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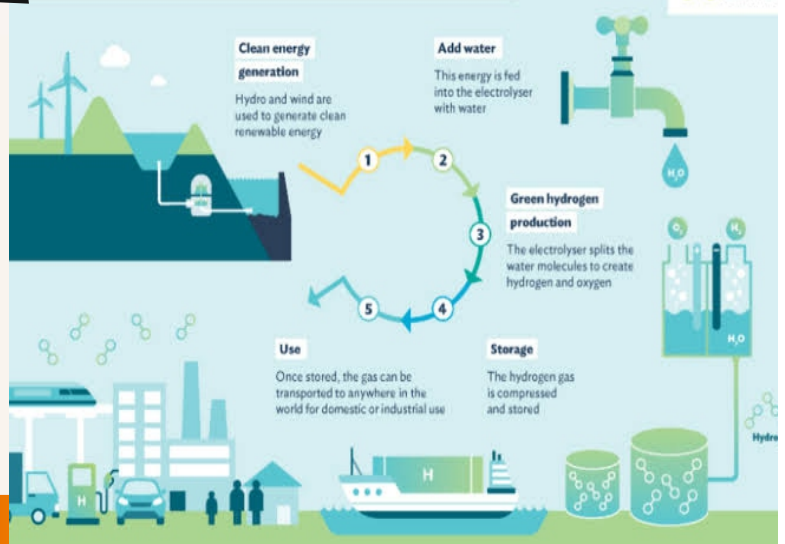
October, 2023



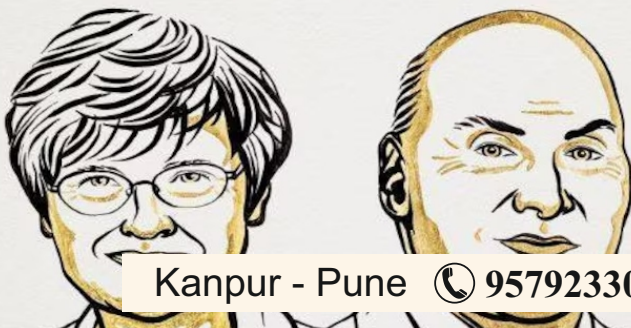
MENTAL HEALTH



How is green hydrogen produced?



THE NOBEL PRIZE IN PHYSIOLOGY OR MEDICINE 2023



Monthly Current Affairs – October 2023

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Geography

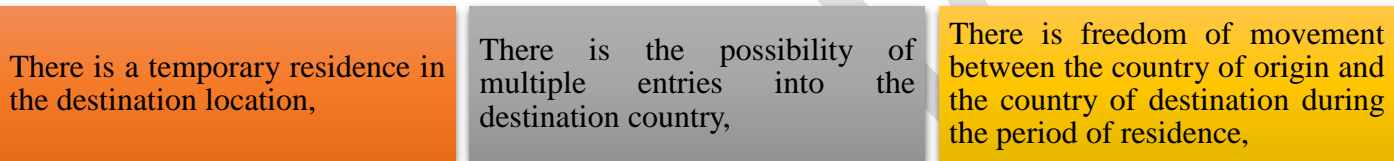
Circular Migration

Context: In India, internal migration, which is migration within a particular country or State, has almost always been circular. With rapid industrialisation, there has been a huge flow of migrants from rural areas to urban cities.

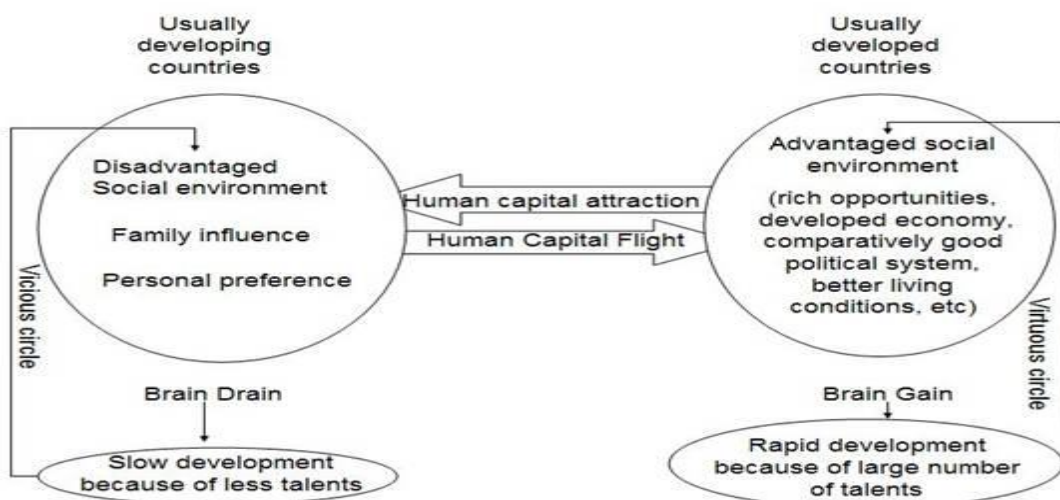
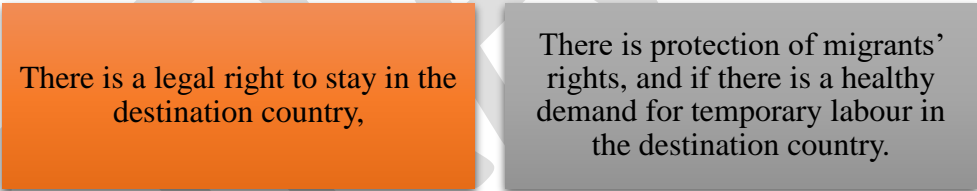
- Circular migration is a **repetitive form of migration** wherein people move to another place (the destination country) and back (country of origin) according to the availability of employment.
- This effectively means that instead of migrating permanently or temporarily (moving for a period of time to complete any contract-based labour) to another location, people move to different locations for a brief period of time when work is available.
- It is a phenomenon mostly among low-income groups who migrate to avail of seasonally available jobs in another country, city, place etc.

- ✓ Circular migration became quite popular in the 60s and 70s with the advent of globalisation and development.
- ✓ Increased access to modern forms of transport and communication, social networks and the growth of multinational corporations have aided the advent of circular migration.
- ✓ However, only recently has the phenomenon been given its due as the seasonal movement of migrants was not properly documented or was boxed along with short-term or temporary migration

According to Philippe Fargues, migration can be defined as



circular if it meets the following criteria —



Public Policy Around Migration

With the increasing fluid movement of people, policy around migration is one of the biggest debates in the world.

- ✓ The movement of citizens from the Global South to the West in search of more employment opportunities or a better standard of living **creates brain drain** for their origin countries and **competition for the citizens** of the destination countries.
- ✓ Similarly, the flow of people moving from rural areas to more urban areas of the same country, results in the **breakdown of infrastructure and agrarian stagnation**. Therefore, migration of any kind has become a policy hazard.

As per the report on measuring circular migration by the **United Nations Economic Commission for Europe Task Force**, one is called a circular migrant if you have completed at least 'two loops' between two countries.

- ✓ Consider country A and B. If you move from A to B and back to A, then you are a return migrant. You had some work, you finished it and now you are back.
- ✓ If you move from A to B to A and then again to B, you have completed two loops between two countries and can be considered a circular migrant. This means you have travelled between your destination and origin country at least two times.
- ✓ This can become more complicated if more than two countries are involved. Consider one more country C.
- ✓ If you move from A to B then back to A and then to C and back to A, you would be a circular migrant as per country A (as you completed two loops) but not for countries B and C. They might classify you as a temporary, short-term or return migrant.

In short, if your primary destination is the country of origin and if you move periodically between two countries for purposes of economic advancement such as employment, business etc., you can be considered a circular migrant.

However, **circular migration is now seen as the best way forward**, as needs of development and individual economic advancement can be balanced out.

- ✓ It is seen as a balanced migration method which looks at migration not only from the point of view of the **receiving country** but also of the sending nation.
 - For the country of origin, migration, especially international migration, is beneficial due to the flow of remittances which will boost and aid the domestic economy.
 - The flow of foreign capital will enhance the economy ensuring more infrastructure, more jobs and by association, a better standard of living.
 - However, large-scale transnational migration will also lead to brain drain, wherein the most talented people of your country will use their intellect and innovation for the advancement of another country.
- ✓ From the perspective of the **host countries**, especially those of the West, a lesser population and a higher access to education has resulted in a large dearth of low-income low-skill jobs which migrants have been able to fill.
 - However, the influx of migrants have caused a wide range of anxieties and cultural conflicts in the host populations with most of them now calling for restrictions and outright ban on migration.

Circular migration aims to quell all these fears.

The negative effects of brain drain will reduce and a sort of brain circulation will be encouraged, wherein the individual can use his talents in both countries and still contribute to remittances.

Circular migration offers a way out to the governments of destination countries as migrants will circulate back to their home areas.

Labour can be introduced to undertake essential functions but it will not remain and become a permanent part of the population.

Circular Migration Within India

In India, internal migration, which is migration within a particular country or State, has almost always been circular.

- With the advent of jobs in the manufacturing, construction and services sector, there has been a huge flow of migrants from rural areas to urban cities.
- Between 2004–2005 and 2011–2012, the construction sector witnessed one of the largest net increases in employment for all workers, specifically for rural males.
- This has led to rural populations and their economy dwindling and urban spaces, while booming, witnessing infrastructural collapse as they are unable to properly house incoming populations.
- In India, the uneven development post-liberalisation, has led to a lot of inter-State migration, with States like West Bengal, Odisha and Bihar having some of the highest rates of out-migration.
- Most of the rural migrants were occupied in agricultural jobs in their origin States; and when they migrated a majority of them were engaged in low-skill jobs.
- The positive outcomes of such inter-State migration include increased access to higher paying jobs when compared to origin States (as per Sarkar and Mishra, a daily wage labourer in West Bengal gets ₹150-180 per day, while in Kerala they would get somewhere between ₹260-380), better household welfare due to remittances, ease of mobility etc.
- Some reports have even stated how women get more autonomy and decision-making power in the family due to the absence of men who migrate.

However, in such migration, especially to southern States where the language barrier is a big obstacle, rural circular migrants are often at the mercy of middlemen or brokers.

- They are made to work in unhygienic and unsafe conditions with little to no protective equipment.
- They are routinely exploited and suffer significant ‘unfreedoms’ in host States.
- Additionally, indigenous wage groups and unions resent these migrants as they are seen as taking away their jobs by agreeing to work for lower wages.
- The study also says that this kind of migration is merely subsistence migration — it’s the bare minimum.
- The migrants are able to barely provide for themselves and their families, with no scope for further asset creation or savings.
- There is also a certain precarity associated with these jobs as they are seasonal and often irregular.
- A lack of jobs in the host States means that they will either have to go back home or look for work in other urban cities.
- This precarity was on clear display during the pandemic in 2020 when migrants en-masse started walking back to their home towns when a lockdown was announced.

Clues To Ancient Kosi Superflood Say It Could Happen Again Today

Context: Geologists have found evidence of an extreme monsoon event and hyper-concentrated flows 11,000 years ago in the Kosi river, which can cause floods and avulsion. Climate change could increase the odds of such events, necessitating disaster response plans that are ready for such outcomes.

- At Rajiv Sinha’s laboratory in IIT Kanpur lie soil, sand, and rocks drilled out from across thousands of metres under the Karnali, Ganga, and Kosi rivers.
 - Each sample, called a “**sedimentary core**” is held in a container 7.6 cm wide; together, they create snapshots of the rivers’ ancient history.
- Every centimetre of these cores reveals the size and kind of sediment that the rivers were carrying at a point in time. The cores thus show how the composition of these sediments changed over time.

Key Highlights

These cores have proved crucial to geologists, who are reconstructing river floods in the Gangetic plain between 23 and 5 million years ago, in the Miocene era.

- Based on these studies, the researchers have reported that climate-change-related and seismic events ravaging the planet today could create **super-floods** that could be catastrophic for people in the Gangetic plain.
- The findings signal that we need to urgently **update India's disaster management strategy** to account for **“cascading hazards”**: natural disasters that are triggered by other disasters.

Delayed Transition

The study began with a peculiar observation.

- As rivers flow from their origins in the mountains to the plains, they carry rocks, gravel, and sand.
- The heavier particles – rocks and gravel – settle down earlier in the river's trajectory whereas the lighter particles settle later.
- The part of the river's path where there is a gradual transition from heavier to lighter particles on the riverbed is called the **gravel-sand transition**.
- With the river Ganga, for example, larger particles are restricted to the areas around Haridwar and Rishikesh, in Uttarakhand.
 - In normal circumstances, large particles should not be usually found in downstream areas.
- But in a 2014 study, it was reported that, around 11,000 years ago, in the **Holocene era**, there was coarse gravel in the Kosi river some 30-40 km downstream of the current gravel-sand transition. Geologist inferred this from sedimentary cores.

At The Mohand Anticline

- The team's investigation of this anomaly – such large particles downstream of the current transition spot – took the team to the Mohand anticline in Uttarakhand, around 45 km southwest of Dehradun.
- At the Mohand anticline, the team documented all the layers and recorded the size and type of the sediments in each.
- The researchers estimated when each sediment layer was deposited based on how deep it was.
- By combining this data with that obtained from the drilled cores, they could compute the rivers' flow at different times.

An Ancient Event

That's how they landed at one potential reason the coarse gravel in the Kosi was so far away from the modern gravel-sand transition: an **“extreme monsoon event”** leading to a flood that occurs every **200-1,000 years**.

- This extreme event is expected to have occurred along with a complementary cause called hyper-concentrated flows.

THE GIST

As rivers flow from mountains to the plains, they carry rocks, gravel, and sand. Heavier particles – rocks and gravel – settle earlier in the river's trajectory whereas lighter particles settle later. The part of the river's path where there is a transition from heavier to lighter particles on the riverbed is called gravel-sand transition

With the Ganga larger particles are restricted to areas around Haridwar and Rishikesh, in Uttarakhand. Large particles should not be usually found downstream. But in a 2014 study it was found that, around 11,000 years ago, in the Holocene era, there was coarse gravel in the Kosi river some 30-40 km downstream of the current gravel-sand transition

- The odds of an extreme monsoon event are expected to increase due to climate change. According to a 2021 study in western Nepal, the chance could increase by as much as 60%. More extreme rains could also mean more landslides, which in turn could mean hyperconcentrated flows leading to floods downstream

An **anticline** is a fold in a sedimentary rock that bulges outwards. Older layers of sediments are found towards the centre and the younger ones are located towards the exterior.

- Hyper-concentrated flows occur when some event – a trigger, such as a landslide or a glacial lake outburst – causes the river to carry more sediments than usual.
- In such conditions, “high concentrations of sediments are distributed through the water column,” according to the paper.
- Hyper-concentrated flows can change the way rivers flow, so they often have devastating consequences.
- “A major landslide combined with a heavy monsoon can generate hyper-concentrated flows, which can actually move very large particles further downstream.
 - As a result, the river could be clogged, the water level could rise to dangerous levels, and cause a flood.
- Hyper-concentrated flows can also change the course of the river in a process called avulsion, forcing thousands of people to move.
- When the Kosi river avulsed in 2008, it deposited around 2 metres of sediment in the surrounding land, inundated and destroyed crops, left the soil infertile, and created conditions conducive to the spread of disease.

Old Threat, New Risk

In early 2021, a large rock and ice avalanche triggered a disastrous flood in Chamoli district, leaving more than 200 people dead or missing. The incident, like several others in Himachal Pradesh and Uttarakhand in 2023, is a reminder of how areas prone to landslides and heavy monsoons are especially vulnerable to hyper-concentrated flows.

- The odds of an extreme monsoon event in the same regions are expected to increase due to climate change.
- According to a 2021 study in western Nepal, the chance could increase by as much as 60%.
- More extreme rains could also mean more landslides, which in turn could mean hyper-concentrated flows leading floods downstream in the plains.

‘Cascading hazards’

Hyper-concentrated flows in “future disaster risk management strategies remains an important and major challenge”. This is because, **India’s disaster management strategy relies largely on a “compartmentalised” understanding of disasters**, where how one disaster leads to the other is not taken into consideration.

- “If we keep looking at these hazards in an isolated and compartmentalised way, we will never be able to understand the entire cascading effect of a disaster”.
- Instead, **we need an “integrated disaster management approach”** where the relationship between instances of earthquakes, landslides, and floods – along with the individual incidents themselves – is used to frame risk-mitigation plans.

Why Are Earthquakes Frequent In Afghanistan?

Context: An earthquake of magnitude 6.3 struck western Afghanistan on October 15, barely a few days after multiple earthquakes of similar strength killed at least a thousand people in the Herat province.

- Multiple earthquakes have destroyed entire villages in the country.

Key Highlights

Afghanistan has faced widespread destruction from intense earthquakes over the years.

- In June 2022, more than 1,000 people were killed when an earthquake of magnitude 6.1 struck Khost and Paktika provinces.

THE GIST

- An earthquake of magnitude 6.3 struck western Afghanistan on October 15, barely a few days after multiple earthquakes of similar strength killed at least a thousand people in the Herat province.
- The earth is made up of chunks of solid rocks called tectonic plates. Discontinuities in these rock masses, along which they have moved, are called fault lines.
- Afghanistan is located over multiple fault lines in the region where the Indian and the Eurasian tectonic plates meet. These plates collide often, leading to significant tectonic activity.

- In 2015, a major earthquake that struck the country's northeast killed over 200 people in Afghanistan and neighbouring northern Pakistan.
- A 6.1-magnitude earthquake in 2002 killed about 1,000 people in northern Afghanistan.
- In 1998, another earthquake and subsequent tremors in northeast Afghanistan killed at least 4,500 people.

How Do Earthquakes Occur?

The earth is made up of chunks of solid rocks called tectonic plates. Discontinuities in these rock masses, along which they have moved, are called fault lines.

- These fractures are a result of tectonic forces and stress that builds up in the earth's lithosphere, causing the rocks to break and slip.
- An earthquake occurs when blocks of lithosphere suddenly slip past one another, releasing energy and sending seismic waves through the ground.
- The surface where the lithosphere chunks slip becomes a fault plane.
- The point within the earth where the fault rupture starts and produces an earthquake is called the **focus or the hypocentre**.
- The point on the surface of the earth directly above it is called the epicentre.

