frequency signals can travel longer distances and penetrate obstacles with lesser attenuation.
- Electronic components (amplifiers, transmitters, receivers) operating at lower frequencies are also easier to design and manufacture
- New spectrum for 3GHz With the increasing demand for mobile services, the currently allocated spectrum is proving inadequate.
- At the simplest level, 5G represents the allocation of new spectrum to increase capacity. Since most of the spectrum at lower frequencies is already being utilized much of this new spectrum is being allocated at higher frequencies.
- The first deployments in India will be around 3GHz, but will expand to 25 GHz and beyond.
- As 5G services evolve to occupy higher frequencies, it will significantly increase the bandwidth available for mobile services.
- However, at these frequencies the design of the transmitting and receiving equipment becomes more complex.
- An interesting fact related to the physics of signal transmission is that at higher frequencies it becomes easier to direct a signal in a specific direction.
- So, signals transmitted from a cell tower can be more precisely directed at a specific user (rather than spreading out in various directions which is just a waste of energy).
- Intuitively, this enhanced directivity results in less interference between signals meant for different users which directly translates to increased capacity.
- Thus, while operating at higher frequencies has some fundamental challenges, it offers some unique opportunities as well
- Existing wireless communication infrastructure is primarily designed around the needs of mobile phones.
- However, several emerging applications in factory automation, gaming and remote healthcare have more stringent latency requirements. Self-driving cars is an illustrative example
- Low delays between transmission and reception of messages are extremely critical when these cars have to cooperate with each other to avoid accidents
- There is also a lot of research around cost and energy efficient electronic devices that can transmit and receive high frequency signals.
- This involves delving into the fundamental physics of semiconductor technologies and is

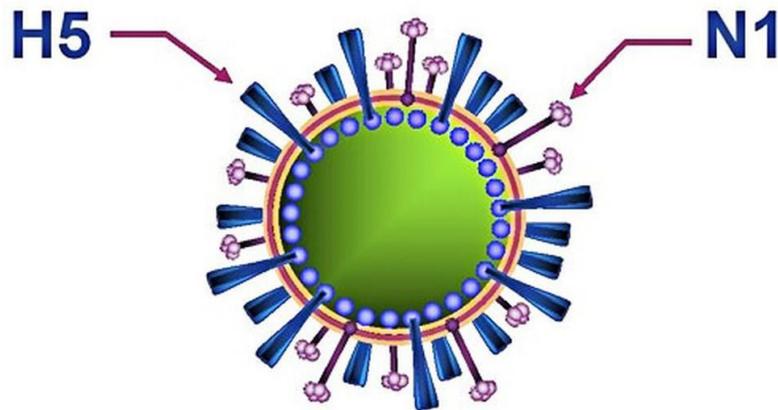
expected to lay the foundation for the growth of wireless technology into higher frequency



bands.

H5N1

- There has been an unprecedented spread of the H5N1 strain of avian influenza in wild birds.
- The virus seems to be spreading in wild birds more easily than ever before.
- The infected wild birds then spread the virus around the world, posing a significant risk to vulnerable species, which makes the virus hard to contain.
- Influenza A virus subtype H5N1 (A/H5N1) is a subtype of the influenza A virus which can cause illness in humans and many other animal species.
- A bird-adapted strain of H5N1, called HPAI A (H5N1) for highly pathogenic avian influenza virus of type A of subtype H5N1, is the highly pathogenic causative agent of H5N1 flu, commonly known as avian influenza ("bird flu").
- It is enzootic (maintained in the population) in many bird populations, especially in Southeast Asia. One strain of HPAI A (H5N1) is spreading globally after first appearing in Asia.
- It is epizootic (an epidemic in nonhumans) and panzootic (affecting animals of many species, especially over a wide area), killing tens of millions of birds and spurring the culling of hundreds of millions of others to stem its spread. Many references to "bird flu" and H5N1 in the popular media refer to this strain.



