

WEEKLY UPDATES – (19th June – 25th June)

Contents

Environment.....	2
LEED Net Zero Certifications	2
Himalayan Glaciers	2
UN Adopts World's First Treaty to Protect the High Seas	3
History	5
Mesolithic-Era Rock Painting in Andhra's Guntur	5
Defence & Security.....	6
Three Theatre Commands to be Established	6
Polity	6
New ART Regulations	6
International Relations.....	8
India Gifts INS Kirpan to Vietnam	8
Geography	9
Groundwater Extraction Has Affected the Earth's Tilt.....	9
Heat Waves & State.....	10
Health.....	12
GEMCOVAC-OM.....	12
Science & Technology	12
The Remarkable Endurance of the Y Chromosome, 'Master of Maleness'	12
Phonons & Quantum Computing.....	14
How Prokaryotes Led to Eukaryotes?	15
Important Days	17
International Yoga Day & Ocean Ring of Yoga.....	17
Report & Index	18
Global Gender Index	18
Govt. Initiatives	18
Gati Shakti portal	18

Environment

LEED Net Zero Certifications

Context: LEED Zero recognises projects that have reached net zero or net positive status in the categories of carbon, energy, water, or waste.

Key Highlights

- India has emerged as a top country with LEED Zero green building projects, outperforming the United States of America and China, said the US Green Building Council (USGBC) and Green Business Certification Inc (GBCI).
- According to the GBCI's findings, out of 150 LEED Zero certified projects, India has 45% or 73 such projects, with Haryana and Tamil Nadu leading the race in certifications.
- The United States and China have the second and third most LEED Zero certifications, with 47 (30%) and 15 (10%) certifications respectively.
- Net zero refers to a state in which the greenhouse gases going into the atmosphere are balanced by removal from the atmosphere. The term net zero is important because – for CO₂ at least – this is the state at which global warming stops.
 - India's leadership position in LEED Zero projects reflects its commitment to sustainability and the adoption of innovative green building practices.
 - It is also in line with India's ambitious target of achieving net zero GHG emissions by 2070.
- LEED Zero has four categories that recognise net-zero status in carbon, energy, water, and waste over a period of 12 months.

About LEED Net Zero Certifications

- ✓ LEED rating system provides a framework for healthy, efficient, carbon and cost-saving green buildings.
 - It is a globally recognized certification system developed by U.S.
 - Green Building Council and administered by Green Business Certification Inc.
 - It achieves and recognizes building at four certification level (Certified, Silver, Gold, Platinum).
- ✓ LEED India Programme is administered by Indian Green Building Council (IGBC).
- ✓ Green Rating for Integrated Habitat Assessment (GRIHA) is India's own green building rating system jointly developed by The Energy & Resources Institute (TERI) and Ministry of New and Renewable Energy.
 - GRIHA is a five-star rating system. This rating is valid for 5 years.

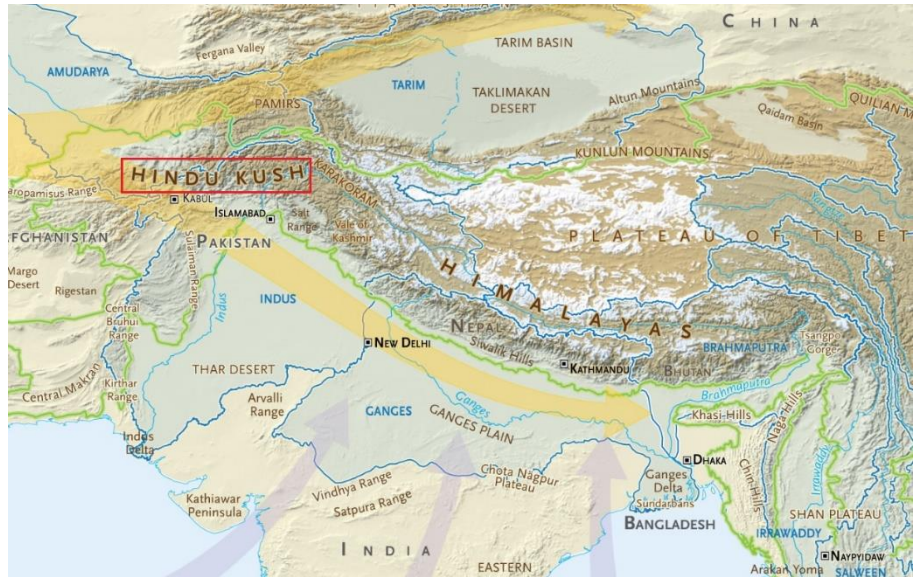
Himalayan Glaciers

Context: Himalayan glaciers could lose 80% of their volume if global warming isn't controlled.

Important Facts

- Himalayas are the great mountain system of Central Asia spanning cross 8 countries – Afghanistan, Bangladesh, Bhutan, China, India, Nepal, Myanmar, and Pakistan.

- It runs northeast to southwest and divides the valley of the Amu Darya to the north from the Indus River valley to the south.
- To the east the Hindu Kush supports the Pamir range near the point where the borders of China, Pakistani-controlled Kashmir, and Afghanistan meet.
- The eastern end of the Hindu Kush in the north merges with the Karakoram Range.



- It runs southwest through Pakistan and into Afghanistan, finally merging into minor ranges in western Afghanistan.
- The highest peak is Mount Tirich Mir, which rises near the Pakistan-Afghanistan border.
- Towards its southern end, it connects with the Spin Ghar Range near the Kabul River.
- Hindu Kush Himalayas are the world's most important 'water tower', being the source of 10 of Asia's largest rivers.
- It is the Earth's 3rd Pole as it's the storehouse of the 3rd largest body of snow on our planet after the Antarctic and the Arctic.
- The Hindu Kush Mountains were centers of Buddhism, including the Bamyán Buddha.
- It has also been a gateway for invasions into the Indian subcontinent, a growing region for the Taliban and al-Qaeda, and a theater of modern warfare in Afghanistan.