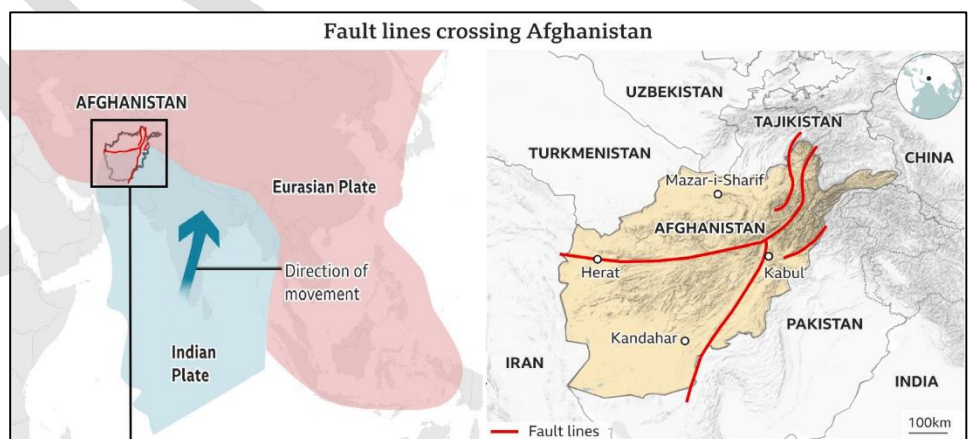
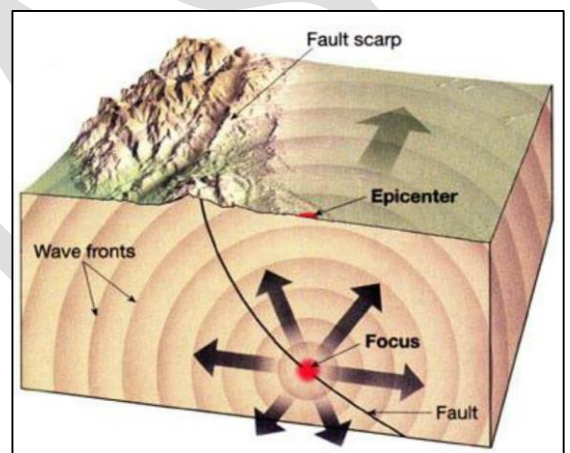
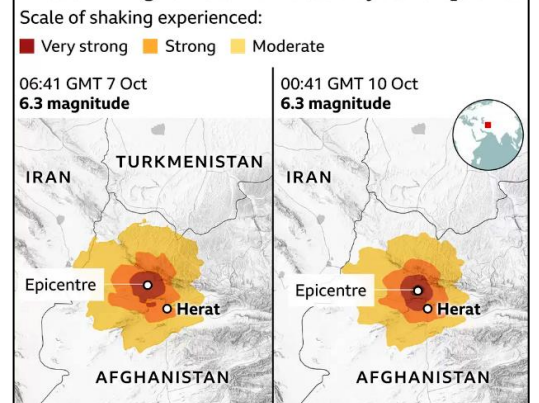
Tectonic plates are slow moving but are always in motion, mostly due to the heat energy generated inside the earth. The edges of these plates are called **plate boundaries** and consist of faults—this is where most earthquakes occur.

Why Do Frequent Earthquakes Occur In Afghanistan?

Afghanistan is located over **multiple fault lines** in the region where the **Indian and the Eurasian tectonic plates meet**.

- These plates collide often, leading to significant tectonic activity.
- Afghanistan is located on the Eurasian plate.
- Towards western Afghanistan, the Arabian plate subducts northward under Eurasia, and towards eastern Afghanistan the Indian plate does the same.
- In southern Afghanistan, the Arabian and Indian plates adjoin and both subduct northward under the Eurasian plate.

Areas in Afghanistan affected by earthquakes



- The **Hindu Kush mountain range** and the **Pamir Knot** are geologically complex regions where tectonic plates meet.
- The collision and convergence of the Indian Plate and the Eurasian Plate result in the folding and faulting of the Earth's crust.

This geological complexity contributes to the occurrence of earthquakes in the region.

- The ongoing northward movement of the Indian Plate towards the Eurasian Plate also results in compression, leading to the uplift of the Himalayas and the transmission of tectonic stress across the entire region, including Afghanistan.
- The compression causes the crust to deform, and creates faults and fractures that can slip and generate earthquakes.
- These interactions at plate boundaries generate significant tectonic stresses and result in earthquakes.
- Afghanistan is also criss-crossed by various active fault systems like the Chaman Fault and the Main Pamir Thrust. These faults are the sources of many earthquakes in the region.

Polity

The State of India's Scheduled Areas

Context: India's 705 Scheduled Tribe (ST) communities — making up 8.6% of the country's population — live in 26 States and six Union Territories.

- Article 244, pertaining to the administration of Scheduled and Tribal Areas, is the single most important constitutional provision for STs.
- Article 244(1) provides for the application of Fifth Schedule provisions to Scheduled Areas notified in any State other than Assam, Meghalaya, Tripura, and Mizoram.
- The Sixth Schedule applies to these States as per Article 244(2).

Key Highlights

- Scheduled Areas cover 11.3% of India's land area, and have been notified in 10 States: Andhra Pradesh, Telangana, Odisha, Jharkhand, Chhattisgarh, Madhya Pradesh, Rajasthan, Gujarat, Maharashtra, and Himachal Pradesh.
- In 2015, Kerala proposed to notify 2,133 habitations, five gram panchayats, and two wards in five districts as Scheduled Areas; it awaits the Indian government's approval.
- However, despite persistent demands by Adivasi organisations, villages have been left out in the 10 States with Scheduled Areas and in other States with ST populations.
- As a result, 59% of India's STs remain outside the purview of Article 244. They are denied rights under the laws applicable to Scheduled Areas, including the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act 2013 and the Biological Diversity Act 2002.

In 1995, the **Bhuria Committee**, constituted to recommend provisions for the extension of panchayat raj to Scheduled Areas, recommended including these villages, but this is yet to be done.

THE GIST

■ India's 705 Scheduled Tribe (ST) communities — making up 8.6% of the country's population — live in 26 States and six Union Territories.

■ However, despite persistent demands by Adivasi organisations, villages have been left out in the 10 States with Scheduled Areas and in other States with ST populations.

■ Based on the 1961 Dhebar Commission Report, the guiding norms for declaring an area as a Scheduled area are — preponderance of tribal population; compactness and reasonable size of the area; a viable administrative entity such as a district, block or taluk; and economic backwardness of the area relative to neighbouring areas.

- The absence of viable ST-majority administrative units has been the standard bureaucratic response — an argument that has also been used to demand the denotification of parts of Scheduled Areas where STs are now a minority due to the influx of non-tribal individuals.

Who Decides a Scheduled Area?

The Fifth Schedule confers powers exclusively on the President to declare any area to be a Scheduled Area. In 2006, the Supreme Court held that “the identification of Scheduled Areas is an executive function” and that it doesn’t “possess the expertise ... to scrutinise the empirical basis of the same”.

- In 2016, the Jharkhand High Court dismissed a challenge to the notification of a Scheduled Area because the ST population there was less than 50% in some blocks. The court observed that the declaration of a Scheduled Area is “within the exclusive discretion of the President”.

How are Scheduled Areas Identified?

Neither the Constitution nor any law provides any criteria to identify Scheduled Areas. However, based on the 1961 **Dhebar Commission Report**, the guiding norms for declaring an area as a Scheduled area are —

Preponderance of tribal population

Compactness and reasonable size of the area

A viable administrative entity such as A district, block or taluk

Economic backwardness of the area relative to neighbouring areas

- No law prescribes the minimum percentage of STs in such an area nor a cut-off date for its identification.
- This said, the 2002 Scheduled Areas and Scheduled Tribes Commission had recommended that “all revenue villages with 40% and more tribal population according to the 1951 Census may be considered as Scheduled Area (sic) on merit”.
- The Ministry of Tribal Affairs communicated this to the States in 2018 for their consideration, but elicited no response.
- Compactness of an area means that all the proposed villages need to be contiguous with each other or with an existing Scheduled Area. If not, they will be left out.
- But contiguity is not a mandatory demarcating criterion. One example is Kerala’s pending proposal, which ignores the conditions.

The **Bhuria Committee** recognised a face-to-face community, a hamlet or a group of hamlets managing its own affairs to be the basic unit of self-governance in Scheduled Areas.

- But it also noted that the most resource rich tribal-inhabited areas have been divided up by administrative boundaries, pushing them to the margins.
- Therefore, determining the unit of the area to be considered — whether a revenue village, panchayat, taluka or district, with an ST-majority population — gave way to arbitrary politico-administrative decisions.

However, PESA’s enactment finally settled this ambiguity in law.

- The Act defined a ‘village’ as ordinarily consisting of “a habitation or a group of habitations, or a hamlet or a group of hamlets comprising a community and managing its affairs in accordance with traditions and customs”.
- All those “whose names are included in the electoral rolls” in such a village constituted the gram sabha.
- The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, also known as the FRA Act, adopted this definition.
- Here, too, the gram sabhas are the statutory authority to govern the forests under their jurisdiction.

- As a result, the definition of a village expanded beyond the Scheduled Areas to include forest fringes and forest villages as well.
- However, gram sabhas are yet to demarcate their traditional or customary boundaries on revenue lands in the absence of a suitable law.
- FRA 2006 requires them to demarcate ‘community forest resource’, which is the “customary common forest land within the traditional or customary boundaries of the village or seasonal use of landscape in the case of pastoral communities, including reserved forests, protected forests and protected areas such as Sanctuaries and National Parks to which the community had traditional access”.
- The traditional or customary boundary within revenue and forest lands (where applicable) would constitute the territorial jurisdiction of the village in the Scheduled Area.

How Are Scheduled Areas Governed?

The President of India notifies India’s Scheduled Areas.

- States with Scheduled Areas need to constitute a Tribal Advisory Council with up to 20 ST members.
- They will advise the Governor on matters referred to them regarding ST welfare.
- The Governor will then submit a report every year to the President regarding the administration of Scheduled Areas.
- The national government can give directions to the State regarding the administration of Scheduled Areas.
- The Governor can repeal or amend any law enacted by Parliament and the State Legislative Assembly in its application to the Scheduled Area of that State.
 - The Governor can also make regulations for a Scheduled Area, especially to prohibit or restrict the transfer of tribal land by or among members of the STs, and regulate the allotment of land to STs and money-lending to STs.
 - These powerful provisions, authority, and special responsibility vested with Governors, with the President’s oversight, have largely remained a dead letter, except briefly in Maharashtra from 2014 to 2020.
- It was only when Parliament enacted the provisions in various laws applicable to Scheduled Areas, including the Panchayats (Extension to Scheduled Areas) Act, or PESA, in 1996 that the intent of the Constitution and the Constituent Assembly actually came alive.
- State panchayat laws had empowered the elected panchayat bodies, rendering the gram sabhas moot. But PESA empowered the gram sabhas to exercise substantial authority through direct democracy, and stated that structures “at the higher level do not assume the powers and authority” of the gram sabha.

Way Forward

- All habitations or groups of habitations outside Scheduled Areas in all States and Union Territories where STs are the largest social group will need to be notified as Scheduled Areas irrespective of their contiguity.
- Secondly, the geographical limit of these villages will need to be extended to the ‘community forest resource’ area on forest land under the FRA 2006 where applicable, and to the customary boundary within revenue lands made possible through suitable amendments to the relevant State laws.
- Finally, the geographical limits of the revenue village, panchayat, taluka, and district will need to be redrawn so that these are fully Scheduled Areas.

Dam Safety

Context: India has almost 6,000 large dams and about 80% of them are more than 25 years old and carry safety risks.

- A new Dam Safety Act (DSA) was passed in late 2021.
- On October 4 this year, a glacial lake outburst flood (GLOF) in North Sikkim’s South Lhonak Lake washed away one of the biggest hydropower projects in India, the Teesta III dam at Chungthang.

- Reports have since revealed there were no early warning systems, no risk assessment or preventive measures in place as required under the Act.

Dam Safety

Dam safety is a function of many parts:

Designing And
Constructing Dams
That Adhere To Safety
Margins

Maintaining And
Operating Them Per
Guidelines

Recording Data In
Real-time In An
Accessible Format

Forecasting Hazardous
Events And Instituting
Emergency Plans

Provisions of the Act

The Dam Safety Act was tabled in the Rajya Sabha in December 2021, as a response to deficient surveillance and maintenance causing dam failure-related disasters. The Act listed key responsibilities and mandated that national and State-level bodies be established for implementation.

- It said a **National Committee on Dam Safety** would oversee dam safety policies and regulations.
- A **National Dam Safety Authority** would be charged with implementation and resolving State-level disputes.
- The **Chairman of the Central Water Commission (CWC)** would head dam safety protocols at the national level.
- A **State Committee on Dam Safety (SCDS)** and **State Dam Safety Organisation (SDSO)** would be set up.
- Hazard profiling and regular assessment are also mandated by the Act.
 - Hazard risk fluctuates at the slightest touch, responding to climate change, urbanisation, and the way people/companies use water or where they are located.
 - Periodic reviews are expected to bring forth fresh inundation maps and new rule curves (which determine the capacity of dam reservoirs), all of which contribute towards the safety of the downstream areas.
 - Spillway capacity and other metrics should be reviewed every five years or so, but periodic reviews are often not conducted or if they are, their findings are not easily available in the public domain.
- The Act requires dam builders to conduct comprehensive dam safety evaluations, but “there is no standardisation of how the failure is analysed and reported.

REGULATORY FRAMEWORK/INITIATIVES

FOR DAM SAFETY IN INDIA:

DAM SAFETY ACT 2021:

Setting up an empowered institutional framework for dam safety at the Central & State level.

- **National Committee on Dam Safety** at national level
- **State Committee on Dam Safety** at state level
- **Dam safety organizations:** Conduct pre-monsoon and post-monsoon inspections of the dams.

NATIONAL DAM SAFETY AUTHORITY:

Maintain standards related to dam safety, prevent dam-related disasters and resolve inter-State issues.

DAM REHABILITATION AND IMPROVEMENT PROJECT (DRIP):

World Bank program, improves the safety and operational performance of selected dams, coupled with institutional strengthening.

NATIONAL HYDROLOGY PROJECT:

It will help in gathering Hydro-meteorological data on real-time basis. Components include

- In Situ Hydromet Monitoring System and Hydromet Data Acquisition System
- Setting up of National Water Informatics Centre (NWIC)
- Water Resources Operation and Management System
- Water Resources Institutions and Capacity Building

Failure to comply with any provision of the Act is punishable with imprisonment and/or fines, and “if such obstruction or refusal to comply with directions results in loss of lives or imminent danger thereof, [entity] shall be punishable with imprisonment for a term which may extend to two years.

What Do The States Need To Do?

Provisions require states to classify dams based on hazard risk

Conduct regular inspections

Create emergency action plans

Institute emergency flood warning systems

Undertake safety reviews

Period risk assessment studies

- Importantly, States were asked to report and record incidents of dam failures.
- Until now, no statutory provision required systemic reporting of failures and no single agency was tasked with tracking this data.
- The CWC keeps a record but the list is not updated regularly.

Surrogacy

Context: The Supreme Court has protected the right of parenthood of a woman, suffering from a rare medical condition, by staying the operation of a law which threatened to wreck her hopes to become a mother through surrogacy.

- Medical board records showed the woman has “absent ovaries and absent uterus, hence she cannot produce her own eggs/oocytes”.
- A government notification on March 14 this year amended the law, banning the use of donor gametes.
 - It said “intending couples” must use their own gametes for surrogacy.
 - The petition was filed in the Supreme Court challenging the amendment as a violation of a woman’s right to parenthood.

Easing the path

On March 14, 2023, government notified amendments to the law to ban the use of donor gametes, saying ‘intending couples’ must use their own gametes for surrogacy

■ Supreme Court says the amendment cannot contradict Rule 14(a), which specifically recognises the absence of a uterus or any allied condition as a medical indication necessitating gestational surrogacy



Key Highlights

“The amendment which is now coming in the way of the intending couple and preventing them from achieving parenthood through surrogacy, we find, is, prima facie contrary to what is intended under the main provisions of the Surrogacy Act both in form as well as in substance,” a Bench of Justices B.V. Nagarathna and Ujjal Bhuyan held in a recent order.

- The petitioner’s lawyer, argued that the **amended Paragraph 1(d) of the Surrogacy (Regulation) Rules, 2022**, by

Surrogacy

Surrogacy is an arrangement in which a woman (the surrogate) agrees to carry and give birth to a child on behalf of another person or couple (the intended parent/s). A surrogate, sometimes also called a gestational carrier, is a woman who conceives, carries and gives birth to a child for another person or couple (intended parent/s).

- ✓ **Altruistic Surrogacy:** It involves no monetary compensation to the surrogate mother other than the medical expenses and insurance coverage during the pregnancy.
- ✓ **Commercial Surrogacy:** It includes surrogacy or its related procedures undertaken for a monetary benefit or reward (in cash or kind) exceeding the basic medical expenses and insurance coverage.

ruling out the use of donor eggs, had made it impossible for his client and her husband to continue with the process of surrogacy to achieve parenthood.

- He argued that the **2023 amendment contradicted Sections 2(r) and 4 of the Surrogacy Act, 2021**, which recognised the situation when a medical condition would require a couple to opt for gestational surrogacy in order to become parents.

- He referred to **Rule 14(a) of the Surrogacy Rules** which listed the

medical or congenital conditions owing to which a woman could choose to become a mother through gestational surrogacy.

- They included “having no uterus or missing uterus or abnormal uterus (like hypoplastic uterus or intrauterine adhesions or thin endometrium or small unicornuate uterus, T-shaped uterus) or if the uterus is surgically removed due to any medical condition such as gynaecological cancer”.

Surrogacy (Regulation) Act, 2021

- ✓ Under the Surrogacy (Regulation) Act, 2021, a woman who is a widow or a divorcee between the age of 35 to 45 years or a couple, defined as a legally married woman and man, can avail of surrogacy if they have a medical condition necessitating this option.
 - The intended couple shall be a legally married Indian man and woman, the man shall be between the ages of 26-55 years and the woman shall be between the ages of 25-50 years, and shall not have any previous biological, adopted, or surrogate child.
- ✓ It also bans commercial surrogacy, which is punishable with a jail term of 10 years and a fine of up to Rs 10 lakhs.
- ✓ The law allows only altruistic surrogacy where no money exchanges hands and where a surrogate mother is genetically related to those seeking a child.

‘Woman’s Choice’

- The lawyer said the Rule made it clear that the **choice was solely that of the woman**. He said his client had begun the surrogacy process months before the **amendment, which cannot be implemented retrospectively**.
- The government, countered that the process of surrogacy cannot be availed under the law unless the child was “genetically related” to the intending couple. This exempted the use of donor eggs.
- The court agreed that the law permitting gestational surrogacy was “woman-centric”. The decision to have a surrogate child was entirely based on the woman’s inability to become a mother owing to her medical or congenital condition.
- Such a condition included the “absence of a uterus or repeatedly failed pregnancies, multiple pregnancies or an illness which makes it impossible for her to carry a pregnancy to term or would make the pregnancy life-threatening”.
- The amendment cannot contradict Rule 14(a) which specifically recognises the absence of a uterus or any allied condition as a medical indication necessitating gestational surrogacy, the court held.
- Addressing the government’s contention that the surrogate child should be “genetically related” to the couple, the court said the child would be related to the husband.
- “In this regard, it may be noted that the expression ‘genetically’ related to the intending couple has to be read as being related to the husband when Rule 14(a) applies,” the court said.

Governance & Social Justice

Rules of Entitlement for Disability Compensation Tightened

Context: The Defence Ministry has issued new entitlement rules (ER) for grant of disability pensions to military personnel, tightening some of the provisions and introducing a new ‘impairment relief’ (IR) in lieu of the ‘disability element’ to cover lifestyle diseases such as hypertension and diabetes.

- The development comes after the Comptroller and Auditor General (CAG) asked the Ministry early this year to carry out an analysis of the disability among soldiers based on its report, which said that almost 40% of officers and 18% of personnel below officer rank (PBOR) who retire every year were drawing disability pensions.

Key Highlights

The 'Casualty Pension and Disability Compensation Awards to Armed Forces Personnel' stipulates the conditions for the award of death/disability compensation to military personnel with effect from September 21.

- The new IR is defined as a monthly disability compensation, calculated as a defined percentage of the last reckonable emoluments, awarded to armed forces personnel who are retired or discharged from service voluntarily or otherwise with a disability sustained under circumstances accepted as Category B or C and assessed not less than 20%.

The Efficiency Perspective

- The primary aim of these rules is not cost-saving but rather the efficient management of the armed forces cadre.
- The presence of a significant number of individuals in lower medical categories sends an unintended message, and these changes aim to address that issue.

Streamlined Assessment and Entitlement

- The revised policy is designed to streamline the assessment and entitlement procedures, reducing ambiguity and the likelihood of litigation.
- This clarity will ensure that military personnel receive the support they need without unnecessary complications.