Phytoplankton and global warming

- An international team of scientists have found a remarkable type of fossilization that has remained almost entirely overlooked until now.
- The fossils are microscopic imprints, or ‘ghosts,’ of single-celled plankton, called coccolithophores, that lived in the seas millions of years ago, and their discovery is changing our understanding of how plankton in the oceans are affected by climate change.
- Declines in the abundance of coccoliths fossils have been documented from multiple past global warming events, suggesting that these plankton were severely affected by climate change and ocean acidification.
- But a study found (Science) new global records of abundant ghost fossils from three Jurassic and Cretaceous warming events (94, 120 and 183 million years ago), suggesting that coccolithophores were more resilient to past climate change than was previously thought.

Ankylosing spondylitis (AS)

- An inflammation of the bones in the spine is called spondylitis. One severe, arthritic form of spondylitis is called ankylosing spondylitis (AS).
- The term ‘ankylosing’ refers to new bone formation leading to the cementing together of a set of adjacent vertebrae, usually in the lower back.
- Spondylitis is different from spondylosis, which is the wearing away of the vertebral column
- An important immune system component, the human leukocyte antigen (HLA) complex, helps distinguish self from non-self-normal proteins that are part of your body versus proteins that

are from invasive organisms, or even damaged or deformed versions of your own normal proteins.

- The HLA complex achieves this by showing a particularly ‘foreign’-looking piece of a bacterial molecule (the antigen) to other immune system components that will hunt down anything resembling this piece
- Some variants of the HLA gene (e.g., HLA-B27) are predisposed to AS and other conditions that cause chronic inflammation of the joints of the spine.



Bacteria in Antarctica

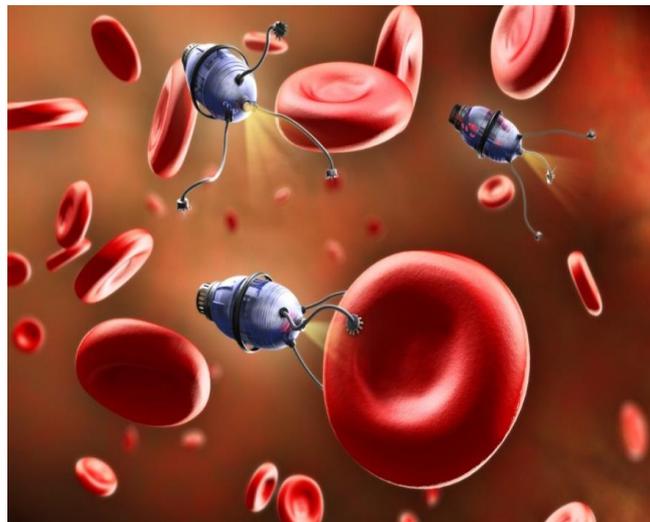
- A bacteria have been discovered in Antarctica with genes that give them natural antibiotic and antimicrobial resistance and have the potential to spread out of the Polar Regions, according to scientists in Chile.
- Scientists from the University of Chile collected several samples from the Antarctic Peninsula from 2017 to 2019.
- They found that the Pseudomonas bacteria, one of the predominant bacteria groups in the Antarctic Peninsula, are not pathogenic but can be a source of ‘resistance genes’, which are not stopped by common disinfectants such as copper, chlorine or quaternary ammonium.

Nanorobots

- Once the shooting pain has been diagnosed as being due to a bacterial infection within the tooth, the dentist drills a hole, scoops out the infected pulp, disinfects the tooth and fills the space with an antibacterial sealant like bleach or hydrogen peroxide
- A common cause of failure is that the underlying bacteria, usually Enterococcus faecalis, hasn't

been completely eliminated paving the way for reinfections that can necessitate extracting the tooth

- A Bengaluru based start-up incubated at the Indian Institute of Science, aspires to go one up by employing nanotechnology.
- By deploying an army of so called ‘nanobots’, or tiny ‘robots’ that are helical crawlers made of silicon dioxide coated with iron, the aim is to have the bots move as close to where the bacteria abound.
- The bots’ movement can be controlled using a device that generates a low intensity magnetic field.
- In their tests, Theranautilus scientists injected these nanobots into extracted tooth samples and tracked their movement via a microscope.