UN Adopts World's First Treaty to Protect the High Seas

Context: The world's first international treaty to protect the high seas was adopted at the United Nations, creating a landmark environmental accord designed to protect remote ecosystems vital to humanity.

Important Highlights

- The treaty, officially known as the treaty on "**Biodiversity Beyond National Jurisdiction**" or **BBNJ**, also introduces requirements to carry out environmental impact studies for proposed activities to be carried out in international waters.
 - Such activities would include anything from fishing and maritime transport to more controversial pursuits, like deep-sea mining or even geo-engineering programs aimed at fighting global warming.
- The treaty also establishes principles for sharing the benefits of "marine genetic resources" (MGR) collected by scientific research in international waters.
- The purpose of this treaty is to prevent species extinctions caused by overfishing, oil extraction, deep-sea mining, and other environmentally impactful activities on the high seas.

About Ratification

- Treaty has been signed by nearly 200 nations after 15 years of discussions. However, the treaty still needs to be ratified by at least 60 member nations to take effect.
- The next ocean conference in June 2025 in Nice, France, is expected to witness the completion of ratifications.

BBNJ: Overview

- It was launched at the One Ocean Summit in February 2022, the High Ambition Coalition on BBNJ aimed for a common and ambitious outcome.
- It is a legally binding International agreement on the conservation and sustainable use of marine biological diversity in areas beyond national jurisdiction.
- It covers the high seas, beyond exclusive economic zones or national waters of countries. These areas account for almost half of the Earth's surface.
- Before this, the UN Convention on the Law of the Sea, adopted in 1982, was the last attempt to extend governance farther into the ocean, as it added regulations to oceans within 12 nautical miles of countries' coastlines.

Need for BBNJ

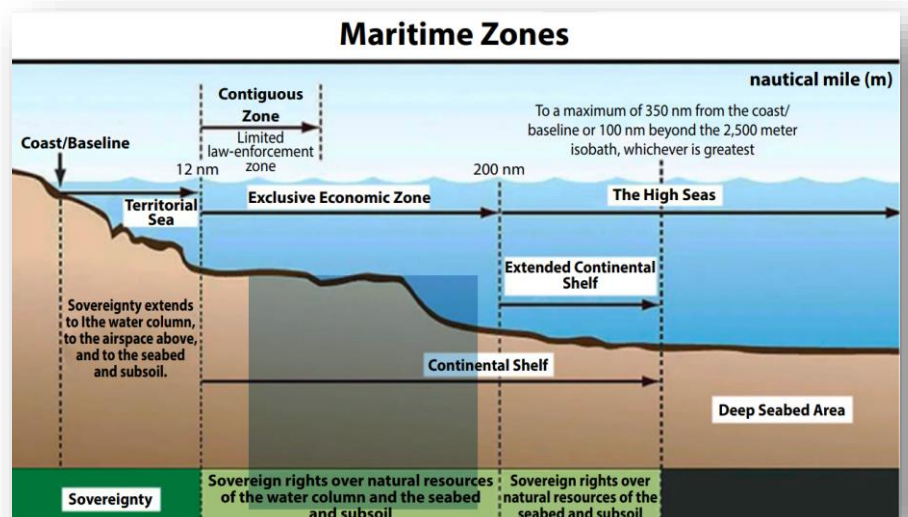
- Currently, only 1% of these areas are under protection. As of 2023, 90% of big fish populations are depleted and 50% of coral reefs are destroyed mainly due to overfishing.

India and BBNJ

- India has been actively involved in the negotiations for the development of an international legally binding instrument for the conservation and sustainable use of BBNJ under the United Nations Convention on the Law of Sea (UNCLOS).

High Seas

- ✓ It refers to the areas of the world's oceans and seas that are beyond any national jurisdiction.
- ✓ These are the waters that do not fall under the sovereignty of any specific country.
- ✓ The high seas are collectively considered a global common, belonging to all humankind.



History

Mesolithic-Era Rock Painting in Andhra's Guntur

Context: A Mesolithic period rock painting depicting a person tilling a piece of land has been found by D. Kanna Babu, former Superintending Archaeologist of the Temple Survey Project (Southern Region) of the Archaeological Survey of India, Chennai, in Orvakallu village in Guntur district, Andhra Pradesh.

Key Highlights

While surveying the lower River Krishna Valley to ascertain the architectural features of shrines, he identified a new prehistoric rock painting on the walls and ceiling of natural rock shelters on a hillock at Orvakallu.

- It was noticed that these were shelters for prehistoric humans who lived at this place.
 - Among these five naturally formed caves, two are embellished with distinguished depictions of rock paintings on the back walls and ceilings executed by people of Mesolithic Age, roughly [from] 5000 BC.
- Paintings were made with “natural white kaolin and red ochre pigments”, as well as that most of them had been “badly damaged” due to exposure to “air and wind”. However, some of the sketches and outlines are still intact for the visitors.
 - Ochre is a pigment composed of clay, sand, and ferric oxide. Kaolinite is a soft, earthy, and usually white mineral produced by the chemical weathering of aluminium silicate minerals like feldspar.
- The find throws light on aspects of the social life and culture of the people who lived in the area.
 - One of the paintings depicted a man catching wild goat with his left hand while wielding a hook-like implement to control it.
 - Another showed two couple standing with their hands raised while a child stood behind them.
 - Also, a painted figure of a man holding a plough and appearing to be tilling land — an indication, in his telling, “of a semi-settled life pattern” in which members of this community cultivated crops.



Painting of a man tilling land found at cave shelters at Orvakallu village in Guntur district. SPECIAL ARRANGEMENT

Village in Guntur district. SPECIAL ARRANGEMENT

Painting of a man tilling land found at cave shelters at Orvakallu



Defence & Security

Three Theatre Commands to be Established

Context: Indian Army, Navy, and Air Force have achieved a consensus on establishment of three theatre commands by 2024, each headed by a senior three-star general (Lieutenant Generals, Air Marshals, or Vice Admirals).