Impairment Relief Concept

- The introduction of impairment relief, a new concept in the rules, has garnered some criticism due to its lack of tax exemption.
- General Chauhan clarified that this change in terminology does not affect the nature of entitlement or the quantum of emoluments.
- It applies to personnel who are not invalidated out due to the nature of their disabilities and continue to serve until the end of their engagement.

Caravan Park in Kerala

Context: The Kerala Tourism Development Corporation (KTDC) will develop the caravan park and camp shelter at Bekal fort.

- The KTDC has also submitted proposals to set up caravan parks at Ponmudi in Thiruvananthapuram and Bolgatty Palace in Kochi.
- The well-protected fort on a hillock overlooking the Arabian Sea boasts a stunning architecture and lush green environs.
- The caravan park at Bekal will be the first park in the public sector in the State.
- At present, there is only one Caravan Park in the State, run by a private player at Wagamon.

Caravan Park – It is a place where people with recreational vehicles can stay overnight, or longer, in allotted spaces known as "sites" or "campsites".

About Bekal Fort

- Bekal Fort is located in **Kasargod district**, Kerala.
- It is the **largest fort in Kerala**.
- It was built in the **17th century** by **Shivappa Nayaka** of the **Keladi dynasty**.
- The fort has seen rise and fall of several dynasties and later came under the control of the **Kingdom of Mysore**.
- **Structure:** The fort appears to emerge from the sea. Almost three-quarters of its exterior is in contact with water.
 - An **important feature of the fort** is the water-tank and the flight of steps leading to an observation tower built by Tipu Sultan.
 - The **fort's zigzag entrance** and surrounding trenches reveal its defensive strategy.
 - **Holes on the outer walls** are designed to defend the fort effectively from naval attacks. The upper holes are meant for aiming at the farthest targets; lower holes below for striking an enemy nearer and the lowest holes to attacking enemy closest to the fort.
 - The fort's solid construction **resembles** the Thalassery Fort and the St. Angelo Fort at Kannur built by the Dutch.

Counting Deaths In India's Prisons

Context: In August this year, the Supreme Court Committee on Prison Reforms found suicide to be the leading cause of 'unnatural' deaths — deaths other than ageing or illnesses — among Indian prisoners, with U.P. recording the highest number of suicides between 2017 and 2021.

- ✓ The report stated that "...the number of custodial deaths has seen a steady rise since 2019, and 2021 has recorded the highest number of deaths so far."
- ✓ On the other hand, 'natural deaths' — 1,879 people in 2021 — were due to ageing and illnesses.

How Are Prison Deaths Classified?

Every year, prison deaths are identified as 'natural' or 'unnatural' by the **Prison Statistics India (PSI) report published by the National Crime Records Bureau (NCRB)**.

- In 2021, a total of 2,116 prisoners died in judicial custody, with almost 90% of cases recorded as natural deaths.
- **Ageing and illness account for 'natural' deaths.**
 - Illness has been **further categorised into** diseases such as heart conditions, HIV, tuberculosis, and cancer.
 - As the prison population swells, recorded natural deaths have increased from 1,424 in 2016 to 1,879 in 2021.
- **'Unnatural' deaths** are more diverse in classification.
 - They include suicide (due to hanging, poisoning, self-inflicted injury, drug overdose, electrocution, etc.) and death due to inmates, assault by outside elements, fire, negligence or excesses and accidental deaths such as natural calamities (earthquakes, snakebites, drowning, accidental fall, burn injury, drug/alcohol consumption, etc.).
 - The **suicide rate among inmates was found to be more than twice the rate recorded in the general population**, as per a report by the Commonwealth Human Rights Initiative (CHRI).

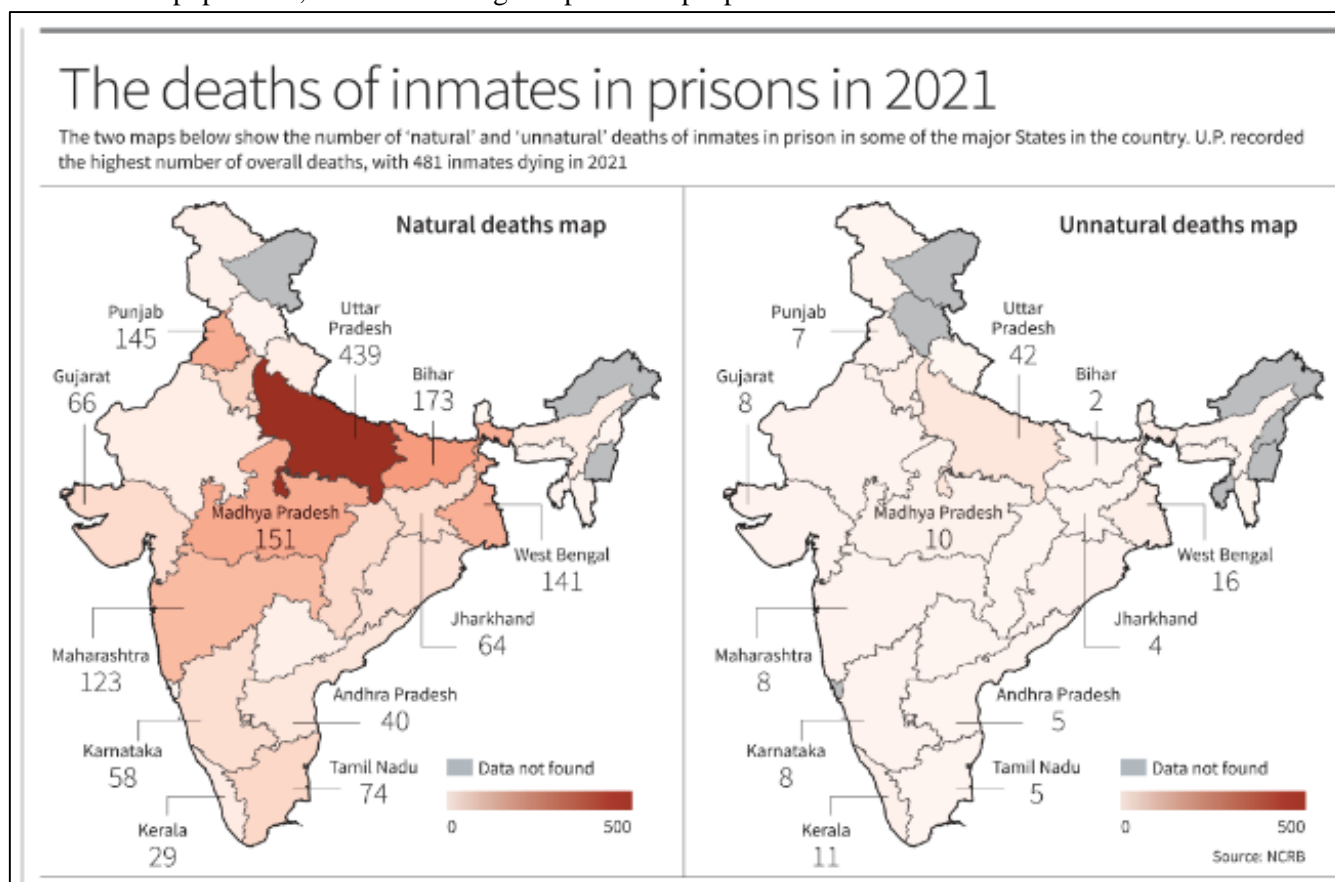
THE GIST

■ In August this year, the Supreme Court Committee on Prison Reforms found suicide to be the leading cause of 'unnatural' deaths.

■ Unnatural' deaths include suicide (due to hanging, poisoning, self-inflicted injury, drug overdose, electrocution, etc.) and death due to inmates, assault by outside elements, fire, negligence or excesses and accidental deaths such as natural calamities (earthquakes, snakebites, drowning, accidental fall, burn injury, drug/alcohol consumption, etc.).

■ In light of rising suicide cases, the NHRC in June this year issued an exhaustive 21-page advisory to States, highlighting that suicides arise out of both medical and mental health issues.

- Additionally, while the NCRB data documents the socio-economic background of the inmate population, the caste or religious profile of people who die is unknown.



What Have The Courts Said?

- In a landmark Supreme Court judgment that drew attention to hostile prison infrastructure which results in custodial deaths, Justice M.B. Lokur said that the **NCRB's distinction between natural and unnatural deaths is "unclear."**
 - "For example, if a prisoner dies due to a lack of proper medical attention or timely medical attention, would that be classified as a natural death [due to illness] or an unnatural death [due to negligence]?"
- This ambiguity, coupled with the fact that **prison deaths are under-reported and rarely investigated**, results in a majority of deaths being classified as 'natural', media reports have noted.
- During the pandemic, the **PSI report classified deaths due to COVID-19 as 'natural' deaths**.
 - At the time, the occupancy rate of prisons was 118% of their capacity, and almost 40,000 more undertrials were held in prisons, in comparison with the previous year.
 - The same year, the sanctioned strength of medical staff was around 1:125, but in reality, there was just one staff member to look after 219 inmates.
- Moreover, as Justice Lokur and previous judgments have pointed out, the **issue of custodial deaths — why they occur and how they are investigated** — is intertwined with how congested prisons are, if inmates have access to medical help, whether there is adequate staff and whether the available staff is properly trained to aid inmates.
- Only 5% of expenditure is spent on medical facilities, as per the PSI 2021 report. Moreover, between 2016 and 2021, money earmarked for spending on inmates was underutilised — ₹6,727.30 crore was the average national expenditure against a sanctioned ₹7,619.2 crore in 2021.

- The **infrastructural deficiencies** are both a cause and effect of “**callousness and neglect of the health of individuals in jail custody**”. The refusal to provide care results in ‘unnatural’ deaths inside prisons, which are otherwise ascribed to ‘natural’ causes.
- The **neglect could be medical, psychological or a continued denial of access to healthcare, food or safety.**

How Are Deaths Investigated?

- Since 1993, the **NCRB** is required to intimate a custodial death within 24 hours, followed by post-mortem reports, magisterial inquest reports or videography reports of the post-mortem.
- Further, if “**an enquiry by the Commission into custodial death discloses negligence** by a public servant, the Commission recommends to authorities of Central/State Governments for paying compensation to the Next of Kin (NoK) and also for initiation of disciplinary proceedings/prosecution against the erring public servant”.
- In cases of **custodial rape and death**, the Code of Criminal Procedure also requires compulsory judicial magisterial inquiry in place of an executive magistrate inquiry.
- The National Human Rights Commission (NHRC) in 2010, however, weakened the legal requirement to say inquiry by a judicial magistrate is “not mandatory” when “there is no suspicion or foul play or where there is no evidence or allegation of an offence.”

There is a need for clear and reliable documentation, greater transparency and accountability. Only a robust reporting system can demarcate how many natural deaths result from pre-existing issues and “how many from conditions developed in prison; whether treatment was given, and whether it was adequate.

What Has Government Done So Far?

The Supreme Court in a 1996 judgment articulated the social obligation towards prisoners’ health, noting that they suffer from a “double handicap”.

“First, the **prisoners do not enjoy the access to medical expertise** that free citizens have.

- Their incarceration places limitations on such access; no physician of choice, no second opinions, and few if any specialists.

Secondly, because of the conditions of their incarceration, inmates are **exposed to more health hazards** than free citizens.

- The **Model Prison Manual of 2016** and the **Mental Healthcare Act of 2017**, outline inmates’ right to healthcare, which includes adequate investment in healthcare facilities, setting up mental health units, training officers to provide basic and emergency care, and formulating suicide prevention programmes to thwart such instances.
- In light of rising suicide cases, the **NHRC** this year issued an **exhaustive 21-page advisory to States**, highlighting that suicides arise out of both medical and mental health issues.
 - The Supreme Court Committee on Prison Reforms made similar recommendations.
- An **infrastructural issue** common to all is the need to scale both quantity and quality of staff, as several reports flag ‘overflowing prisons’ with inmate count exceeding capacity in at least 26 States.
 - The **NHRC recommended** filling positions of “Prison Welfare Officers, Probation Officers, Psychologists, and Medical Staff,” further noting that “the strength should be suitably augmented to include Mental Health professionals.”
 - There is an acute shortage of staff: a sanctioned staff of 3,497 people (out of which only 2,000 roles were filled), was responsible for looking after 2,25,609 prisoners in 2021 (this number has shot up to 5,75,347 as of September 2023, according to the National Prisons Information Portal).
 - Vacancies too are unevenly distributed— States like Bihar and Uttarakhand had over 60% of positions lying vacant.

- Moreover, the total strength of staff includes personnel charged with medical, executive, correctional, ministerial and other duties; not everyone is trained to provide medical aid.
- Another recommendation is to allow inmates an **“adequate number of telephones” with friends and family**; judgments also note that prisoners should be allowed **access to newspapers or periodicals to “reduce the feeling of isolation” and “possibility of harmful activity.”** Authorities have denied such literature — including a P.G. Wodehouse book to Gautam Navlakha — citing “security risks”.
- To prevent suicides specifically, guidelines recommend a **strict check on tools** such as ropes, glasses, wooden ladders, pipes; initial mental health screening at the time of entry into jail; and installing CCTV cameras to monitor high-risk inmates.
 - Human rights activists have cautioned against the latter measure, as heightened surveillance would violate the rights of prisoners.
 - Almost 1.5% of the prison population suffers from mental illnesses, per the CHRI report.
 - It also flagged a dearth of correctional staff including psychologists, “limited access to mental healthcare resources”, inadequate identification of mental illnesses in inmates along with heightened vulnerability and stigma.

A Draft: Menstrual Hygiene Policy

Context: The Centre’s Menstrual Hygiene Policy was recently hosted online for comments from the public and experts seems to remedy that.

- The debate about whether menstrual leave must be given or not occupied space, time and effort, more recently, traditionally, menstrual hygiene or the access or affordability of menstrual products and private and clean toilets have always been in debate.

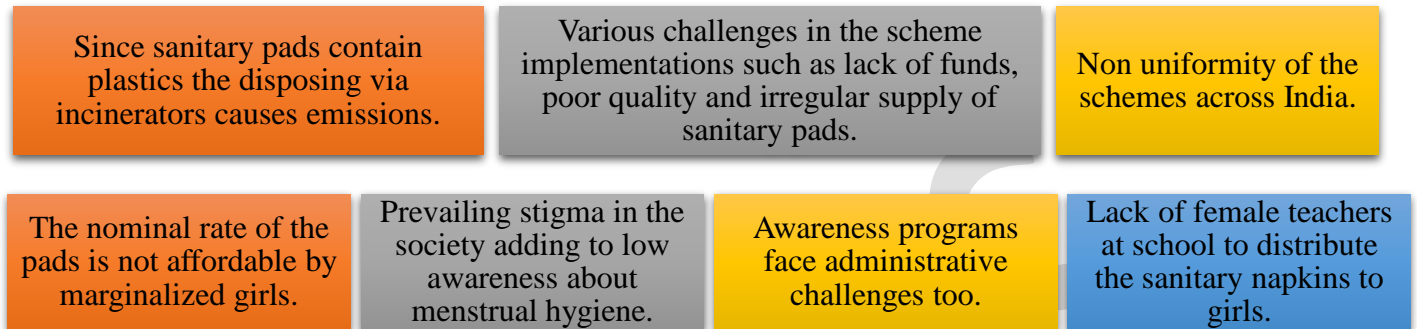
Key Highlights

The Menstrual Hygiene Policy officially **aims** at addressing the long-standing challenges associated with menstruation in our country.

- The document records:
 - Historically, this biological phenomenon has been overlooked, resulting in negative impact on girls, women, families and the environment. With time, awareness has increased, but we need more investment to comprehensively address the diverse requirements of all individuals who menstruate.
 - India, with its vast and diverse population, acknowledges the critical importance of this issue and places great emphasis on framing a comprehensive menstrual hygiene policy.
 - This policy is essential for effectively addressing the needs of all who menstruate and promote a positive transformation within our society.
- The number of women who have no access to the restroom, access to napkins, or other menstrual products is staggering.
- First and foremost it affects the mental health of the women, impacts on their confidence, development and So, if there is a policy that will be seriously implemented, and improve women’s access to hygiene and privacy.
- The policy will adopt a **“life cycle” approach** and attempt to provide comprehensive support through out the menstrual journey — from menarche to menopause.
 - So, when and if, fully implemented, it might just break down the barriers that women and girls face today.
- The Menstrual Hygiene Policy document online reiterates its commitment to align with India’s aspirations to achieving the Sustainable Development Goals —particularly in relation to good health and well-being, quality education, gender equality, and clean water and sanitation.
- It has also pledged to make menstrual products more accessible and affordable, in addition to creating hygienic toilets in public areas, workplaces, and schools.

- The policy vows to serve as a catalyst to raise awareness, challenge societal norms and foster a society that embraces menstrual hygiene as a natural and normal part of life.

Challenges To Menstrual Hygiene



Other Measures Taken By Governments For Menstrual Hygiene

Menstrual Hygiene Scheme	<ul style="list-style-type: none"> • Launched in 2011 to provide sanitary pads to girls aged 10 to 19 at a nominal rate.
Suvidha scheme	<ul style="list-style-type: none"> • Launched in 2019 to distribute eco-friendly and biodegradable pads at a subsidized rate. • As of 2021-22 over 1,128 lakh pads are distributed under this scheme.
Rashtriya Kishor SwasthyaKaryakram	<ul style="list-style-type: none"> • Focuses on promoting sexual and reproductive wellness for all adolescents.
Mini incinerators	<ul style="list-style-type: none"> • The Union Government in 2013 issued guidelines for setting up mini incinerators in schools to burn sanitary waste.

Railways Develops Anti-Freeze Flushes and Fuel Tanks

Context: Railways develops anti-freeze flushes and fuel tanks for journeys in J&K. The process of linking Kashmir to Kanniyakumari, through the new Udhampur-Srinagar-Baramulla Rail Link (USBRL) project, poses a unique challenge to the Railways in maintaining water and fuel in liquid form in sub-zero temperatures during the winters.

Key Highlights

- To circumvent the problem of water freezing in toilets and fuel tanks, engineers at the Rail Coach Factory (RCF) in Kapurthala have designed and implemented indigenous innovations.
- While the LHB coach design is prominently used by the Railways, it did not have temperature control systems.
- In winter, temperatures in the J&K region plummet to minus-eight to minus-12 degrees Celsius.
 - There is a problem if the water freezes in the tanks.
 - The flushes and the toilets won't work as the water won't get circulated.
 - There will be no supply of water in the taps.
- Another major challenge is that if the water tank is full, there is a hazard that it will develop cracks and burst, as ice has the tendency to expand.