Sela macaque

- A new species of old world monkey recorded from Arunachal Pradesh has been named after a strategic mountain pass at 13,700 ft above sea level.
- Sela macaque (*Macaca selai*), the new-to-science primate was identified and analyzed by a team of experts from the Zoological Survey of India (ZSI) and the University of Calcutta.
- The phylogenetic analysis revealed that the Sela macaque was geographically separated from the Arunachal macaque (*Macaca munzala*) of Tawang district by Sela.
- This mountain pass acted as a barrier by restricting the migration of individuals of these two species for approximately two million years, the study said.
- Sela is situated between Dirang and Tawang towns in western Arunachal Pradesh.

- The study says the Sela macaque has a tail longer than the Tibetan macaque, Assamese macaque, Arunachal macaque and the white-cheeked macaque but shorter than the bonnet macaque and toque macaque.
- Sela macaque belongs to the sinica species-group of Macaca, but it differs from all other members of this group through attributes such as brown collar hair and muzzle, and the absence of chin whiskers

Sela pass

- The Sela Pass is a high-altitude mountain pass located on the border between the Tawang and West Kameng districts in the Indian state of Arunachal Pradesh.
- It has an elevation of 4170 m (13,700 ft) and connects the Indian Buddhist town of Tawang to Dirang and Guwahati.
- The pass carries the National Highway 13 (previously NH 229), connecting Tawang with the rest of India.
- The pass supports scarce amounts of vegetation and is usually snow-covered to some extent throughout the year.
- Sela Lake, near the summit of the pass, is one of approximately 101 lakes in the area that are sacred in Tibetan Buddhism.



AKRUTI

- The Nuclear Power Corporation of India Limited, which is assisting unemployed youth living in 16 village panchayats near the Tarapur Atomic Power Station (TAPS) through its Advanced Knowledge and Rural Technology Implementation (AKRUTI) programme, is all set to launch a similar initiative in the villages surrounding Kudankulam Nuclear Power Project (KKNPP).

- The Bhabha Atomic Research Centre, the country's premier multidisciplinary research and development centre under the Department of Atomic Energy, besides identifying newer nuclear power generation techniques, is devising new, user-friendly and cost-effective technologies in the fields of nuclear science, radioisotopes, industry, health and agriculture.
- These technologies are being taught to the younger generation and the unemployed youth to make them entrepreneurs.
- One of the AKRUTI's interesting technology transfers is the cost-effective foldable dryer, which can be used for drying fruits, vegetables and fish.

Measles Rubella elimination

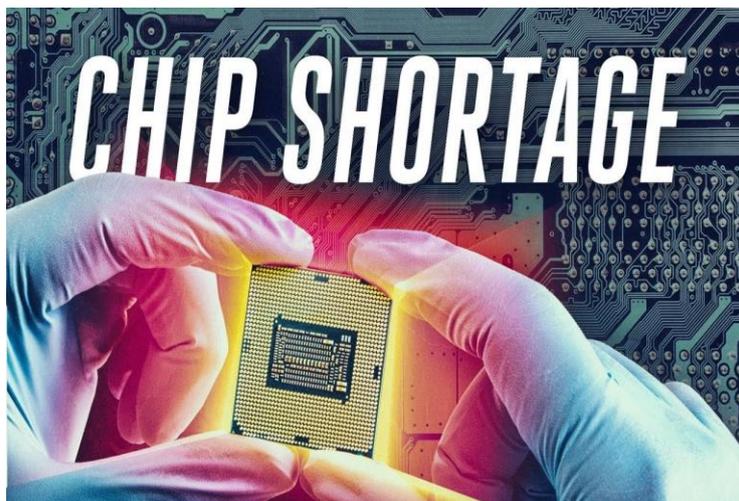
- The Government decided to eliminate measles and rubella from India by the year 2020 having missed the earlier set target of 2015. So, in 2017 there was an urgency to accelerate efforts.
- The basic plan was to create a very high level of vaccination-induced immunity against both diseases, by inoculating MR vaccine
- The two arms of intervention are vaccination and surveillance. Surveillance helps identify places where either virus is still in transmission, so that vaccination can be pinpointed there to stop further spread.
- In the pre-vaccination era, while polio paralyzed about 1% of all children before the age of five, measles actually killed 1% of all under-five children. During measles outbreaks, the case-fatality rate was about 10%-15%
- Children who recovered would have lost weight as well as the steady momentum of cognitive development and scholastic performance.
- Measles affects the immune system rendering the child vulnerable to other infectious diseases, leading to high mortality over the next two to three years.
- During the pandemic, people switched to work from home, and children connected to schools through laptops.
- This shift led to a surge in demand for laptops and tablets.
- High consumer demand for low-end products, coupled with large orders from tech firms chocked chip makers whose factories were also closed during lockdowns
- The rubella virus is a slower transmitter and the risk of rubella is extended from childhood through adolescence into the reproductive age range. In most individuals, rubella infection
- Affected babies are born with severe birth defects such as cataracts, deafness, heart defects and

developmental delay this is ‘congenital rubella syndrome’ (CRS).