Key Highlights

- These commands will be responsible for managing northern borders with China, western front with Pakistan, and a maritime command in peninsular India.
- Theatre Command means putting specific number of personnel from three services (Army, Navy and Air Force) under a common commander in a specified geographical territory.
- Shekatkar committee and Kargil review committee had recommended the creation of theatre commands.
- India has 19 military commands with 17 (Army 7, IAF 7, and Navy 3) of them service-oriented.
- Currently, India has two unified commands:
 - Andaman and Nicobar Command, which is geographical.
 - Strategic Forces Command, which is functional and handles the country's nuclear arsenal.
- Significance of Theatre Command
 - Build integrated war-fighting machinery in a cost-effective manner.
 - Enhance synergy and coordination among three services and enabling more effective management of national security challenges.
 - Streamline planning and military operations.

Polity

New ART Regulations

Context: The Health Ministry had notified the Assisted Reproductive Technology Regulations (ART), 2023, which are aimed at providing donors and patients with better medical care and security earlier this year.

Key Highlights

The new provisions have pushed up the already sky-high medical costs and are proving to be a challenge for treating doctors and couples wanting to have children through ART because of the restricted and limited resource availability in terms of donors.

New Provisions

- The new ART provisions impose restrictions on the number of times a donor, male or female, can donate (sperm/oocyte) in their lifetime, and specifies age limits for donors.
- The provision states that an oocyte donor should be a person who have been married at least once in their lives and have at least one living child of her own (minimum three years of age).
- She can donate oocyte only once in her lifetime and not more than seven oocytes can be retrieved.
- Also, an ART bank cannot supply gamete (reproductive cell) of a single donor to more than one commissioning couple (couple seeking services).

- Additionally, parties seeking ART services will be required to provide insurance coverage in the favour of the oocyte donor (for any loss, damage, or death of the donor).
- A clinic is prohibited from offering to provide a child of pre-determined sex. Also checking for genetic diseases before the embryo implantation is needed.
- Overall, the new ART laws are restricting the number of donation attempts. They have the potential to increase costs and create challenges for couples relying on assisted reproductive techniques.

About Assisted Reproductive Technology

All fertility therapies that deal with either eggs or embryos are considered to be ART. In general, ART treatments entail surgically removing eggs from a woman's ovaries, fertilizing them in a lab with sperm, and either putting them back into her body or giving them to another woman.

They exclude procedures where only sperm are treated (such as intrauterine—or artificial—insemination) or where a woman takes medication solely to increase egg production without intending to have eggs extracted.

Salient Provisions of the Assisted Reproductive Technology (Regulation) Act 2021

- Rules for ART clinics & banks
 - Every ART clinic and bank must be registered under the National Registry of Banks and Clinics of India which will maintain a central database with details of such institutions.
 - The registration of such clinics and banks is valid for five years and can be renewed for another five years.
 - It may be cancelled or suspended if the institution violates the provisions of the Act.
- Conditions for sperm donation & ART services
 - A registered ART bank can screen, collect and store semen from men aged between 21 and 55 years. It can also store eggs from women aged between 23 and 35 years.
 - Under the Act, female donors need to be married with at least one child of their own, aged at least three.
 - A child born via an ART procedure will be deemed to be the couple's biological child in the eyes of the law and is entitled to all such rights. The donor does not retain any parental rights over the child.
- Consent and insurance coverage
 - Such ART procedures require the written informed consent of both the couple and the donor.
 - The couple seeking an ART procedure must provide insurance coverage for the female donor in case of loss, damage, or death of the donor.
- Regulation of ART processes
 - The National and State Board formed under the Surrogacy Act 2021 are also expected to regulate ART services.
 - These boards are to advise the government on policy, review and monitor implementation of the law, and formulate a code of conduct for ART clinics and banks.
- Offences
 - Offences under this Act include abandoning or exploiting children born through ART; sale, purchase, or trade of embryos; exploiting the couple or donor in any form; and transfer of an embryo into a male or an animal.
 - Such offences are punishable with imprisonment up to 8 to 12 years and a fine up to Rs 10 to 20 lakhs.

- Clinics and banks are prohibited from advertising or offering sex-selective ART.
- Such an offence is punishable with imprisonment ranging between 5 to 10 years or/and a fine of Rs 10 to 25 lakhs.

Shortcomings of the 2021 Act

- **Exclusion of Unmarried and Heterosexual Couples**

- The Act excludes unmarried men, divorced men, widowed men, unmarried yet cohabiting heterosexual couples, trans persons, and homosexual couples (whether married or cohabiting) from availing of ART services.
- This exclusion is relevant as the Surrogacy Act also excludes above said persons from taking recourse to surrogacy as a method of reproduction.

- **Reduces the Reproductive Choices**

The Act is also limited to those commissioning couples who are infertile - those who have been unable to conceive after one year of unprotected coitus. Thus, it is limited in its application and significantly reduces the reproductive choices of those excluded.

International Relations

India Gifts INS Kirpan to Vietnam

Context: India gifted the indigenously-built in-service missile corvette INS Kirpan to Vietnam to enhance its naval capabilities.

- ✓ Both Ministers identified means to enhance existing areas of collaboration, especially in the field of defence industry cooperation, maritime security and multinational cooperation, the Ministry said.
- ✓ Gen. Phan also visited headquarters of the Defence Research and Development Organisation (DRDO) and discussed ways to enhance “defence industrial capabilities by cooperation in defence research and joint production”.
- ✓ In June 2022, India and Vietnam signed an MoU on mutual logistics support in presence of the two Defence Ministers during Mr. Singh’s visit to the South East Asian nation.
- ✓ The two Defence Ministers also signed the ‘Joint Vision Statement on India-Vietnam defence partnership towards 2030’

INS Kirpan

- INS Kirpan is a Khukri class missile corvette displacing 1,350 tonnes and was commissioned into the Navy on January 12, 1991.
- It has a displacement of close to 1,400 tonnes, a length of 91 metres, a beam of 11 metres and is capable of speed in excess of 25 knots.
- The ship is fitted with a medium-range gun, 30 mm close-range guns, chaff launchers, and surface-to-surface missiles, according to the Navy.
- They can perform coastal and offshore patrol, coastal security, surface warfare, anti-piracy, and Humanitarian Assistance and Disaster Relief (HADR) operations.