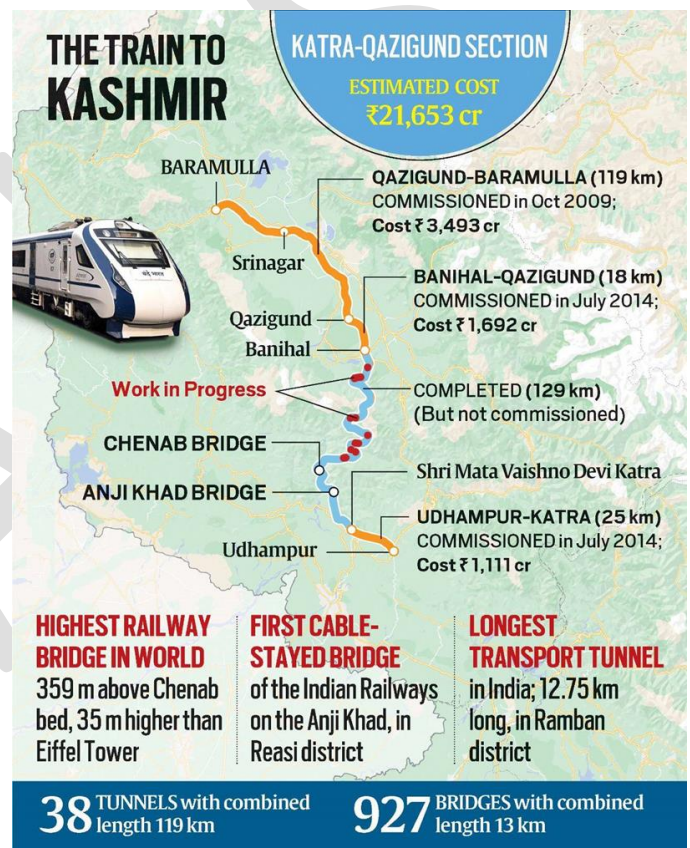
About RCF

The RCF had designed double-walled composite insulated water tanks of capacities ranging between 450 litres and 685 litres.

- The water tank mimics thermoplastic bottles with two walls and an insulation layer of foam in the middle, which traps the air.
- This will maintain water in liquid form in sub-zero conditions from 16 to 20 hours. The water may remain cold but it won't freeze.
- In another innovation, the RCF has borrowed technology from the defence services to tackle the problem of freezing water in the supply pipelines.
 - They are using heated pipes with a distributed heating system covered by insulation. The water will remain cold at five to eight degrees Celsius in liquid form.
- To contain energy loss, geysers will be deployed at the point of use in toilets, where only as much water as is needed by the users will be heated. A similar technology is being deployed in the fuel tanks for locomotives by the RCF.

Udhampur- Srinagar-Baramulla Rail Link (USBRL) Project

- Udhampur-Srinagar-Baramulla Rail Link Project(USBRL) is 272 km-long. The project connects Udhampur to Baramulla.
- It aims to connect Kashmir Valley with the rest of the country by a railway line.
- It includes 38 tunnels with a combined length of 119 kilometers.
- The longest tunnel in the project is Tunnel T-49, which is 12.75 kilometers long making it India's longest transportation tunnel.
- There are 927 bridges in total. One of the bridges is Chenab Bridge which will be the highest railway bridge in the world.
- Indian railway's first cable-stayed bridge is also being constructed on Anji Khad.



Namo Bharat

Context: Prime Minister Narendra Modi flagged off the country's first Regional Rapid Transit System (RRTS), calling the Nammo Bharat train a glimpse of India's promising future.

Key Highlights

- The RRTS is a new rail-based, semi-high-speed, high-frequency commuter transit system.
- With a design speed of 180 kmph, it is a regional development initiative, which is designed to provide high-speed trains for intercity commuting every 15 minutes, going up to a frequency of every five minutes when required.
- Developed at a cost of more than ₹30,000 crore, the train will allow a commuter to travel between Delhi and Meerut in less than an hour.

- A total of eight RRTS corridors have been identified for development in the National Capital Region.
- Three RRTS corridors have been prioritised for implementation in the first phase: Delhi-Ghaziabad-Meerut; Delhi-Gurugram-SNB-Alwar; and Delhi-Panipat.
- Officials in the Housing and Urban Affairs Ministry said the rapid transit system being developed in the country is a state-of-the-art regional mobility solution, comparable to the best in the world.

FASTER THAN METROS, MORE FREQUENT THAN TRAINS



180 km/hr
DESIGN SPEED

160 km/hr
OPERATION SPEED

100 km/hr
AVERAGE SPEED



Praveen Khanna

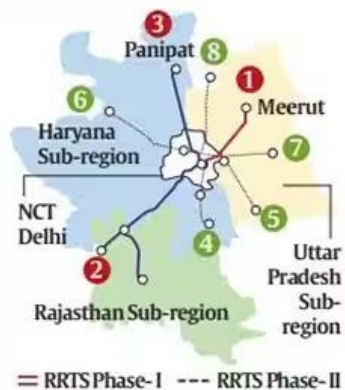


60 Min

TIME TO TRAVEL 100KM

CORRIDORS- UNDER RRTS PHASE I

- 1 Delhi – Ghaziabad – Meerut Corridor
- 2 Delhi – Gurugram – SNB – Alwar Corridor
- 3 Delhi – Panipat Corridor



OTHER CORRIDORS

- 4 Delhi – Faridabad – Ballabhgarh – Palwal
- 5 Ghaziabad – Khurja
- 6 Delhi – Bahadurgarh – Rohtak
- 7 Ghaziabad-Hapur
- 8 Delhi-Shahadra-Baraut

DNA, Face Matching Systems at Police Stations

Context: Centre to introduce DNA, Face Matching Systems at Police Stations across country.

- In April 2022, the Criminal Procedure (Identification) Act (CrPI) was passed by Parliament. The Act enables police and central investigating agencies to collect, store and analyse physical and biological samples including retina and iris scans of arrested persons.
- The rules that would govern the Act were notified in September 2022. However, the Act is yet to be implemented fully as the National Crime Records Bureau (NCRB), the nodal agency, is still preparing the guidelines and Standard Operating Procedure (SOP) to implement the legislation.
- The NCRB operates under the Union Ministry of Home Affairs (MHA). Though the Act and rules do not distinctly mention collection of DNA samples and face-matching procedures, in subsequent meetings with State police officials, the NCRB has said that these measures will be rolled out in around 1,300 locations across the country.

Why Was The Legislation Brought In?

- The CrPI Act repealed the British-era Identification of Prisoners Act, 1920 whose scope was limited to collecting and recording finger impressions, footprint impressions and photographs of certain category of convicted persons and impressions of non-convicted persons on the orders of a Magistrate.
- The government said the new Act made provisions for the use of modern techniques to capture and record appropriate body measurements.

Key Highlights

It will be implemented under the **Criminal Procedure Identification Act** which was passed last year; the law enables police and Central investigating agencies to collect, store, and analyse physical and biological samples, including retina and iris scan of arrested persons; NCRB to prepare the SOPs.

- More than a year after the Criminal Procedure Identification Act was passed by Parliament, the Centre is all set to roll out “DNA and face-matching” systems at 1,300 police stations across the country.
- The Act and rules do not explicitly mention the collection of DNA samples and face-matching procedure, the NCRB, in meetings with State police officials, informed them that the said measures would be rolled out in around 1,300 locations spread across police districts, commissionerates, and special investigation units at State headquarters.
- The Union Home Ministry has constituted a Domain Committee for the successful implementation of the Act with representatives from the State Police, Central law enforcement agencies, and other key stakeholders.
- A technical sub-committee for preparing the SOPs for capturing DNA as a measurement has also been constituted.
- The States have been asked to identify the locations and prepare the sites where the measurement collection unit (MCU) may be established as suggested by the NCRB. The Central body under the Home Ministry will be the repository of the database at the national level.
- A Delhi Police official said they were recording measurements such as thumb and finger impressions and photographs of accused persons according to the old format and were also using the National Automated Fingerprint Identification System (NAFIS).
 - Under the NAFIS, another project maintained and managed by NCRB, workstations and scanners have been put up at around 1,300 police stations.
 - It has fingerprint details, a unique 10-digit number of more than one crore people, accused and convicts, across the country.
 - This database is also being integrated with the Criminal Procedure Identification Act.
- An official said the NCRB has cautioned against the misuse of databases by ensuring identification and deployment of appropriate safeguards, adding that only designated officials must have access in real time.
- The NCRB has said the tools and systems used by the police should be technologically, legally, and forensically sound and accredited.

Food Labels To Have QR Code To Help The Visually Disabled

Context: The Food Safety and Standards Authority of India (FSSAI) has recommended the use of quick response (QR) codes on food products for accessibility by persons with visual disabilities, stating that this would ensure access to safe food for all, including those with special needs.

Key Highlights

The FSSAI said that ensuring inclusive access to information was a fundamental right of citizens. “It is imperative that food products are labelled in a manner that ensures accessibility to all consumers, including those with visual impairments.

- The FSSAI under its Food Safety and Standards (Labelling and Display) Regulations, 2020 has **comprehensively outlined the information** to be included on the labels of food products.
 - This includes product name, shelf life, nutrition facts, vegetarian/non-vegetarian logos, ingredient lists, allergen warnings, and other product-specific labelling requirements.
- The information is **aimed** at empowering consumers to make informed choices when selecting food products.
 - The Rights of Persons with Disabilities Act, 2016 recognises the rights and needs of individuals with disabilities, which emphasise accessibility and the promotion of health for persons with disabilities.

- The FSSAI said that to **enhance accessibility**, food business operators were encouraged to incorporate provisions that facilitate easy access to nutritional information for visually impaired individuals.

Information Provided By QR Codes

- These QR codes should encompass comprehensive details about the product, including, but not limited to, ingredients, nutritional information, allergens, manufacturing date, best before/expiry/use by date, allergen warning, and contact information for customer inquiries, the FSSAI said.
- It added that the inclusion of QR code for the accessibility of information did not replace or negate the requirement to provide mandatory information on the product label, as prescribed by relevant regulations.

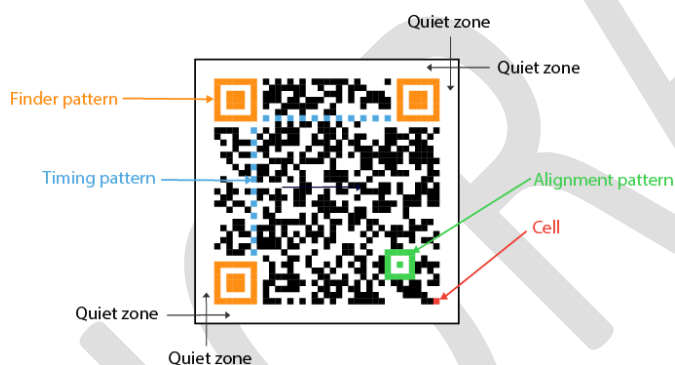
The latest advisory caters to two important regulations

- The FSSAI's Food Safety and Standards (Labelling and Display) Regulations, 2020 which outlines the information to be included on labels of food products.
- The Rights of Persons with Disabilities Act, 2016 which recognises the rights of individuals with disabilities and emphasises accessibility of health for persons with disabilities.

About QR Code

A QR code is a type of two-dimensional matrix barcode, invented in 1994, by the Japanese company Denso Wave for labelling automobile parts.

- According to market experts, for the food manufacturers, using QR codes on food products can help improve their brand image, customer loyalty, and operational efficiency.



Line Barcode

- Traditional one-dimensional barcodes
- Can only be read horizontally (1D)
- Only hold a limited amount of data - UPC = 12 digits (#s)



QR Code

- Two-dimensional Barcode or Matrix Barcode
- Can be read horizontally and vertically
- 4,000+ characters of information

How Olympic Cities Are Selected?

Context: Prime Minister Narendra Modi publicly declared **India's intention to host the Olympic Games, preferably in 2036**, during the opening ceremony of the 141st International Olympic Committee (IOC) session in Mumbai on October 14.

- He also mentioned India's ambition to host the **Youth Olympics in 2029** although the quadrennial event is currently scheduled for 2030.
- Only **three Asian countries have ever hosted the Olympics — China, South Korea and Japan**, with Japan hosting the games twice in 1964 and 2020.
- With India throwing its hat into the ring, there are at least five confirmed countries interested in hosting the 2036 Games and nine others reportedly in various stages of preparations and discussions internally and with the IOC.

- If India does manage to outbid the competition, it will be the first big-ticket multi-discipline sporting event in the country since the controversy-marred Commonwealth Games (CWG) in 2010.

How A Host Country Was Initially Selected?

In the older system of electing an Olympic host, cities, through their **respective national Olympic committees**, would submit a **letter of interest to the IOC** to start a multi-year, multi-step evaluation process.

- The **bidding cities** would complete a series of questionnaires, evaluated by the IOC.
- The **second step** of the process involved scrutiny from the IOC Evaluation Commission and a series of inspections of all venues before the final bids are put to vote at an IOC session, ending in a host being decided seven years in advance as per the Olympic Charter.
- It often led to excessive spending among the bidders, to secure rights, often ending in huge debts, corruptions and scandals.
- However, after Thomas Bach took over as the IOC president in 2013, he put in place **the Olympic Agenda 2020**, as a roadmap for the future of the Olympic Movement, approved by the 2014 IOC session.
- One part of the agenda dealt with a new process for host city selection, called the ‘new norm’, that was officially adopted during the 2019 IOC session in Lausanne.

What Was The New Approach?

The new process placed emphasis on **three main aspects** — flexibility, sustainability and cost-effectiveness — with the **motto** being ‘The Games adapt to the region, the region does not adapt to the Games’.

How Has The Process Become More Flexible?

- With respect to flexibility, the seven-year rule was done away with and there has been greater flexibility in deciding the hosts — the IOC has said that the 2036 edition could be decided even as late as after 2030.
- In contrast, Paris and Los Angeles were selected through a tripartite agreement in 2017 that assured both countries hosting rights in 2024 and 2028 respectively, giving Los Angeles 11 years to prepare.

THE GIST

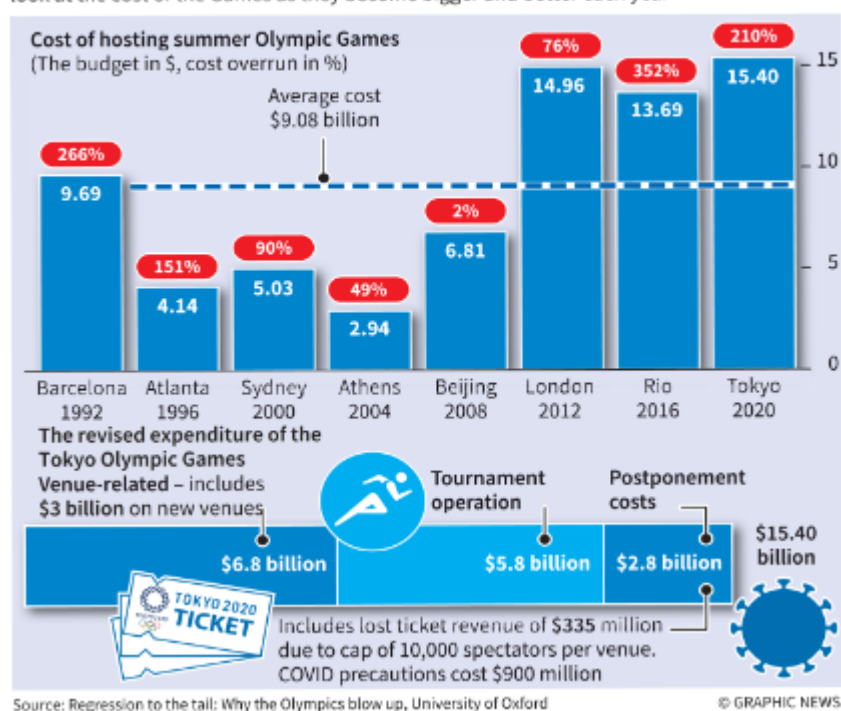
- After Thomas Bach took over as the IOC president in 2013, he put in place the Olympic Agenda 2020, as a roadmap for the future of the Olympic Movement.

- In order to ensure the long-term sustainability of the infrastructure and to avoid any public backlash, hosts are encouraged as far as possible to use existing and temporary venues.

- Besides India, the other confirmed nations interested are Mexico (spread across the four cities of Mexico City, Guadalajara, Monterrey and Tijuana), Indonesia (at the new capital of Nusantara which is still under construction), Turkey (Istanbul) and Poland (Warsaw).

The price of the Olympics

With India openly declaring its willingness to host the 2036 edition of the Olympic Games, a look at the cost of the Games as they become bigger and better each year



- Brisbane too was named host for the 2032 edition in 2021, 11 years ahead.
- There is now a two-stage process — a continuous dialogue and a targeted dialogue — without any fixed deadlines, to assess, discuss and guide potential hosts.
- The continuous dialogue is a non-committal stage not specific to any particular edition. It is basically a discussion between the IOC's Future Hosts Commission (FHC) and interested parties about the hosts' vision for the Games, its purpose and long-term legacy.
- This is followed by putting together a master plan and working out logistical details, with every potential host free to work out their own template.
- Also, unlike the past, the Games can be planned to be held across cities or even in conjunction with another country.
- The **FHC includes** athletes, international federations, national Olympic committees and the international paralympic committee.
- Once there is seriousness in a bid to progress to the next level, it will enter the **'targeted dialogue' phase** with the interested parties termed **'preferred host'**.
- However, unlike in the past when a party, once rejected, would be discouraged from bidding again, now the other interested parties can continue continuous dialogue for future events.
- In a **targeted dialogue**, the bids become more determined. While there is again no time-frame for a targeted dialogue, it is anticipated to not exceed 12 months.
- It explores the proposals to host a specific edition of the Olympic Games and brings the IOC's executive board into the picture for detailed discussions.
- This is where each of the 'preferred hosts' answer the FHC's questions and provides guarantees on infrastructure, accommodation, security and public services among others and makes the final submission.
- The FHC then prepares an advisory report for the executive board which has the power to either recommend a single host or shortlist more than one for elections by the IOC members.

What About Sustainability And Cost-Effectiveness?

In order to ensure the long-term sustainability of the infrastructure and to avoid any public backlash, hosts are encouraged as far as possible to use existing and temporary venues.

- Any new venues built must be in line with existing developmental plans and have a long-term justification irrespective of the Games.
- All editions of the summer/winter/youth Olympic Games from 2030 onwards must also adhere to the IOC's climate positive commitment.
- As per the IOC's claims, the focus on using existing and temporary venues has led to an 80% decrease in the bid budgets for the 2026 Winter Games compared to the 2018 and 2022 editions.
- Los Angeles has claimed to not build any new infrastructure for the 2028 Games while Paris has declared using 95% existing or temporary venues for 2024.
- The IOC also provides technical support and expertise to 'preferred host(s)' on marketing, venue development and sustainability to reduce costs.

Who Are The Other Potential Bidders Apart From India For The 2036 Games?

Besides India, the other confirmed nations interested are Mexico (spread across the four cities of Mexico City, Guadalajara, Monterrey and Tijuana), Indonesia (at the new capital of Nusantara which is still under construction), Turkey (Istanbul) and Poland (Warsaw). India is yet to decide the city/cities where the Games will be organised.

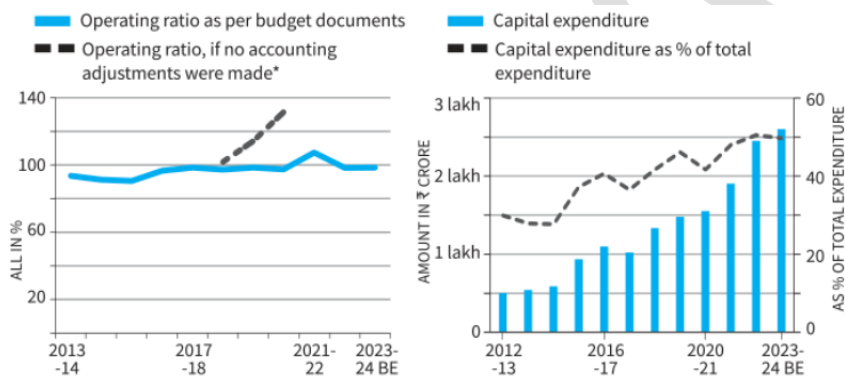
- Of these, Mexico is the only one to have previously hosted the Games in 1968.
- Other potential bidders include Egypt, Seoul, China, Qatar, Hungary, Italy, Denmark, Canada and Germany.