- Fortunately, CRS is preventable with vaccination if given prior to pregnancy.
- The MR vaccine is a combined product, targeting two diseases in one shot.

Global chip shortage

- The lockdown has had a domino effect on global supply chains. Separately, Russia’s invasion of Ukraine has strained exports of essential commodities used to make chip sets.
- Moscow supplies rare materials like palladium, and Kyiv sells rare gases to make semiconductor fab lasers.
- This combination is required to build chipsets that power a range of devices, from automobiles to smartphones.
- When the pandemic began, carmakers stopped requesting chips from suppliers due to low demand for new vehicles.
- And now, as they ramp up production to meet consumer demand, chip makers are down on supply because they have cut deals with other industries.



Green Hydrogen

The story so far:

- At the World Economic Forum in Davos, Switzerland, a few days ago, Minister of Petroleum and Natural Gas Hardeep Singh Puri said India will emerge as the leader of green hydrogen by taking advantage of the current energy crisis across the globe

What is green hydrogen?

- A colorless, odorless, tasteless, non-toxic and highly combustible gaseous substance, hydrogen is the lightest, simplest and most abundant member of the family of chemical elements in the universe. But a color green prefixed to it makes hydrogen the “fuel of the future”.
- The ‘green’ depends on how the electricity is generated to obtain the hydrogen, which does not emit greenhouse gas when burned.
- Green hydrogen is produced through electrolysis using renewable sources of energy such as solar, wind or hydel power.
- Hydrogen can be ‘grey’ and ‘blue’ too. Grey hydrogen is generated through fossil fuels such as coal and gas and currently accounts for 95% of the total production in South Asia.
- Blue hydrogen, too, is produced using electricity generated by burning fossil fuels but with technologies to prevent the carbon released in the process from entering the atmosphere

Why is India pursuing green hydrogen?

- Under the Paris Agreement (a legally binding international treaty on climate change with the goal of limiting global warming to below 2°C compared to pre-industrial levels) of 2015, India is committed to reducing its greenhouse gas emissions by 33-35% from the 2005 levels.
- At the 2021 Conference of Parties in Glasgow, India reiterated its commitment to move from a fossil and import-dependent economy to a net-zero economy by 2070.
- India’s average annual energy import bill is more than \$100 billion and the increased consumption of fossil fuel has made the country a high carbon dioxide (CO₂) emitter, accounting for nearly 7% of the global CO₂ burden.
- In order to become energy independent by 2047, the government stressed the need to introduce green hydrogen as an alternative fuel that can make India the global hub and a major exporter of hydrogen.
- The National Hydrogen Mission was launched on August 15, 2021, with a view to cutting down carbon emissions and increasing the use of renewable sources of energy.

How much green hydrogen is India producing?

- India has just begun to generate green hydrogen with the objective of raising non-fossil energy capacity to 500 gigawatts by 2030

What are the advantages of hydrogen as a fuel?

- The intermittent nature of renewable energy, especially wind, leads to grid instability. Green hydrogen can be stored for long periods of time. The stored hydrogen can be used to produce electricity using fuel cells.
- In a fuel cell, a device that converts the energy of a chemical into electricity, hydrogen gas reacts with oxygen to produce electricity and water vapour. Hydrogen, thus, can act as an energy storage device and contribute to grid stability.
- Experts say the oxygen, produced as a by-product (8 kg of oxygen is produced per 1 kg of hydrogen), can also be monetized by using it for industrial and medical applications or for enriching the environment.
- The possibilities of hydrogen have made many countries pledge investments with Portugal having unveiled a national hydrogen strategy worth \$7.7 billion in May.