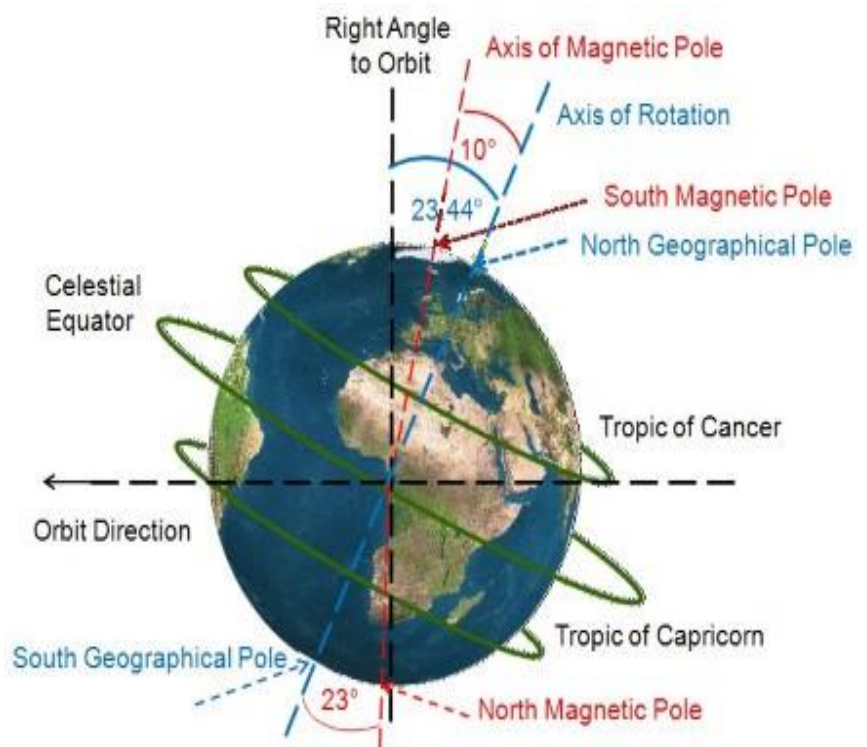
Geography

Groundwater Extraction Has Affected the Earth's Tilt

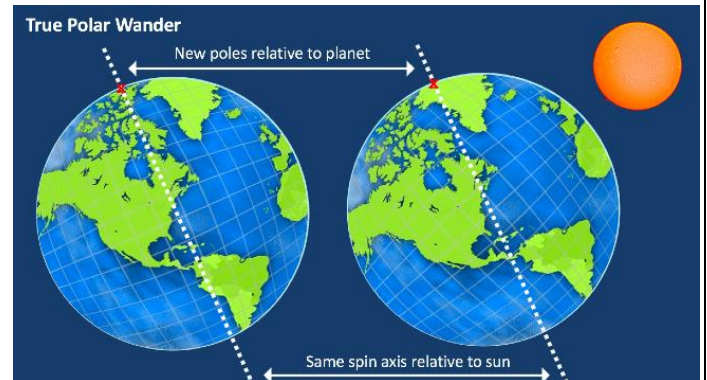
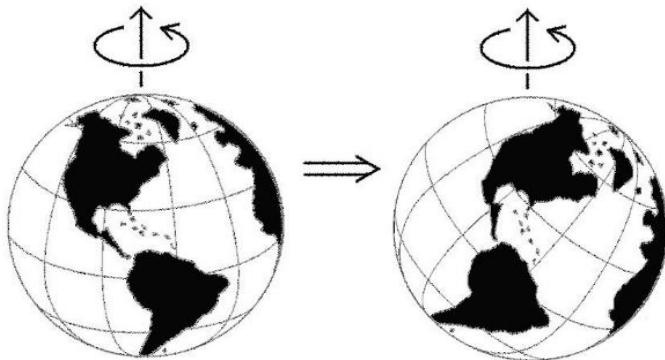
Context: Groundwater pumped up from the earth and moved elsewhere to quench the thirst of humans and their activities has caused the earth's axis to tilt nearly 80 cm to the east, a new study has found.

Key Highlights

- Scientists have known for a long time that the movement of water can affect the earth's rotation.
 - A study published in 2016, for example, showed how the movement of water around the world contributed to the wobble in the earth's axis.
- Researchers analyzed changes in the drift of Earth's rotational pole and water movement
 - First, by accounting for just ice sheets and Glaciers and
 - Then by adding different groundwater redistribution scenarios.
- The scientists also said that the location of groundwater depletion is important because that affects how much the axis wanders.
- With their model, they found that pumping groundwater from mid-latitude areas affected the drift the most.
- The study found that nearly 2,150 billion tonnes of groundwater have been pumped and drained into the oceans between 1993 and 2010, raising sea levels by 6.24 mm.
- The scientists also said that the location of groundwater depletion is important because that affects how much the axis wanders.
- With their model, they found that pumping groundwater from mid-latitude areas affected the drift the most.



- It is the migration of the magnetic poles over Earth's surface through geologic time.



- They also found that the most amount of groundwater redistribution took place in northwest India and western North America, both mid-latitude regions.
- Groundwater depletion has been a particular concern across India since the past decade. About 95% of the groundwater extracted in India is used to irrigate agricultural fields.

Heat Waves & State

Context: Poor living conditions have exacerbated the effects of heat waves. In the brutal heatwave beating down on Uttar Pradesh and Bihar, one district in U.P., Ballia, reported the most deaths.

What is Heat Wave?

- A heatwave is a prolonged period of abnormally hot weather.
- Heatwaves usually last for several days or weeks and can occur in both dry and humid climates.
- They are characterized by temperatures that are significantly higher than the average for a particular region during that time of year. This is because climate change is causing a rise in global temperatures.
- When the planet heats up, it leads to more extreme weather events, such as heat waves. Its geography makes India particularly vulnerable to these events.