- While Qatar has been on a hosting spree for large-scale events in recent times, with the football World Cup in 2022, and is scheduled to host the 2030 Asian Games, Egypt will become the first African nation to host if it wins, as will Indonesia in South-East Asia.
- Although India has hosted several single-sport competitions including World Cups and World Championships over the years, the regional South Asian Games in 2016 was the last multi-discipline international event held here.
- Before the 2010 CWG, India had hosted the 2003 Afro-Asian Games, the Asian Games (1951 and 1982) and the 2007 World Military Games.
- However, the largest gathering of athletes here has been around the 5,000 mark while the recent Asian Games in Hangzhou saw 11,970 athletes participating and the Tokyo Olympics also had 11,420 athletes.

The Indian Railways' Revenue Problem

Context: While investment in railways boosts manufacturing, and services as well as tax revenue for the government and more job opportunities, a key organisation like the Railways cannot be allowed to go the Air India way — the investments made should add to its revenue.

- The Indian Railways (IR) has been on a spending spree with respect to capital expenditure (capex), particularly after the government merged its rail budget with the main budget.
- However, its operating ratio, which is the ratio of ordinary working expenses to the gross traffic receipts, has shown no improvement.
- A lower ratio implies better profitability and surplus for capital investment.



THE GIST

- The Indian Railways (IR) has been on a spending spree with respect to capital expenditure (capex), particularly after the government merged its rail budget with the main budget.
- The CAG report presented in Parliament on August 8, 2023 states that there was a loss of ₹68,269 crore in all classes of passenger services during 2021-22, with all the profit from freight traffic nullified in cross subsidising passenger services.
- The objective of this three part series is to examine how the freight business of IR can be improved.

The Trap of Rising Debt

Since the IR continues to have a total lack of surplus, it has been augmenting the funds raised through Gross Budgetary Support (GBS) and Extra Budgetary Resources (EBS).

- The merging of budgets helped this cause as GBS from the central government could be increased without much scrutiny.
- However, with respect to EBS, there is a price to pay.
- The IR's spending on repayment of principal and interest is pegged at ₹22,229 crore and ₹23,782 crore respectively, which together make it 17% of revenue receipts, a sharp rise from less than 10% till 2015-16.
- It appears that this debt liability was noticed as capex relied almost entirely on GBS in this year's budget.

- Despite this, the unprecedented rise in capex appears to be predicated on the premise that the IR's operating and financial performance should not be viewed in isolation but along with its role as an engine for the growth of the country's economy.
- Investment in railways boosts manufacturing and services, tax revenue for the government and allows for more job opportunities.

However, a key organisation like the IR cannot be allowed to go the Air India way — the investments made should be productive for IR's revenues.

Identifying The Problem

The IR's freight segment is profitable whereas the passenger segment makes huge losses.

- The Comptroller and Auditor General of India (CAG) report presented in Parliament on August 8, 2023 states that there was a loss of ₹68,269 crore in all classes of passenger services during 2021-22, with all the profit from freight traffic nullified in cross subsidising passenger services.
- This is nothing new for the IR but the situation has become grimmer and since any significant increase in passenger fares is unlikely, the IR has no option but to boost its freight volumes and in turn its revenue.
- The annual growth in freight volume and revenue of the IR in the period April-July 2023 stand at 1% and 3% respectively, while the economy grows at 7%. This is a dismal performance.
- The IR's modal share in India's freight business has steadily decreased to approx. 27% from upwards of 80% at the time of independence.
- The **objective of this series** is to examine how the freight business of IR can be improved. The movement of cargo by the IR is artificially divided into goods and parcels.
 - The division is not semantic but indicates a paradigmatic difference in approach with respect to tariff rules, handling, moving and monitoring.
 - Shippers, however, are not interested in these differences as their concern is mainly about the safe movement of their cargo from point A to B at the least cost and as fast as possible.
 - The time has come for the IR to shed such an artificial divide so that cargo can be divided based on its characteristics as bulk and non-bulk (or value added).
 - While the divisions are not water tight, bulk cargo would essentially refer to large volumes of cargo (full train loads or amenable for into full train loads) which can be easily handled mechanically and non-bulk cargo would be smaller in volume and less amenable for mechanical handling.

The Lessening Share

The 11 commodities in the IR's transport basket account for 90% of tonnage and revenue, of which coal is around 45% and iron ore and cement are around 10% each.

- Although these three still account for two thirds of the IR's total freight volume, the share of the IR in their transport has reduced over the years.
- For example, coal consumption was 602 and 978 million tonnes (MT) in 2011 and 2020 respectively while the rail transport share was 420 and 587 MT respectively; the rail share fell from around to 70% to 60% in a ten-year period. Though it improved to 64% in 2023 it is still lower than what it was in 2011.
- Similarly, the share of exim containers moving in and out of ports hovered between 10% and 18% since its introduction in 2009-10, with the 2021-22 figure being 13%.
- It should be noted that private container train operation policy, initiated in 2006 to boost the rail share of container movement, has not made any significant dent in improving the share.
- Further adding to the woes of the IR is the constantly fluctuating key index of Net Tonne Kilometres (NTKM), which fell for two successive years in 2015-16 and 2016-17 by 4% and 5% over the preceding years — first time such a fall has happened for two consecutive years.

- Demonetisation perhaps had some effect in the fall as NTKM recovered in 2017-18 by 11% registering an increase of 1.6% in the three-year period starting 2015-18.
- However, NTKM continued to fluctuate as it fell again in 2019-20 by 4%. In the seven-year period ending 2021-22, NTKM grew annually at the rate of 3.5% — much less than the road transport growth rate.

International Relations

Operation Ajay

Context: India brought back the first batch of citizens from crisis-hit Israel under Operation Ajay.

Operation Ajay

- It is consistent with our PM’s motto of not leaving any Indian behind.
- India has initiated “Operation Ajay” to evacuate its citizens from conflict-stricken Israel.
- This marks the second evacuation operation of the year, following Operation Kaveri, which brought back Indian citizens from Sudan earlier.
- The decision to initiate Operation Ajay comes in response to recent conflicts in the region, including a Hamas attack on Israel and the subsequent military strike on the Gaza Strip.

According to the Ministry of External Affairs spokesperson, Israel has nearly 18,000 Indians and the airlift operation is aiming to cater to those who are willing to be evacuated. People are being accommodated in aircraft on a “first-come, first-serve” basis. Officials have indicated that the number of evacuees may increase if the crisis prolongs.

Various Other Past Operations

Operation Name	Year	Reason for Evacuation
Operation Dost	2023	Turkey-Syria earthquake
Operation Ganga	2022	Tensions between Russia and Ukraine
Vande Bharat	2020	Covid-19 pandemic
Operation Samudra Setu	2020	Covid-19 pandemic
Evacuation from Brussels	2016	Terrorist strikes
Operation Raahat	2015	Conflict in Yemen
Operation Maitri	2015	Nepal earthquake
Operation Safe Homecoming	2011	Conflict in Libya
Operation Sukoon	2006	Conflict in Lebanon
1990 Kuwait Airlift	1990	Invasion of Kuwait by Iraq

Ferry to Sri Lanka

Context: PM Modi launches the passenger ferry service between Nagapattinam and Kankesanthurai, speaks of enhanced economic and diplomatic ties.

- Enhanced connectivity was bringing people of India and Sri Lanka closer, Prime Minister Narendra Modi said on Saturday at the launch of an international, high-speed passenger ferry **Cheriyapani** service between Nagapattinam on the eastern coast of Tamil Nadu and Kankesanthurai in the northern province of Sri Lanka.



Key Highlights

- Connectivity is not only about bringing two cities closer. It also brings our countries closer, our people closer and our hearts closer,” Mr. Modi said, emphasising the role of trade, tourism and people-to-people ties in promoting new opportunities for growth for the young people of both countries.
- In his remarks, he highlighted the rich history of maritime trade linked to Nagapattinam and nearby towns.
- The ferry service will help strengthen cultural, commercial, and civilisational ties between the two nations.
- Connectivity was the central theme of the joint vision of the India-Sri Lanka economic partnership, Mr. Modi said, adding that India would take steps to resume the operation of the ferry service between Rameswaram and Talaimannar as well.
- This was an important step in improving connectivity between the two nations. People of both countries have travelled across the Palk Strait for many years before they were suspended due to the civil war, he said.
- The launch affirmed the “neighbourhood first” policy of India which would help improve disaster management, maritime security, and ease of business.

Ferry service to Sri Lanka is a blow to Lakshadweep

The launch of a new ferry service between Tamil Nadu and Sri Lanka has the islanders of Lakshadweep feeling short-changed as it has further worsened their transportation woes.

- The islanders had been clamouring for more passenger vessels for inter-island transport when Cheriyaipani, a high-speed ferry with the capacity to carry 150 passengers, was taken out of service within the island group and launched for the ferry service connecting Sri Lanka.
- Cheriyaipani, was one of the three high-speed vessels conducting inter-island ferry services besides occasionally conducting services to Kochi in the mainland.
- Together the three vessels had a capacity to carry 450 passengers. It’s just Valiyaipani and Parali now, with a combined capacity of 300 passengers. This is sure to further aggravate the transportation crisis faced by the islanders.
- The high-speed ferries are the ones that would ply to the farthest island in the group, Minicoy. These apart, there are just three intra-island ferries — each capable of carrying 50 passengers — operating in the island group.
- But they are not cleared to operate to the mainland or to Minicoy.
- The islanders have been up in arms about the erratic service of the five ships linking the island group with Kochi.

How Is The IORA A Key Bloc For India?

Context: ‘Reinforcing Indian Ocean Identity’ was the banner theme at the **Indian Ocean Rim Association’s (IORA)** Council of Ministers (COM) held in Colombo on October 11, that was attended by foreign ministers and senior officials of the 23-nation grouping of countries.

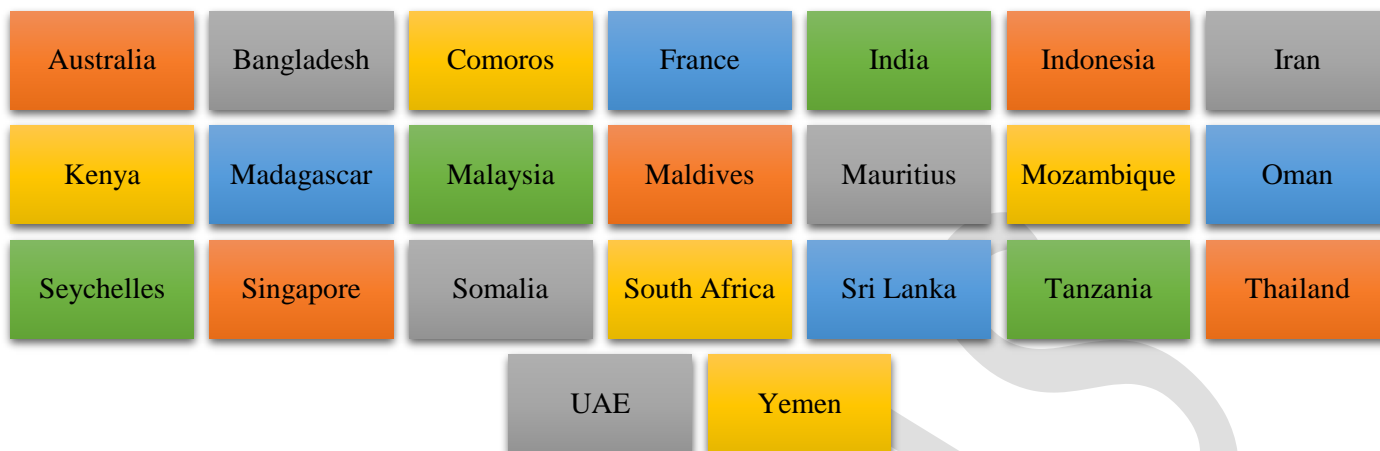
- This year’s conference was marked by a lot of interest from other countries, especially those who are “dialogue partners” or would like to become dialogue partners, putting a spotlight on the 26-year-old organisation, believed to be the brainchild of former South African President Nelson Mandela.

What Is The IORA And How Was It Formed?

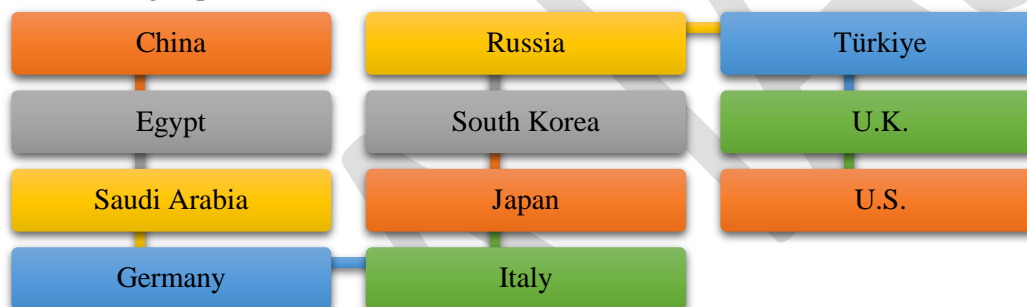
The Indian Ocean Rim Association includes 23 countries from Africa, West Asia, South Asia, South East Asia, Australia and littoral states situated in and around the Indian Ocean.

- The grouping, whose apex body is the Council of Foreign Ministers that meet once a year, moves by rotation through members every two years.
- Sri Lanka took charge as Chair this year from Bangladesh, and India is Vice-Chair, meaning that the troika of IORA is within the South Asian region.

- IORA’s membership includes 23 countries:



- It also has 11 dialogue partners:



- While the IORA was formed in 1997 (then called the Indian Ocean Region-Association for Regional Cooperation) in Mauritius, its genesis came from a speech Nelson Mandela gave in Delhi in 1995.
- He was invited by then Prime Minister P.V. Narasimha Rao as the guest for Republic Day, and said at a ceremony that India and South Africa should explore “the concept of an Indian Ocean Rim of socioeconomic cooperation and other peaceful endeavours” that could help developing countries within multilateral institutions “such as the United Nations, the Commonwealth and the Non-Aligned Movement”.

Why Does The Indian Ocean Region Matter?

- A **third of the world’s population** (2.6 billion people) live in the region, and 80% of global **oil trade**, 50% of the **world’s containerised cargo** and 33% of its **bulk cargo** passes through it.
- The region produces a combined total of \$1 trillion in **goods and services** and intra-IOA trade is billed at around \$800 billion.
- India’s other regional organisations, like SAARC (South Asian Association for Regional Cooperation) and BIMSTEC (Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation), face their own challenges.
- While the QUAD (Quadrilateral Security Dialogue), has made progress, it remains U.S.-led, along with military allies Australia and Japan.
- Meanwhile, China is actively trying to rope in India’s neighbours with groupings like the Belt and Road Initiative (BRI), China-Indian Ocean Region Forum on Development Cooperation, China-South Asian Countries Poverty Alleviation and Cooperative Development Centre, which exclude India.

- IORA, however, remains a “safe space” for India and other countries of the region that wish to keep out the constant challenge of big-power rivalries.
- **IORA membership is based on consensus**, and Pakistan has not been admitted to the grouping since it first applied in 2001, on the basis that it has not extended MFN (most favoured nation) status to India, making the IORA a less contentious space for India as well, compared to groupings like the Shanghai Cooperation Organisation (SCO).

What Does IORA Focus On?

- According to its charter, the IORA’s seven priority areas are



- The IORA also runs a special fund in addition, disbursing \$80,000-\$150,000 for project grants to members, and has a particular focus on climate change.
- It is clear that strategic issues and the importance of keeping a free and open sea lane, guarding against piracy, have become an integral part of the discussions.
- Speaking at the conference this year, External Affairs Minister stressed the importance of maintaining the Indian Ocean as a “free, open and inclusive space” where there was “respect for sovereignty and territorial integrity” based on the UN Convention on the Law of the Seas, and in comments understood to be aimed at China, warned of the dangers of “hidden agendas, unviable projects or unsustainable debt” to countries in the Indian Ocean Region.

Sri Lanka Announces Free Visas For Indians To Boost Tourism

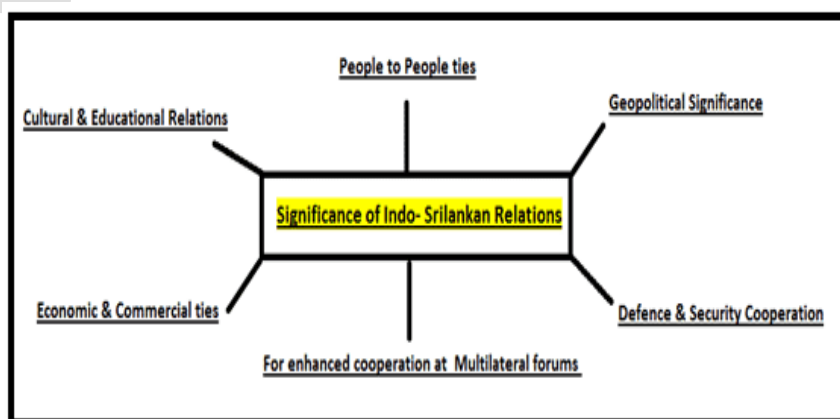
Context: Sri Lanka waived visa fee for Indians and tourists from six other countries, as part of its efforts to boost tourist arrivals and help rebuild the island nation’s battered economy following last year’s financial crash.

Key Highlights

- India has remained Sri Lanka’s top source market for many years. This year, over 2 lakh Indian tourists — constituting 20 % of the total tourist arrivals — have visited the island nation until September.
- As part of its decisions this week, the Cabinet announced implementation of a pilot project to issue free tourist visas to tourists from China, India, Russia, Thailand, Indonesia, Malaysia, and Japan until March 31, 2024.

Several measures

- According to a statement on the weekly Cabinet decisions, published by the Department of Government Information, the move



is part of “several new programmes” planned for the promotion of the Sri Lankan tourism industry, one of the chief foreign exchange earning sectors for the country, apart from exports and worker remittances.

- Sri Lanka’s tourism sector is struggling to bounce back after three major setbacks in the last few years — the Easter Sunday terror attacks in 2019, the coronavirus pandemic in 2020 and 2021, and the unprecedented economic crisis in 2022.
- Until now, Indian tourists were charged \$20 with their visa application online. The decision to issue free tourist visas is likely to boost tourist arrivals including from India, officials said.

India & China-Bhutan Boundary Talks

Context: China and Bhutan held their 25th round of boundary talks in Beijing and signed a Cooperation Agreement on the “Responsibilities and Functions of the Joint Technical Team (JTT) on the Delimitation and Demarcation of the Bhutan-China Boundary.” This advances their 3-Step Roadmap initiated in 2021 for border resolution, building on the positive momentum since their last talks in 2016.

THE GIST

- China and Bhutan held their 25th round of boundary talks and signed a Cooperation Agreement related to the demarcation of the Bhutan-China border.
- Bhutan-China border dispute primarily concerns the Doklam plateau and the India-China-Bhutan trijunction, as well as the Jakarlung and Pasamlung valleys.
- The 3-Step Roadmap initiated in 2021 aims to clearly delineate the Bhutanese and Chinese territories, involving discussions at the table, on-site visits, and formal demarcation.