Factors Responsible for Heat Wave

Prevalence of hot dry air over a region

Absence of moisture in the upper atmosphere

Sky should be practically cloudless

Large amplitude anti-cyclonic flow over the area

Jet streams, El-Nino and La-Nina,

Anthropogenic factors like heat island

- IMD's criteria to declare Heat wave:

Based on Departure from Normal

- **Heat Wave: Departure from normal is 4.5°C to 6.4°C.**
- **Severe Heat Wave: Departure from normal is >6.4°C**

Based on Actual Maximum Temperature

- **Heat Wave: When actual maximum temperature $\geq 45^{\circ}\text{C}$.**
- **Severe Heat Wave: When actual maximum temperature $\geq 47^{\circ}\text{C}$.**

Key Highlights

- A statements in newspapers revealed that a heatwave is only half heat, the other being bad public infrastructure and social security. Ballia's toll could be high because of, as the team suspects, contaminated water, or because the local people could not cool themselves.
- Heat's deadliness depends on an individual's general well-being, acclimatisation, physical exertion, comorbidities, location, relative humidity, and extent of heat exposure.
- But for all the complexity the interplay of these factors augurs, the fight against this mode of the climate crisis, which India is expected to suffer more often, can benefit considerably from some literacy and access to resources.
- Heat is deadly when our bodies are unable to shed it as quickly as it accumulates. This can happen due to poor living conditions, adherence to caste- and gender-based strictures, or even in overcrowded hospitals.
- Amenities that can help include access to drinking water, indoor ventilation, health care, regular work breaks, and protections against wage loss. If a person dies in a heatwave, it is only fair to ask whether he/she was able to access these amenities.
- If U.P. and Bihar are to forge a better way forward vis-à-vis their heat response, they need to register all heat-related deaths, assign the cause, ensure the medical certificates of the cause of death (MCCDs) follow the proper codes of the most recent revision of the International Statistical Classification of Diseases and Related Health Problems, and issue them.
- The Office of the Registrar General should compile and release MCCD data annually to facilitate independent research and policy input and prevent time-wasting disputes over official versus actual figures. However, the office has not released the corresponding reports for 2021 and 2022.
- In the 2020 report, which was uploaded only last year, Bihar assigned causes to just 3.4% of registered deaths — the worst among States. Not everyone who dies during a heatwave has died due to the heat, but only if good living conditions have been the norm. If they have not, the state is as much to blame as the heat.

Health

GEMCOVAC-OM

Context: India's first indigenous mRNA vaccine (GEMCOVAC-OM) for the Omicron variant, was approved under emergency use guidelines by the Drug Controller General of India.

Key Highlights

- It is developed by Pune-based Gennova Biopharmaceuticals Ltd.
- It is India's first mRNA vaccine developed to address the problems in the earlier approved mRNA vaccines.
- This mRNA-based vaccine uses spike protein of the omicron variant (BA.1) of the SARS- CoV-2 as an antigen.
- It was stable in a 2-8°C range and could therefore be stored in ordinary refrigerators.
- The vaccines could be administered as an intradermal (ID) injection only (into the skin) via a “needle-free” PharmaJet system.
- It is tested at the National Institute of Virology (NIV) against the newest (Omicron subvariant), XBB 1.16, and it is shown to be effective.
- It is indicated as a single booster dose in individuals aged more than 18 years administered at least 4 months after completion of primary vaccination with either Covishield or Covaxin.
- mRNA is a molecule that contains the instructions or recipe that directs the cells to make a protein using its natural machinery.

m-RNA Based Vaccine

- mRNA vaccines work by introducing a piece of mRNA that instructs the cells to produce the viral protein.
- As part of a normal immune response, the immune system recognizes that the protein is foreign and produces specialized proteins called antibodies.
- Antibodies protect the body against infection by recognizing individual viruses or other pathogens, attaching to them, and marking the pathogens for destruction.
- Once produced, antibodies remain in the body, even after the body has rid itself of the pathogen.
- If a person is exposed to a virus after receiving mRNA vaccination for it, antibodies can quickly recognize it, attach to it, and mark it for destruction before it can cause serious illness.
- Individuals who get an mRNA vaccine are not exposed to the virus, nor can they become infected with the virus by the vaccine.

Science & Technology

The Remarkable Endurance of the Y Chromosome, ‘Master of Maleness’

Context: Many animal species have a genuine fear of losing the Y chromosome in the distant future. This has happened in some species that have naturally lost this chromosome. Such animals provide us with models to understand the process of sex-chromosome turnover and a means to repurpose another chromosome into a sex chromosome. It has been discovered that the Y chromosome possesses genes linked to ageing and lifespan regulation.

Key Highlights

- Scientists published the complete genetic sequence of the Y chromosome in 2003. This sequence provided an outline of 23 million bases of the 60 million or so bases that together make up the Y chromosome.
- In total, the chromosome encoded for only 55 genes and accounted for around 2% of the genetic material inside a cell.
- Many researchers jokingly refer to the Y chromosome as the “juvenile delinquent” among chromosomes thanks to its abundance of repetitive sequences, poor functional utility (with a small number of genes), reluctance to socialise (i.e. recombine with other chromosomes), and a high proclivity to degenerate over the course of evolution.
- Indeed, because it has little potential to recombine, the diminutive Y chromosome has been passed from father to son, carrying the legacy of generations.
- Scientists have extensively studied it to understand human migration and evolution. It has also fuelled countless debates, unravelled the mysteries of paternity, revealed genetic diversity, and illuminated the intricate tapestry of our shared past.



Background: Vital Genes

- In a landmark genetic study, published in March 2003 in the American Journal of Human Genetics, researchers reported that around 0.5% of all the men in the world have inherited a Y chromosome from the Mongol emperor Genghis Khan or one of his descendants.
- While the Y chromosome has been at the centre of many scientific and social controversies involving sex determination and gender discrimination, we would be better off not underestimating its influence on other aspects of health as well.
- In fact, contrary to initial assumptions that the chromosome is degenerating and shrinking over time, and possibly has little functional role, researchers have discovered of late that the Y chromosome possesses genes that are vital to biological functions, including those linked to ageing and lifespan regulation (recent studies have shed light on an intriguing connection between the human Y chromosome and longevity).
- In the animal kingdom (including mammals), scientists have noticed substantial differences in lifespan between the sexes: the females tend to live longer than the males.
 - This phenomenon has been attributed largely to the absence of a second Y chromosome in males, exposing the deleterious mutations in the X chromosome.
- It is also well known that men lose the Y chromosome (LoY) with age and that this is associated with a higher frequency of cancers, Alzheimer’s disease, and a shorter lifespan.
 - This has been corroborated by studies on mice models that showed that LoY resulted in shorter lifespans and that older mice with LoY displayed significant memory deficiencies compared to younger mice.

- However, a recent study in fruit flies from France’s National Centre for Scientific Research, published in the journal Nature Ecology and Evolution on June 12, attributed the longevity to the phenotypic sex of the animal rather than the presence of a Y chromosome.
 - Phenotypic sex refers to an individual’s sex as deduced from their genitalia.

Why Y Chromosome Matter?

- Studies conducted by researchers at the University of Virginia School of Medicine, U.S., and Uppsala University, Sweden, together with others have shown that LoY in humans occurs with age and is associated with several debilitating medical conditions – a finding that has been validated in mice with LoY, resulting in weak heart muscles (cardiomyopathy), stretched or thickened heart tissue (fibrosis), and heart failure.
- In another paper published in June, researchers performed an analysis of 29 primate sex chromosomes and suggested that in the last 80 million years, there has been a rapid evolution of the Y chromosome.
- This is exemplified by the fact that the human Y chromosome is about one-third as big as the X chromosome. So, many animal species, including humans, have a genuine fear of losing the Y chromosome in the distant future.

Examples

- Rodents, which have naturally lost their Y chromosome.
- Genome sequences of the Neanderthals, an ancient relative of the modern human, harbour telltale signs of the replacement of the Y chromosome beginning from modern humans.
 - This suggests that such replacement is not new to the human lineage, and that it is quite possible that the Y chromosome may have to relinquish its coveted title of “master of maleness” to another chromosome in the times to come.

Phonons & Quantum Computing

Context: Recently, IBM published a paper in which it claimed to have demonstrated that a quantum computer could solve a useful problem that today’s conventional computers can’t. IBM researchers have developed an Acoustic Beam-Splitter to manipulate Phonons to be used for Quantum Computing.

Quantum Computing

Quantum computing is a rapidly emerging technology. It harnesses the laws of quantum mechanics to solve problems that seems to be too complex for classical computers.

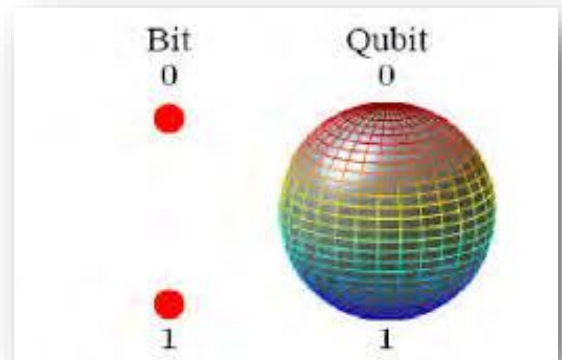
Quantum mechanics is a subfield of physics. It describes the behavior of particles like atoms, electrons, photons, etc. in the molecular and sub molecular realm.

Qubits

Quantum computers use qubits as their basic units of information. A qubit can be a particle — like an electron; a collection of particles; or a quantum system engineered to behave like a particle.

Phonons & Photons: What are They?

- Photons are packets of light energy; similarly, phonons are packets of vibrational energy.
- Researchers can manipulate electrons using electric currents, magnetic fields, etc. and photons with mirrors, lenses, etc., they needed new tools to manipulate phonons. Therefore, acoustic beam-splitter has been developed.
 - Beam-splitters are used widely in optics research.
 - When a beam-splitter is placed in the light's path, it will split the beam into two, that is, it will reflect 50% of the photons to one side and let the other 50% pass straight through.



Acoustic Beam - Splitter

- It is a tiny device resembling a comb, with 16 metal bars jutting out of it.
- It was placed in the middle of a two-mm-long channel of lithium niobate.
- Each end of the channel had a superconducting qubit — a qubit whose circuit components were superconducting — that could both emit and detect individual phonons.
- The whole setup was maintained at an ultra-low temperature.
- If these phonons were converted to sound, their frequency would be too high for humans to hear.
- Each phonon in the study represented, according to the paper, the “collective” vibration of around one quadrillion atoms.
- The team found that these phonons interacted with the comb just like photons interact with an optical beam-splitter.
- When a phonon was emitted from the left side of the channel, it was reflected half of the time and transmitted to the right side the other half.
- When phonons were emitted simultaneously from the left and the right sides, they both ended up on one side (as expected).

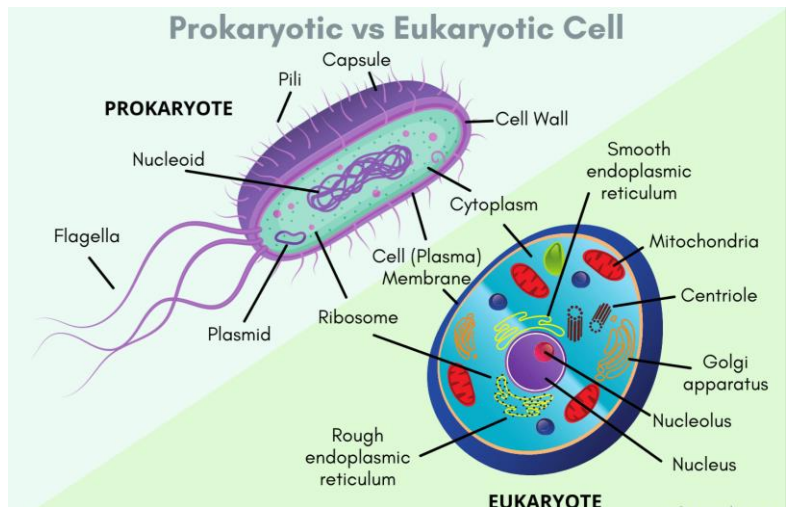
How Prokaryotes Led to Eukaryotes?