Dividing line

A brief overview of the boundary dispute between China and Bhutan

- Bhutan and China have no formal diplomatic relations but have held 24 rounds of boundary talks between 1984 and 2016
- Talks concentrated on north and west Bhutan regions
- Eastern Bhutan not part of the talks
- so far, say officials
- Sakteng sanctuary is situated close to the border with Arunachal Pradesh
- In June 2020, China attempted to stop UNDP-GEF funding for Sakteng by claiming it was disputed, but was overruled



Significance of Talk

- The Boundary talks between Bhutan and China were held after a gap of seven years and indicate significant progress has been made.
- Bhutan and the Tibetan Autonomous Region share a contiguous border to Bhutan’s north and west. Since 1984, Bhutan and China had held 24 rounds of talks to resolve the disputes until 2016, but the 25th round appeared to have been held up after the Doklam Standoff between Indian and Chinese armies in 2017, and then the COVID-19 pandemic in 2019-2021.
- However, the two sides used the pause to hold talks at other levels in rapid succession, especially after China threatened to open a new front for a border dispute to Bhutan’s east.
- Since then, the Expert Group of diplomats on both sides met in 2021 to agree on a 3-step roadmap, and the first boundary delimitation technical talks were held in August 2023.

3-Step Roadmap

- The 3-Step roadmap MoU signed by the Bhutanese Foreign Minister and Chinese Assistant Foreign Minister in 2021, and the JTT established to implement the roadmap by the Expert Group in August are hoping to draw a line clearly delineating Bhutanese and Chinese territory for the first time.
- Bhutan and China don’t have diplomatic ties, as Bhutan has traditionally avoided diplomatic relations with all the United Nations Security Council permanent members.

- The 3-Step Roadmap involves first, agreeing to the border “on the table”; then visiting the sites on the ground; and then formally demarcating the boundary.

Why Is India Watching Closely?

- For India, given the breakdown in its ties with China over the standoff at the Line of Actual Control from 2020, any hint of closer ties between China and one of its closest neighbours is a cause for worry.
- More specifically, New Delhi is watching the demarcation discussions over Doklam, as amongst the proposals China has placed on the table is an agreement to “swap” areas in Doklam under Bhutanese control with areas in Jakarlung and Pasamlung which China claims.
- The Doklam trijunction cuts very close to India’s Siliguri corridor a narrow area that connects the North Eastern States to the rest of India and India would not like to see China gain access to any area closer to it.
- Since the Doklam standoff in 2017, China has doubled down on its control of the Doklam plateau, and according to a recent Pentagon report, has continued to build “underground storage facilities, new roads, and new villages in disputed areas in neighbouring Bhutan,” erasing many of the strategic gains that New Delhi had hoped for after China agreed to step back from the standoff point in 2017.
- Finally, India’s worry is over China’s demand for full diplomatic relations with Bhutan, and opening an Embassy in Thimphu.
- Given India’s challenges with Chinese projects and funding in other neighbouring countries including Bangladesh, Nepal, Sri Lanka and the Maldives, any Chinese presence in a small country like Bhutan would be problematic.
- However, Bhutan’s leadership has thus far said that all decisions would consider India’s interests and that it has always consulted India on issues of concern.

Bangladesh Is Building Memorial To Honour Indian Heroes Of 1971 War

Context: A memorial to honour the Indian soldiers who sacrificed their lives in the **Liberation War of Bangladesh in 1971** at Ashuganj in Bangladesh is in the advanced stages of completion. It will have the names of around 1,600 Indian soldiers inscribed on it.

Key Highlights

- It is expected to be ready by December. This will be the first memorial in Bangladesh to exclusively honour Indian soldiers from the 1971 war.
- The foundation stone for the memorial at Ashuganj, Brahmanbaria was laid by Prime Minister Narendra Modi and Bangladesh Prime Minister Sheikh Hasina in March 2021.
- All the names of the Indian soldiers martyred will be engraved so that everybody can know who are these people who sacrificed for our emancipation, for our liberation,” Mr. Haque had said.



CYBER SECURITY

Commercial Spyware to Target Opponents

Context: Between May and September, former Egyptian MP Ahmed Eltantawy was targeted with Cytrox’s Predator spyware sent via links on SMS and WhatsApp. Apple has since released an update for its products fixing the bug used in the attack. The attack on Mr. Eltantawy came after he publicly stated plans to run for President in the 2024 Egyptian



elections, which is especially concerning since Egypt is a known customer of Cytrox’s Predator spyware, Citizen Lab said in a blog post.

Spyware

Spyware is loosely defined as **malicious software designed to enter a device, gather sensitive data, and forward it to a third party without the user’s consent.**

- While spyware may be used for commercial purposes like advertising, malicious spyware is used to profit from data stolen from a victim’s device.
- Spyware is broadly categorised as **trojan spyware, adware, tracking cookie, and system monitors.**
- While each type of spyware gathers data for the author, system monitors and adware are more harmful as they may make modifications to a device’s software and expose the device to further threats.

This was not the first time spyware was used for surveilling a political opponent in a country.

- In 2021, investigations under the Pegasus Project revealed the massive scale of potential targets of spyware — more than 50,000 phone numbers in 50 countries.
- Reports shared that victims of the spyware attacks were in India, Azerbaijan, Bahrain, Hungary, Kazakhstan, Mexico, Morocco, Rwanda, Saudi Arabia and the UAE.
- The Pegasus spyware was also reportedly used by the Kingdom of Saudi Arabia to target journalist Jamal Khashoggi’s wife months before his death.
- Mr. Khashoggi, a U.S. resident, was murdered at the Saudi consulate in Istanbul. He was a known critic of the Saudi Arabian Crown Prince Mohammed Bin Salman.

However, in almost all known cases authorities either chose to deny allegations of the use of spyware or have been non-committal in their response.

Commercial Spyware

Malicious spyware has been around since the 1990s. Earlier iterations of spyware were limited to being used by criminals to steal passwords or financial information. However, opportunities for governments and law enforcement agencies to use spyware as part of legal investigations led to the development of commercial spyware.

- Commercial spyware mainly targets mobile platforms and can legitimately be used against criminals and terrorists.
- However, the lack of global regulations for companies developing spyware has led to their use by authoritarian governments to spy on political opponents.
- Commercial spyware, such as the Pegasus spyware from the NSO group, can reportedly not only mop up information from mobile devices but also turn on the camera and microphone without the owner’s knowledge, effectively turning handsets into a spying device.

How Are The Devices Targeted?



- Investigations by Citizen Lab and Google’s Threat Analysis Group (TAG) revealed that spyware on the former Egyptian MP’s device was delivered via network injection from a device located physically inside Egypt.
 - The investigators, therefore, attribute the **network injection attack** to the Egyptian government with “high confidence”.
- Mr. Eltantawy’s device was infected when he visited certain **websites without ‘HTTPS’** from his phone.
 - When he visited these sites, his device was silently redirected to a website, that matches the fingerprint for Cytrox’s Predator spyware — this is where his device was injected with the spyware.

- In India, the **Pegasus spyware** was part of a \$2-billion “package of sophisticated weapons and intelligence gear” transaction between India and Israel after Narendra Modi became the first Indian Prime Minister to visit Israel.
 - The spyware in India was used against at least 40 journalists, Cabinet Ministers, and holders of constitutional positions, according to reports in The Washington Post.
 - The spyware was delivered to the victim’s phones by **exploiting zero-day vulnerabilities**, which means even the device manufacturer was unaware of these exploits.

And while in all these cases, malicious links were sent to the victim’s device, reports indicate that the spyware is capable of zero-click attacks. This means that they can infect a device without requiring users to click on a malicious attachment or link.

Increasing Use of Spyware

- Between 2011 and 2023, at least **74 governments contracted with commercial firms to obtain spyware or digital forensics technology.**
- Autocratic regimes are more likely to purchase commercial spyware or digital forensics than democracies — 44 regimes classified as closed autocracies or electoral autocracies are known to have procured targeted surveillance technologies.
- Earlier this year, an **Indian defence agency was reportedly purchasing equipment from an Israeli spyware firm** that is being billed as a potential Pegasus alternative.

Inconsistencies in democratic governments’ approach in tackling human rights abuses and lack of fragmentations in the regulatory framework are seen as enablers in the use of spyware by authorities.

WHAT IS PEGASUS?

Built and marketed by Israeli company NSO, Pegasus is a spyware that infects devices and spies on the victim by transferring data to a master server in an unauthorised manner. The company claims to sell it only to “vetted foreign governments” worldwide

HOW DOES IT WORK?

- Pegasus, in the very basic form, can infect devices that are connected to the internet. Some updated versions, experts claim, can also infect phones even without the victim clicking on any links or messages
- Most spyware and stalkerware apps disguise themselves as anti-theft applications that can be used to track stolen or lost devices. While viruses and malware can be detected by anti-virus software, spyware and stalkerware apps disguise themselves as useful and send out stolen data to central servers without the knowledge of the users



Military Exercises, Defence & Security

Astra BVR Air-To-Air Missile

Context: The Indian Air Force (IAF) has placed two contracts with Bharat Dynamics Ltd. (BDL) for the indigenous **Astra Beyond Visual Range (BVR) air-to-air Missile** and the first batch is expected to be inducted by the end of the year, according to defence sources.

Key Highlights

- The Astra is fully integrated on the Su-30MKI.
- In August, it was successfully test fired from the Light Combat Aircraft (LCA) Tejas off the coast of Goa during which the missile was released from the aircraft at an altitude of about 20,000 ft.
- The IAF plans to arm its frontline fighters with the Astra-Mk1 and officials have said that the Astra-2 would become the mainstay of the IAF’s BVR missile arsenal, reducing import dependency.
- In May 2022, the Defence Ministry signed a contract with BDL for supply of Astra Mk-I missiles and associated equipment for the IAF and the Navy at a cost of ₹2,971 crore.

Astra Missiles

Astra is an Indian family of all-weather beyond-visual-range air-to-air missile, developed by the Defence Research and Development Organisation.

- Different missiles of this family are capable of engaging targets at varying distances of 500 m up to 340 km.

Astra Mark 1

Limited series production of Astra Mk-1 missiles began in 2017.

- The Astra Mark 1, has a maximum head-on launch range of 100 kilometres, a speed of 4.5 Mach, and launch clearance up to 20 kilometres in height (66,000 ft).
- The Astra may either be launched by the mother ship or in buddy mode.
- Extensive and rigorous trials have validated the Astra missile's warhead capability, maximum launch ranges against head-on and maneuvering targets, long-range target engagement capability, clear missile separation at supersonic speeds, and launch under high 'G' forces, and multiple missile launches against multiple targets.
- The Astra-1 is meant to carry a 15-kilogram pre-fragmented high explosive warhead that is ignited by a radio proximity fuse.
- The missile's Electronic Counter-Countermeasure (ECCM) capabilities allow for unrestricted operation in an Electronic Counter-Countermeasure (ECM) environment.
- Astra MK-1 already in Service is better than the Chinese PL-12 used by Pakistan and China.

Astra Mark 2

Astra MK-2 is the new version of Astra MK-1 with better range and launched from an ejector.

- The Astra MK-2 has conventional dual-pulse rocket motor with improved grain quality and with solid fuel.
- It is longer in length as a result of which more quantity of fuel can be loaded resulting in better range.
- Thus Astra Mk2 missile easily exceeds the performance of the USA made AIM-120D AMRAAM & Chinese made PL-15. It has been tested to 180 km. What sets it apart is its striking affordability.
- Astra MK-2 shares most of the key features of its predecessor Astra MK-1 such as aerodynamics, design, smokeless propulsion, Ku band AESA seeker, etc., so its development process has been very fast.
- Astra MK-2 is likely to be inducted into IAF service by end of 2023 or Q1 2024 max as every system from design, body, dual pulse rocket motor, actuators, various sensors, warhead, instruments and Ku band AESA seeker has been validated and tested.
- It will also come with improved high-angle off boresight capability, improved ECCM system, will sport a way data link (first for Indian missile) & an AESA radar which will improve the first kill probability by a significant margin.



Indian Air Force Unveils New Ensign on its 91st Anniversary

Context: The Chief of the Air Staff unveiled a new Ensign for the force, as it marked its 91st anniversary, by the inclusion of the Air Force Crest in the top right corner of the Ensign, towards the fly side.

- This year, the Air Force Day parade was held at the Air Force Station, Bamrauli in Prayagraj.
- The air display held in the afternoon on the banks of the Triveni Sangam, saw a few lakh people turn up to watch the aerial manoeuvres.



About New Ensign

- Explaining the new Ensign, a statement said the IAF Crest has the **national symbol, the Ashoka lion**, on the top with the words **Satyameva Jayate in Devanagari below it**.
- Below the Ashoka lion is a Himalayan eagle with its wings spread, denoting the fighting qualities of the IAF, it stated, adding, “A ring in light blue colour encircles the Himalayan eagle with the words ‘Bharatiya Vayu Sena’ and the motto of the IAF is inscribed below Himalayan eagle in golden Devanagari.”

Key Highlights

- In the event the **Sarang helicopter** display team has gone from a four-helicopter to a five-helicopter military display team.
- In another first, the newly inducted **C-295 transport aircraft** made its maiden appearance, while the legacy **MiG-21 Bison** made what is likely its last appearance in an air display, prior to the planned phasing out by 2025.
- The **theme** for this year’s **Air Force Day** was “**IAF — air power beyond boundaries**”, which the Air chief said aptly reflected the “**inherent global reach of air power and how air power will prove decisive in future conflicts**”.
- This is the **first Air Force Day Parade to be commanded by a woman officer**, Group Captain Shaliza Dhami.
 - She is also the first woman officer of the IAF to command a combat unit.
 - The parade had an all-woman contingent of newly inducted Agniveer Vayu personnel.
- The parade also included a flight of **Garud Commandos** of the IAF for the first time, as they completed 20 years of service.
- The Air chief presented Unit Citations to four IAF Units — 16 Squadron, 142 Helicopter Unit, 901 Signal Unit and 3 Base Repair Depot for their contribution to the service.

India, Italy Sign Defence Agreement

Context: India and Italy signed a defence cooperation agreement to promote cooperation in varied defence domains such as “security and defence policy, R&D, education in military field, maritime domain awareness, sharing of defence information and industrial cooperation, including co-development, co-production and setting up of joint ventures”.

- During the discussions, **particular emphasis** was placed on **fostering defense industrial cooperation**. This includes encouraging interactions between Indian start-ups and Italian defense companies to leverage the strengths of both nations.

The agreement outlines the following key areas of bilateral cooperation:





Security and Defense Policy

India and Italy will collaborate on defining and shaping security and defense policies.

Research and Development

Joint efforts will be made in research and development projects related to defense technology and innovation.

Education in the Military Field

Both nations will promote educational exchanges and partnerships in military training and knowledge sharing.

Maritime Domain Awareness

Enhancing awareness and security in maritime domains will be a focus of the cooperation.

Sharing of Defense Information

India and Italy will exchange crucial defense information to strengthen their defense capabilities.

Industrial Cooperation

The two nations will work together on co-development, co-production, and establishing joint ventures in the defense sector.

India-Italy Bilateral Relations

India and Italy are ancient civilizations but young states. Based on common interests like rule based international order, India and Italy have enjoyed a cordial relationship.



India-Italy Bilateral Relations	
Diplomatic	<ul style="list-style-type: none"> Political relations between India and Italy were established in 1947. The two countries enjoy cordial relationships. There has been a regular exchange of visits at political and official levels between both countries. Italy has supported India's membership to export control regimes like the Missile Technology Control Regime (MTCR), Wassenaar Arrangement, and the Australia Group.
Trade and Investment	<ul style="list-style-type: none"> Italy is among India's top 5 trading partners in the EU. The balance of trade has been in India's favour since the early eighties. In 2021, the two countries inked a Strategic Partnership on Energy Transition to advanced collaboration on areas like green hydrogen and biofuels. India invited Italy to partner in 'Make in India' and 'Aatmanirbhar Bharat Abhiyan' with a focus on the areas of renewable energy, green hydrogen, IT, telecom, and space among others. Italy also joined the successful India-France led International Solar Alliance comprising over 90 members.
Cultural Exchange	<ul style="list-style-type: none"> The agreement for cultural cooperation was signed in 1976.



	<ul style="list-style-type: none"> • It was replaced by a new Agreement in July 2004. • The Cultural Exchange Programme (CEP) between Italy and India entails exchange of students in language programmes as well as other academic courses.
Scientific Cooperation	<ul style="list-style-type: none"> • An Agreement on S&T Co-operation has existed since 1978. • The Agreement envisages three yearly action plans under which a maximum of thirty joint research projects can be undertaken. • This agreement was replaced by one signed in Nov 2003. • India-Italy Science and Technology Cooperation(JSTC) has been actively promoting cooperation through joint project proposals.
Defence	<ul style="list-style-type: none"> • Defence cooperation has traditionally been an important pillar of India-Italy relations. An MOU on Defence Cooperation was signed in November 1994. • The Indian Army has a historical connection with Italy. • India also welcomed Italy's engagement in the Indian Ocean Rim Association (IORA) and Italy's new status as a Development Partner of ASEAN • The navies of both countries regularly co-operate in anti-piracy missions.

Significance

- Italy is among India's top 5 trading partners in the EU(currently fourth). The balance of trade has been in India's favour since the early eighties.
- Italy is an export-oriented economy and Europe's second largest manufacturer, for whom secure supply chains and maritime routes linking Asia to Europe and rules-based trade are important. India as a strong power in indo-pacific can use it to her advantage.
- Hedge against china: current italian government has raised concerns regarding china. India can utilise Italy to influence the EU.

Issues

Lack of separate Frame works	<ul style="list-style-type: none"> • India does not have a separate trade agreement with Italy like it has for England . engagement with Italy is under the umbrella of EU
Saddled by incidents	<ul style="list-style-type: none"> • Incidents like treatment of Italian Marines, Cancellation of VVIP chopper deal have worn down the relationship.

Radiation Detection Equipment

Context: Radiation detection equipment (RDE) will soon be installed at eight land crossing points along India's borders with Pakistan, Bangladesh, Myanmar and Nepal to check the trafficking of radioactive materials for its possible use in making nuclear devices, officials said.

- The RDE will be installed at the integrated check posts and land ports of Attari (Pakistan border), Petrapole, Agartala, Dawki and Sutarkandi (all on the Bangladesh border), Raxaul and Jogbani (Nepal) and Moreh (Myanmar).
- The Union government has taken the initiative to install the RDE so that the trafficking of radioactive materials across international borders can be checked.

Radiation Detection Equipment (RDE)

Radiation detectors, also known as **particle detectors**, are instruments designed for the detection and measurement of subatomic particles.

- Radioactive materials emit subatomic particles (i.e., electrons, protons, neutrons, alpha particles, gamma rays, and numerous mesons and baryons) as they decay.

How RDEs Work?

RDEs are equipped with the following capabilities to detect and address potential threats effectively.

- **Raise Alarms:** RDEs can raise alarms in the presence of specific types of radiation: Gamma radiation & Neutron radiation.
- **Generate Video Frames:** RDEs have the capability to generate video frames, allowing for visual inspection of suspected objects.
- **Differentiation Abilities:** RDEs can differentiate between special nuclear material and naturally occurring radiation.
 - This is essential to prevent false alarms triggered by harmless substances like fertilizers and ceramics.
- RDEs can also detect high-energy gamma isotopes, a characteristic attribute of recycled uranium, further enhancing their detection capabilities.

Phasing Out Cheetah, Chetak Helicopters From 2027

Context: The Army will start phasing out the first lot of vintage Cheetah and Chetak helicopters from 2027 on completion of their total technical life, as it looks to induct the indigenous light utility helicopters (LUHs) to replace them, according to defence sources. The armed forces have been attempting to replace the Cheetah and Chetak helicopters for well over a decade.