Context: Organisms on planet Earth are broadly divided into prokaryotes and eukaryotes. Prokaryotes are unicellular, do not have any organelles such as mitochondria, and their DNA is not packaged into a nucleus. Eukaryotes have mitochondria, their DNA is packaged into a nucleus, and most eukaryotes are complex, multicellular beings.

Key Highlights

- About 50 years ago, a subset of unicellular organisms, the Archaea, were shown to have a different line of descent as compared to bacteria. The two differ in the composition of their cell walls, and in the sequence of some of their genes.

- The term Archaea, was used because the first members of this domain were found living in extreme environments of very high temperatures or very high salt.
- One group of archaea were shown to have proteins that closely resembled eukaryotic proteins. These organisms are found in a geological formation where geothermally heated water is forced out of a ridge in the Atlantic Ocean floor at a depth of 2400 meters below sea level.
- Many other related members were later found in unusual ecosystems, and came to be collectively called the Asgard, which is the home of the Gods in Norse mythology.
- The mitochondria, which are the energy-generating organelles of eukaryotic cells, and the photosynthesizing chloroplasts found in plant cells, have evolved from free-living bacteria.
- The ancestor of mitochondria was a proteobacteria that was engulfed by an Asgard archaean organism. Descendants of this endosymbiotic union gave rise to animals, fungi and plants.
- In plants, the Asgard-mitochondrial union was followed by the intake of a photosynthesizing cyanobacterium, which became the chloroplast.



Basis of Differentiation	Prokaryotes	Eukaryotes
Size	Generally smaller (1-10 μm)	Generally larger (10-100 μm)
Nucleus	No true nucleus	True nucleus
DNA	Circular DNA	Linear DNA with histones
Membrane-bound organelles	Absent	Present (e.g., mitochondria, endoplasmic reticulum)
Cell division	Binary fission	Mitosis and meiosis
Flagella	Simple, not membrane-bound	Complex, membrane-bound
Cell wall	Usually present (peptidoglycan or other materials)	Present in some (e.g., plants, fungi)
Examples	Bacteria, archaea	Protists, fungi, plants, animals

Important Days

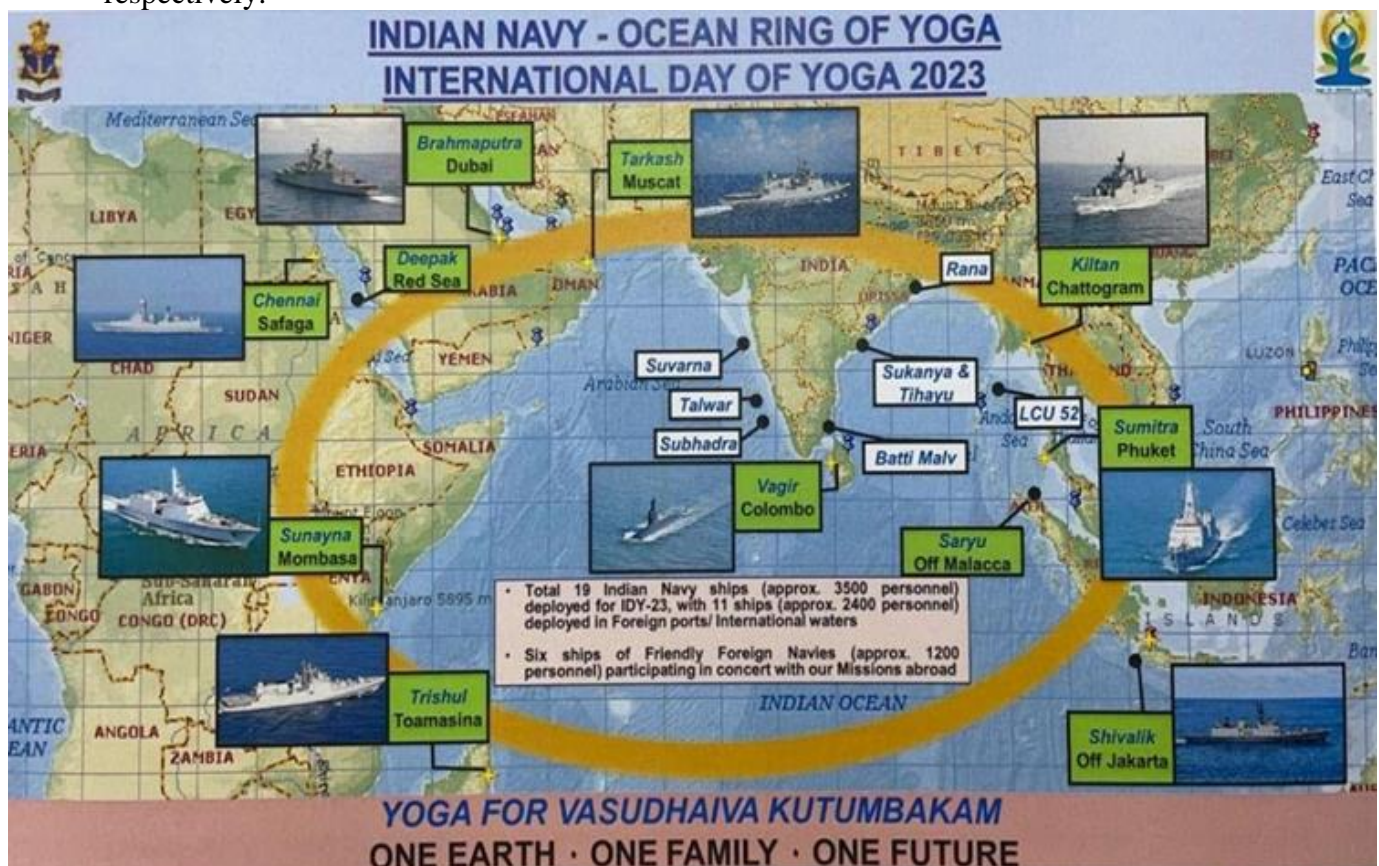
International Yoga Day & Ocean Ring of Yoga

Context: 21st June was recognised as the International Day of Yoga (IDY) by the United Nations General Assembly (UNGA) in December, 2014 at the initiative of Prime Minister of India Narendra Modi. Since 2015, the IDY has been observed worldwide with great enthusiasm and fervour.

- ✓ To commemorate IDY 23, the Ministry of AYUSH has planned an event 'Ocean Ring of Yoga' (symbolising unity and solidarity) in coordination with Ministry of Defence and other ministries.
- ✓ In support of the IDY-23 initiative, Indian Navy ships deployed in the Indian Ocean Region are visiting various ports of friendly foreign countries and spreading the message of 'Vasudhaiva Kutumbakam' which is also the theme for IDY 23.

Important Facts

- The Indian Navy has been an ambassador for Yoga across the seas for several years now and Yoga sessions are scheduled at most foreign ports visited by Indian Naval ships; thereby spreading the message of the benefits accrued from Yoga towards leading a healthy lifestyle.
- This year, Indian Navy is actively supporting the IDY at a global scale as port calls are planned at Chattogram, Bangladesh; Safaga, Egypt; Jakarta, Indonesia; Mombasa, Kenya; Toamasina, Madagascar; Muscat, Oman; Colombo, Sri Lanka; Phuket, Thailand; and Dubai, UAE by IN Ships Kiltan, Chennai, Shivalik, Sunayna, Trishul, Tarkash, Vagir, Sumitra and Brahmaputra respectively.



Report & Index

Global Gender Index

Context: India was ranked 127 among 146 countries in gender parity — up eight places from last year’s place — in the Gender Gap Report, 2023 of the World Economic Forum (WEF).

Key Highlights

- India was ranked 135 in 2022. The country had improved by 1.4 percentage points from then, marking a partial recovery towards its 2020 parity level.
- India had closed 64.3% of the overall gender gap, the report said. However, it underlined that India had reached only 36.7% parity in economic participation and opportunity.
- The country had attained parity in enrolment across all levels of education.
- Iceland is the most gender-equal country for the 14th consecutive year and the only one to have closed more than 90% of its gender gap.
- In India, while there had been an uptick in parity in wages and income, the share of women in senior positions and technical roles had dropped slightly since the last edition.
- On political empowerment, India has registered 25.3% parity, with women making up 15.1% of MPs.
- For India, the 1.9 percentage point improvement in sex ratio at birth had driven up parity after more than a decade.
- “Compared with top scoring countries that register a 94.4% gender parity at birth, the indicator stands at 92.7% for India,” it said.
- Overall, the Southern Asian region has achieved 63.4% gender parity, the second-lowest of the eight regions.

Gender gap

India jumped eight spots to rank 127 in the Global Gender Gap Index, 2023. A look at how select countries fared

Rank	Country	Score	Rank change
1	Iceland	0.912	-
2	Norway	0.879	+1
59	Bangladesh	0.722	+12
103	Bhutan	0.682	+23
107	China	0.678	-5
115	Sri Lanka	0.663	-5
116	Nepal	0.659	-20
127	India	0.643	+8
142	Pakistan	0.575	+3



Govt. Initiatives

Gati Shakti portal

Context: Industry is hopeful that the government may soon agree to open up access to the PM Gati Shakti portal developed for planning multi-modal infrastructure projects, thus helping facilitate greater private capital investments especially in connectivity projects that are seen as critical to sustain the economy’s momentum.

Key Highlights

- Launched in October 2021, the PM Gati Shakti di-platform brings together 16 ministries, including Railways and Roadways, so as to spur an integrated and coordinated approach to planning and implementing infrastructure connectivity projects.
- So far, access to the portal's data, which include detailed maps with existing economic and social infrastructure as well as upcoming projects, is restricted to Central and State government agencies.
- Confederation of Indian Industry (CII) says that some access to the portal's information trove would help not just logistics firms plan operations, but also enable fresh capital spending across allied sectors.
- It has been asked that block the sensitive data and the rest should be made available. That can be a big benefit for all of the planning of the private sector as well. And that will actually help attract more capex and outside funding.

Gati Shakti Portal or National Master Plan for Multi-Modal Connectivity

- Portal aims to ensure integrated planning and implementation of infrastructure projects in the next four years, with focus on expediting works on the ground, saving costs and creating jobs.
- The Gati Shakti scheme will subsume the Rs 110 lakh crore National Infrastructure Pipeline (launched in 2019).
- The scheme also aimed at increasing cargo handling capacity and reducing the turnaround time at ports to boost trade.
- It also aims to have 11 industrial corridors and two new defence corridors – one in Tamil Nadu and other in Uttar Pradesh.
- Extending 4G connectivity to all villages is another aim. Adding 17,000 kms to the gas pipeline network is being planned.
- It will help in fulfilling the ambitious targets set by the government for 2024-25, including expanding the length of the national highway network to 2 lakh kms, creation of more than 200 new airports, heliports and water aerodromes.
- It intends to bring together 16 infrastructure related Ministries.
 - This will help in removing long-standing issues such as disjointed planning, lack of standardisation, problems with clearances, and timely creation and utilisation of infrastructure capacities.
- Gati Shakti Digital Platform involves the creation of a common umbrella platform through which infrastructure projects can be planned and implemented in an efficacious manner by way of coordination between various ministries/departments on a real-time basis.