Key Highlights

- In November 2021, the Defence Acquisition Council approved the procurement of 12 limited series production (LSP) variants of the LUH at a cost of around ₹1,500 crore, six each for the Army and the Air Force.
 - The choppers have been designed and developed by Hindustan Aeronautics Ltd. (HAL), but the project was delayed due to issues with the autopilot.
 - The issue with the autopilot of the LUHs has been addressed and the trials by the HAL have commenced.
- The six LSP LUHs are expected to be delivered to the Army between December 2024 and June 2025.
- The bigger contract for LUHs is expected to be concluded by January 2024 and deliveries expected by 2026 onwards.
- In the interim, the Army is also looking to lease 20 utility helicopters to address the shortage.

About LUH

- LCH is the **first indigenous Multi-Role Combat Helicopter**.
- **Designed and developed by:** Hindustan Aeronautics Limited (HAL).
- **Specifications:**
 - Maximum take-off weight: 3,100 kg.
 - Can carry a useful load of 1,500 kg.
 - Maximum speed: 220 km/h, cruise speed: 200 km/h.
 - Service ceiling (maximum altitude it can reach): 6,500 meters.
- **Range:** Approximately 500 km.
- **Features:** It has potent ground attack and aerial combat capability.
 - Equipped with a 3-axis autopilot for stable and controlled flight in various conditions.
 - Features a modern glass cockpit with digital avionics and instrumentation.
 - Includes a weather radar system for real-time weather information.
 - Cockpit lighting works with night-vision goggles for low-visibility conditions.

Environment

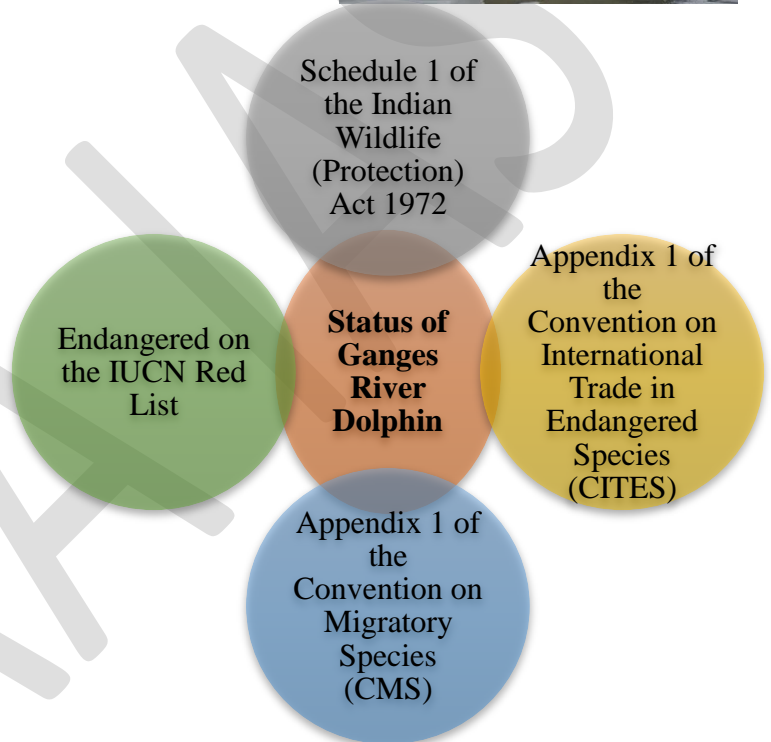
Ganga-Ghagra Basin Canals Pose a Threat to Dolphins: Study

Context: A recent publication by scientists and researchers has revealed that 19 Gangetic river dolphins had been rescued from the irrigation canals of the Ganga-Ghagra basin in Uttar Pradesh between 2013 and 2020.



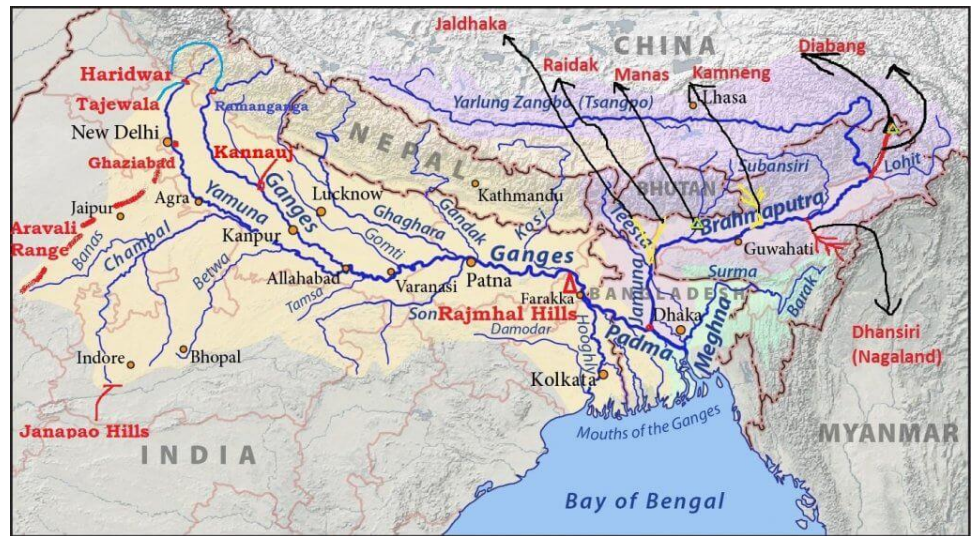
Key Highlights of Publication

- The publication, “**Rescuing Ganges river dolphins (Platanista gangetica) from irrigation canals in Uttar Pradesh, North India, 2013-2020**”, not only highlights the capture and relocation methods but also describes the behavioural and demographic details of rescued animals and locations of the canals where the animals had been trapped.
- The paper points out that 24 rescue operations had been conducted from 2013 to 2020 and five dolphins had died.
- “There were 19 successful rescue operations and 14 dolphins were identified as female and 10 as male.
- The TBL (total body length) of these dolphins was found to be between 128 cm and 275 cm.
 - The size of male dolphins ranged from 128 cm to 195 cm, whereas the females ranged from 190 cm to 274 cm.
 - Of the five dolphins that died, three had a length over 243 cm.
- The publication said **dams and barrages had severely affected this habitat** as dolphins moved into irrigation canals where they were at a risk of injury or death from a multiple factors, such as rapidly receding waters, heat stroke and human interferences.
- The researchers also pointed out the **higher proportion of females to males**, and said larger animals and pregnant females look for an easier prey base in the canal system.
- Over 70% of entrapments were reported either post monsoon or during peak winter. This suggests straying incidents are directly related to the release of water into canals during or after the monsoon.
- “The other 30% of dolphins were rescued during peak summer when water levels fall and the minimum water flow is maintained.
- Among the rescued dolphins, females were found trapped between September and May with maximum occurrence during peak winter (December to February).
- In contrast, males were mostly recorded post monsoon and during the summer season, with least occurrence in peak winter,” the paper says.
- Considering that the dolphins are found in the **Ganga-Brahmaputra-Meghna delta**, this is a huge problem to monitor this huge area and canal system.



About Ghagra River Basin

- The river begins on the southern slopes of the Himalayas in Tibet, in the Mapchachungo glaciers, at an elevation of about 3962 meters.
- The river flows south through Nepal as the Karnali River, passing through one of Nepal's most desolate and unexplored regions.
- The Seti River, which drains the western part of the catchment and joins the Karnali River in Doti north of Dunderas Hill, is a 202-kilometer-long stream that feeds this river.
- The Bheri River, which runs for 264 kilometres through the eastern part of the Catchment and converges with the Karnali River near Kuineghat in Surkhet, is another feeder stream.



Threats to Gangetic River Dolphins in Ganga-Ghagra Basin



- **Habitat Fragmentation:** Dams, barrages, and irrigation canals fragment the natural habitat of the Gangetic river dolphins. These structures disrupt the continuity of river systems and can isolate dolphin populations. As a result, dolphins may find themselves confined to the canals, limiting their access to their natural river habitats.
- **Risk of Entrapment:** The canals create artificial waterways that may lead dolphins away from their natural river channels. These dolphins can become trapped in the canals, as the structures may not provide easy exit points for them. The confined spaces of the canals increase the risk of dolphins getting stuck, unable to return to the main river.
- **Rapidly Receding Waters:** Irrigation canals are designed to transport water for agricultural purposes, and water levels can fluctuate rapidly. Dolphins may enter canals following prey or other factors and may not anticipate sudden changes in water levels. When water levels drop rapidly, dolphins can become stranded or injured.
- **Heat Stroke:** Canals in the Ganga-Ghagra Basin can be exposed to intense sunlight, leading to elevated water temperatures. Dolphins are sensitive to temperature changes, and exposure to hot water can cause heat stroke and distress, potentially leading to injuries or fatalities.
- **Human Interference:** The presence of humans in and around canals can pose threats to dolphins. Activities such as fishing, boat traffic, and watercraft collisions can harm dolphins directly or disrupt their behavior.
- **Limited Prey Base:** The canals may not provide an ideal environment for the dolphins' natural prey, which includes fish. Limited food availability in the canals can lead to malnutrition and decreased reproductive success among dolphin populations.

- **Seasonal Water Flow:** Seasonal changes in water flow, such as during the monsoon or dry seasons, can influence the movement of dolphins. Water releases into canals during the monsoon may attract dolphins, but subsequent decreases in water flow can result in entrapment.

Coexistence of Asiatic Wild Dog & Tiger

Context: Overlapping prey availability or habitat suitability could dictate a positive association between dholes and tigers, facilitating coexistence or even cooperative behaviours between the two species of carnivores, a new study has found.

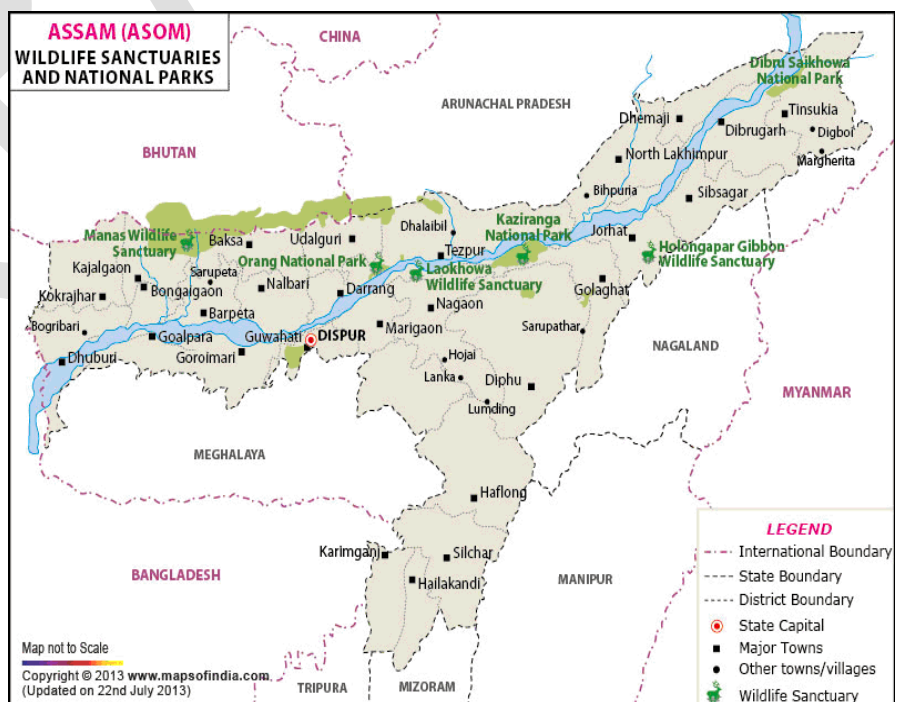
- The paper, titled “Do dholes segregate themselves from their sympatrids? Habitat use and carnivore coexistence in the tropical forest”, was published in the latest issue of *Mammalian Biology*, a peer-reviewed international scientific journal edited by the German Society for Mammalian Biology.
- Sympatric refers to animals, plant species, and populations within the same or overlapping geographical areas.
- The scientists studied the dholes in three phases from April 2017 to May 2019 in the 500-sq.km Manas National Park.
- “We aimed to assess the relative abundance index, habitat use and factors (space and time) influencing dhole co-existence with other sympatric carnivores in Manas National Park,” the study said.

Key Highlights

- The **dhole or Asiatic wild dog** (*Cuon alpinus*) is the only endangered wild pack-living canid in the **tropical Indian forests** and is considered at **high risk of extinction**.
- The study through camera traps at **Manas National Park** in Assam also revealed that the **diurnal activity of the dholes had the highest temporal overlap with leopards and the lowest with clouded leopards**.

Fragmented Population

- Operating in packs of five to 10 — larger groups of more than 30 were observed in 2004 — dholes were once widespread across southern and eastern Asia.
- The global population of adult dholes, now classified as **endangered on the International Union for Conservation of Nature’s Red List**, is estimated to be between 949 and 2,215.
- Factors such as **habitat loss, declining prey availability, persecution, disease, and interspecific competition** have contributed to the ongoing fragmentation of its populations.
- The hypotheses included **conflict with humans** on the periphery of protected areas as the **primary threat** to dholes, higher habitat utilisation where small-medium prey species such as rodents, hares, and rhesus macaques are found, and a **negative relationship between dhole habitat use and other large carnivores**.



- However, our study findings revealed a **surprising positive relationship between dhole habitat use and tiger**, rejecting the habitat exclusivity hypothesis.
 - This unexpected result challenges the assumption of antagonistic interactions between these two species and suggests a more complex ecological dynamic.
 - The positive association could be attributed to factors such as **overlapping prey availability or habitat suitability, which may facilitate co-existence or even cooperative behaviours** between dholes and tigers.

Manas National Park

It is located in the foothills of Himalayas in Assam. It is contiguous with the Royal Manas National Park in Bhutan.

- It is a national park, UNESCO Natural World Heritage site, a Project Tiger reserve, an elephant reserve and a biosphere reserve.
- Flora: It contains some of the largest remaining grassland habitats in the sub-Himalayan grassland ecosystems.
- Fauna: The Park is known for its rare and endangered endemic wildlife such as the Assam roofed turtle, hispid hare, golden langur and pygmy hog.
- The name of the park originates from the Manas River, which is named after the serpent goddess Manasa.
- The Manas River is a major tributary of Brahmaputra River, which passes through the Manas National Park.

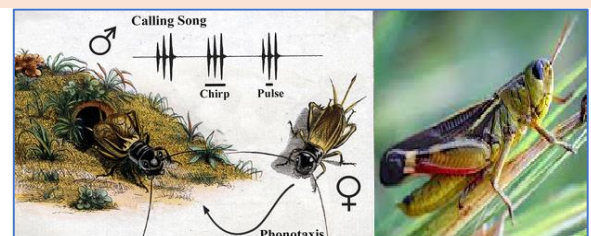
About Asiatic Wild Dog

Dhole	
About	<ul style="list-style-type: none"> • Dhole (<i>Cuon alpinus</i>) is a wild carnivorous animal and is a member of the family Canidae and the class Mammalia.
Habitat	<ul style="list-style-type: none"> • Dholes, historically widespread across southern Russia to southeast Asia, are now mainly found in south and southeast Asia, with northern populations in China. • In India, they are clustered in the Western and Eastern Ghats, central India, and northeast India, with Karnataka, Maharashtra, and Madhya Pradesh playing a crucial role in their conservation, according to a 2020 study.
Conservation	<ul style="list-style-type: none"> • Wildlife Protection Act, 1972: Schedule 2. • International Union for Conservation of Nature's Red List: Endangered. • The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES): Appendix II. • The creation of reserves under Project Tiger provided some protection for dhole populations sympatric with tigers. • In 2014, the Indian government sanctioned its first dhole conservation breeding center at the Indira Gandhi Zoological Park (IGZP) in Visakhapatnam.

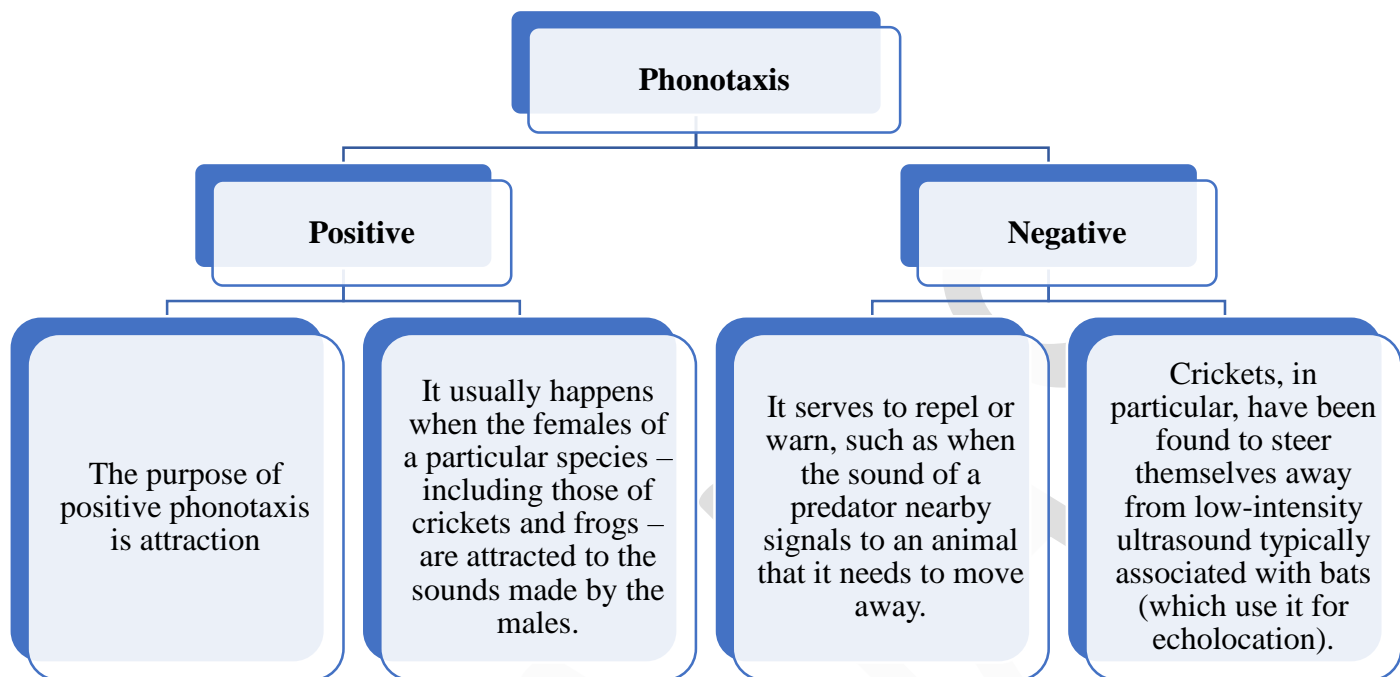
Cricket Use Phonotaxis To Attract Mates

Context: The click of crickets in the evening or frogs croaking during the monsoon are called phonotaxis (the movement by an animal in response to a sound).

- It has mostly been observed among crickets, moths, frogs, toads, and a few other creatures.



Key Highlights



- In 1984, scientists found that Mediterranean house geckos (*Hemidactylus turcicus*) use positive phonotaxis to their advantage.
- The fields that these geckos inhabited were also home to male decorated crickets (*Gryllodes supplicans*), which used species-specific sounds to attract the females from their burrows.
- The geckos recognised and followed this call until they reached the burrow, where they consumed the female crickets.

About Crickets

- Cricket, any of approximately **2,400 species of leaping insects** that are worldwide in distribution and known for the **musical chirping of the male**.
- They have mainly **cylindrical bodies, round heads, and long antennae**. Behind the head is a **smooth, robust pronotum**.
- Crickets are noticeable for their **loud calls**, especially at night. Male crickets produce this **sound by rubbing their wings against each other** to attract females.
- The females listen to these calls using **ears located on their legs** and approach the males for mating and reproduction.

2023: On Course To Be Warmest Year On Record

Context: 2023 recorded the **hottest-ever September**, following the warmest-ever two months on record — July and August 2023.

- As the world gears up for COP28, there is alarming data on the horizon.
- The year 2023 is on course to possibly becoming the warmest year in recorded history, with **temperatures nearing 1.4°C above the pre-industrial era average**.

Key Highlights

In September 2023, global temperatures reached a record high.

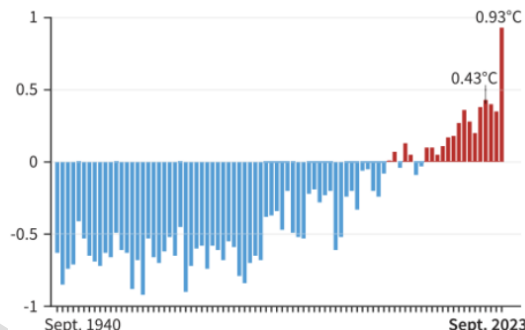


- The average surface air temperature was 16.38°C, which is 0.93°C higher than the September average between 1991 and 2020.
- Moreover, it was 0.5°C warmer than the earlier record set in September 2020.

Chart 1 shows the globally averaged surface air temperature anomalies relative to 1991–2020 for each September from 1940 to 2023.

- The month of September 2023 was approximately 1.75°C above the average temperature of September during the 1850-1900 span, which is considered the pre-industrial benchmark.
- From January to September 2023, the global surface air temperature was 0.52°C above the 1991-2020 average and 0.05°C higher than the same period in 2016, the warmest year.
- During this time frame in 2023, the world’s average temperature was 1.40°C higher than the baseline period of 1850-1900.

Chart 1 | Globally averaged surface air temperature anomalies relative to 1991–2020 for each September from 1940 to 2023

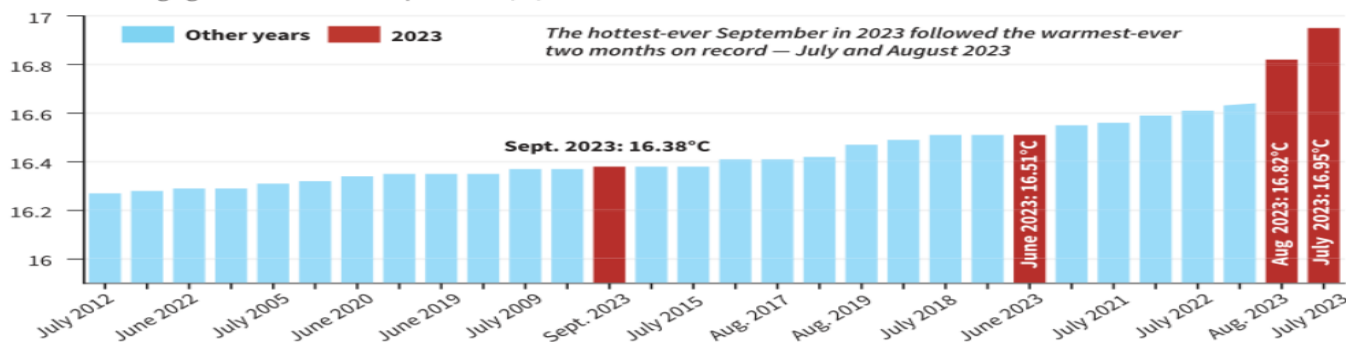


According to the Copernicus Climate Bulletin, in September 2023, the majority of **Europe experienced temperatures significantly higher than the average from 1991 to 2020.**

- A region stretching from France to Finland and extending to north-western Russia reported its hottest September ever.
- Notably, both Belgium and the U.K. faced unparalleled heatwave conditions at the start of the month.

Chart 2 shows the average global surface air temperatures for the 30 warmest months between 1940 and 2023, arranged in ascending order.

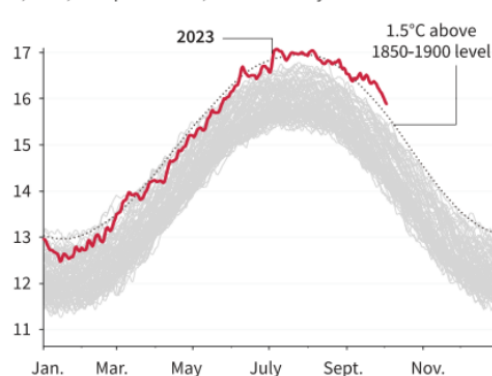
Chart 2 | Average global surface air temperatures (°C) for the 30 warmest months between 1940 and 2023



- The global mean temperature reached monthly records of 16.95°C and 16.82, in July and Aug 2023 respectively.
- The notable increase in these two months, especially compared to the July 2019 record of 16.63°C, is evident in Chart 2.
- Moreover, September 2023 is the sole September represented in this chart. The warmest September before 2023 recorded an average surface air temperature 15.88°C, which is not high enough to be included in chart 2.

Chart 3 shows the global daily surface air temperature (°C) from January 1, 1940 to September 30, 2023, plotted as a time series for each year.

Chart 3 | Global daily surface air temperature (°C) from January 1, 1940, to September 30, 2023 for each year



- The line for 2023 is highlighted. Other years are marked in grey. The thick black line represents the 1.5°C threshold above pre-industrial levels.
- For more than 80 days in 2023, the global temperature was at least 1.5° higher than pre-industrial levels. The year 2023 holds the record for the highest number of such days.

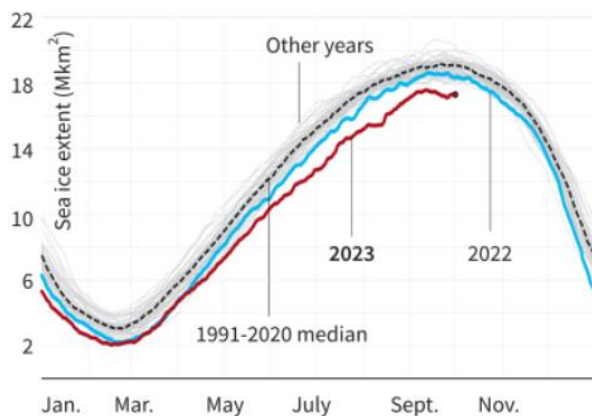
In a worrying update, the extent of **sea ice has stayed at very low levels** for this time of the year in the **Antarctic region**. Sea ice extent refers to the total area of an ocean where there is at least some sea ice present.

- Satellite records for September reveal that both daily and monthly extents have plummeted to their lowest annual peaks, with the monthly extent dropping 9% below the norm.

Chart 4 shows the daily Antarctic sea ice extent from 1979 to September 2023. The year 2023 is highlighted; the median for 1991–2020 is shown as a dotted line.

Meanwhile, the monthly average Arctic sea ice extent in September 2023 reached its annual minimum of 4.8 million km², about 1.1 million km² (or 18%) below the 1991-2020 average for September. This value is the fifth lowest in the satellite data record.

Chart 4 Daily Antarctic sea ice extent from 1979 to September 2023. The median for 1991–2020 is shown as a dotted line



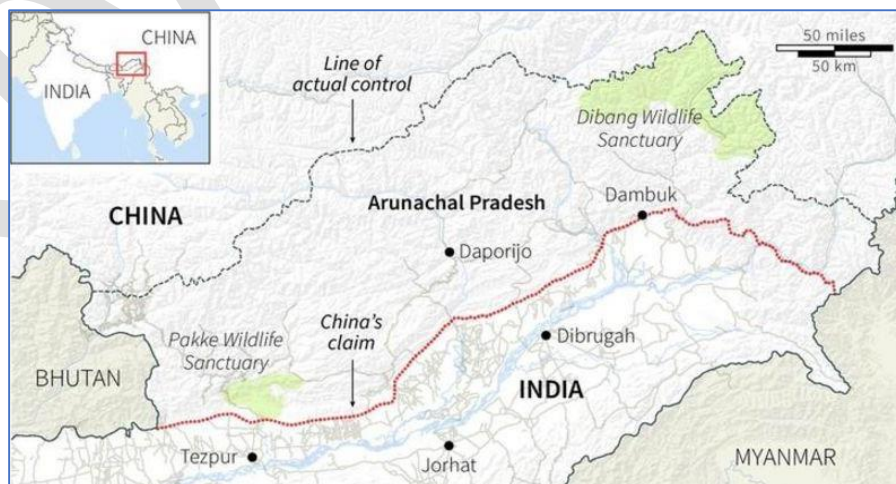
A Treasure Trove: The Forests Of Arunachal Pradesh

Context: Recently researchers, conservationists and forest officers mapped the rich biodiversity of Arunachal Pradesh in the northeast with its tiger reserves, river systems, migratory birds, varied flora and fauna and complex ecosystems.

- Field assistants, a central part of any field research project, provide unique insights into local context, culture and community.

Dibang Wildlife Sanctuary

- It is located in the Upper Dibang Valley district of Arunachal Pradesh.
- A rapid survey of tigers, co-predators and their prey in the sanctuary. During the three-year period, 11 tigers, including two cubs were recorded.
- As the sanctuary lies in the **Indo-Chinese transition zone**, the flora and fauna of this region is highly endemic and significant.
- There are over 130 species of birds, and various types of snakes.
- **Some endangered species** are the Mishmi takin (the takin is the national animal of Bhutan), the Asiatic black bear, Musk deer and the Blyth's tragopan.
 - The Mishmi takin (*Budorcas taxicolor tibeticus*) is an endangered goat-antelope native to India, Myanmar and the People's Republic of China. It is a subspecies of takin.



- The Mishmi takin lives in Northeast India and eats bamboo and willow shoots. It has an oily coat to protect it from the fog.
- According to Idu Mishmi mythology, tigers and the Idu Mishmi people are brothers; because of this belief, tigers are never hunted unless they become dangerous to life and property.
- There are extensive tracts of **primary forests** —the **density of population is very low** — and the region is rich in biodiversity. There are at least 25 species of mammals like the clouded leopard, wild dog, the Asiatic black bear and the small clawed otter, and more than 240 species of birds.
- **Type of cultivation** undertaken in the region is known as **Swidden agriculture**, or shifting cultivation or jhum cultivation, refers to the technique of rotational farming in which land is cleared for cultivation (normally by fire) and then left to regenerate for a few years.
 - **Subsistence crops** like rice, millets and vegetables are grown, and Swidden cultivation intricately binds the forest communities to their cultural identity.
 - The **Adi people** celebrate at least 13 festivals related to shifting cultivation.
- Jemethang valley is about four hours from Tawang and home to **the Monpa tribe**.

Kamlang Tiger Reserve

- Located in Lohit district of Arunachal Pradesh, this Tiger reserve was established in 1989 and covers an area of approximately 783 square kilometers.
- Kamlang is contiguous to the Namdapha Tiger Reserve.
- The sanctuary's topography is unique due to its rough terrain, which is covered in dense tropical and subtropical forests.
- It is surrounded by the Lang River on the Northern side and Namdapha National Park on the Southern side.
- It is home to all four big cats (tiger, leopard, clouded leopard and snow leopard).
- The Kamlang Tiger Reserve has several species of hornbills. Rufous-necked hornbills are common and Wreathed hornbills visit in the winters. The Glaw Lake, considered sacred by the Mishmis.
- Several tribal groups, including the Miju Mishmis, Tangsas, Lisus, and Chakmas, reside in the Kamlang Tiger Reserve. These people rely on natural resources for survival as they live close to the sanctuary's perimeter.



Pakke Tiger Reserve

- Pakke Tiger Reserve, is a Project Tiger reserve in the East Kameng district of Arunachal Pradesh in Northeast India.
- It falls within the Eastern Himalaya Biodiversity Hotspot.
- It is bounded by Bhareli or Kameng River in the west and north, and by Pakke River in the east.
- Boundaries: East – Papum Reserve Forest; South – Assam's Nameri National Park; West – Doimara Reserve Forest and Eaglenest Wildlife Sanctuary; North – Shergaon Forest Division
- The main perennial streams in the area are the Nameri, Khari and Upper Dikorai. West of Kameng River are Sessa Orchid Sanctuary and Eaglenest Wildlife Sanctuary.
- It was known as Pakhui Tiger Reserve, but renamed in April 2001 by the Governor of Arunachal Pradesh. It has won India Biodiversity Award 2016 in the category of 'Conservation of threatened species' for its Hornbill Nest Adoption Programme.

- It is home to over 2000 species of plants, 300 species of birds, 40 species of mammals, 30 species of amphibians and 36 species of reptiles. Many species of the flora and fauna are globally threatened, and PTR is one of the last remaining strongholds left for these species.
- It is known for its amazing sightings of four resident hornbill species.

Important Indigenous tribes of Arunachal Pradesh

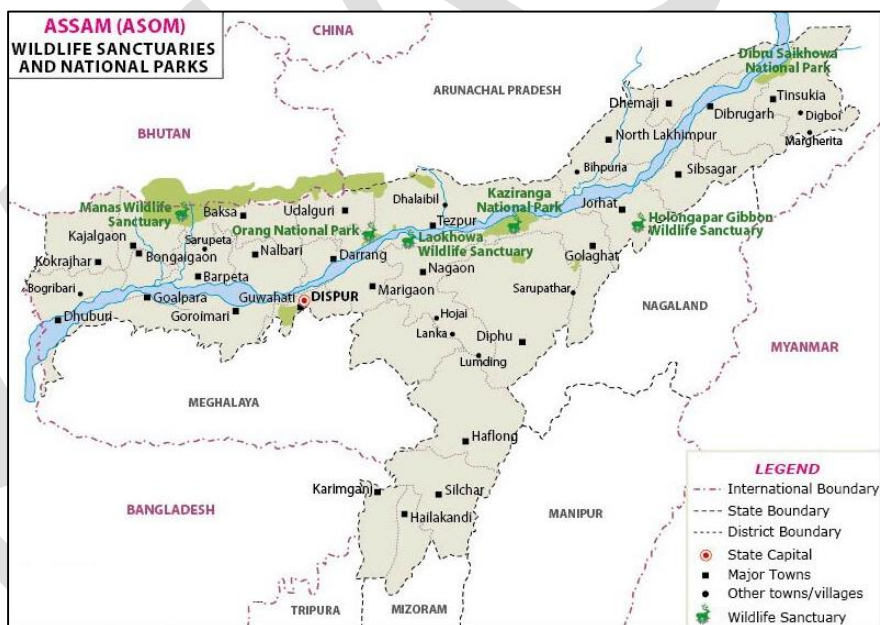
Kman Mishmis	Nyishi	Monpa	Apatani or Tani	Adi people	Tangshang people or Tangsa Naga
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Kaziranga Sanctuary Reopens

Context: The Kaziranga National Park and Tiger Reserve reopened with a literary tribute to a British-era forest officer who rid its name of any hunting connotations.

Key Highlights

- The 1,300-sq.km reserve, the world’s safest address for the one-horned rhinoceros, opens annually for tourists in October.
- The plan for a nature and wildlife-specific library at the Centenary Convention Centre in the Kohora area of Kaziranga, could not materialise in 2020 because of COVID outbreak.
- Named after Patrick D. Stracey, the library was.
 - Stracey, who was born in Andhra Pradesh’s Kakinada, served as an Indian Forest Service officer in Assam.
 - He played a key role in renaming the Kaziranga Game Sanctuary as a wildlife sanctuary in 1950.
 - He also established the Assam Forest School, a training institute catering to the northeastern region.
- “The PD Stracey Library offers readers books and magazines on the world of nature apart from merchandise to take memories of Kaziranga home. The initiative is a tribute to a legendary forest officer.



Kaziranga Wildlife Sanctuary	
Location	<ul style="list-style-type: none"> • It is located in the State of Assam and covers 42,996 Hectare (ha). • It is the single largest undisturbed and representative area in the Brahmaputra Valley floodplain.
Legal Status	<ul style="list-style-type: none"> • It was declared as a National Park in 1974. • It has been declared a tiger reserve since 2007. <ul style="list-style-type: none"> • It has a total tiger reserve area of 1,030 sq km with a core area of 430 sq. km.
International Status	<ul style="list-style-type: none"> • It was declared a UNESCO World Heritage Site in 1985. • It is recognized as an Important Bird Area by Bird Life International.



Important Species Found	<ul style="list-style-type: none"> It is the home of the world’s most one-horned rhinos. <ul style="list-style-type: none"> Pobitora Wildlife Sanctuary has the highest density of one-horned rhinos in the world and second highest number of Rhinos in Assam after Kaziranga National Park. Much of the focus of conservation efforts in Kaziranga are focused on the ‘big four’ species— Rhino, Elephant, Royal Bengal tiger and Asiatic water buffalo. <ul style="list-style-type: none"> The 2018 census had yielded 2,413 rhinos and approximately 1,100 elephants. As per the figures of tiger census conducted in 2014, Kaziranga had an estimated 103 tigers, the third highest population in India after Jim Corbett National Park (215) in Uttarakhand and Bandipur National Park (120) in Karnataka. Kaziranga is also home to 9 of the 14 species of primates found in the Indian subcontinent.
Flora	<ul style="list-style-type: none"> It is a mix of eastern wet alluvial grasslands, semi-evergreen forests and tropical moist deciduous forests. It is primarily famous for its dense and tall elephant grasses intermixed with small swamplands. It also includes an abundant cover of water lilies, water hyacinths and lotus.
Rivers and Highways	<ul style="list-style-type: none"> The National Highway 37 passes through the park area. The park also has more than 250 seasonal water bodies, besides the Diphlu River running through it.

Estivation: Summer Urge to Nap

Context: Some animals feel the need to sleep to beat the heat, but for a whole season. This is called estivation (or aestivation).

- It is a biological phenomenon whereby the animal enters a long period of dormancy, or inactivity, in response to high temperature or maybe even drought-like conditions.
- It is a survival strategy that helps the animal conserve energy and water in a difficult time.
- During estivation, the animal often seeks shelter in a cool underground burrow, crevice or cocoon, where it will remain in a state of reduced metabolic activity, which in turn reduces the rate at which the body consumes energy.
- Estivation can also be a way to avoid desiccation – extreme dryness of the skin – and also lower the risk of being preyed on by a predator.

Example

- The West African lungfish (*Protopterus annectens*) burrows into the mud of a drying water body and secretes a cocoon of mucus around itself during a drought.
- Desert tortoises (*Gopherus agassizii*) dig burrows and retreat into them in hot summer months.
- Many land snails seal themselves in their shells with a mucous plug, and stay inactive until the conditions outside improve.

Aestivation vs Hibernation

Hibernation	Aestivation
Also known as “winter sleep”.	Also known as “summer sleep”.
Longer duration.	Short duration.
Animals look for a warm place to sleep.	Animals look for a moist, cool and shady place to sleep.
It prevents any internal body damage due to low temperatures.	It prevents excessive water loss and internal body damage due to high temperatures.
Hibernation takes place in warm and cold-blooded animals like bats, mammals, birds, etc.	Aestivation takes place in cold-blooded animals like snails, earthworms, frogs, etc.

Paintbrush Swift Butterfly

Context: Butterfly makes a rare call in Himachal. The paintbrush swift (*Baoris farri*) butterfly has been photographed for the first time in Himachal Pradesh.



- Paintbrush swift is rarely found in the State, home to 25% of the butterfly species found in India; 120 species of butterflies have been documented by the **Wild Bhattiyat Project in 2022**.
- It has been noticed first time in Himachal Pradesh's **Chamba district**.
- The paintbrush swift (*Baoris farri*), a butterfly species of the Hesperidae family, was sighted and photographed in the second week of October during a field survey conducted under the Wild Bhattiyat Project initiated by the Bhattiyat Forest Range of the Dalhousie Forest Division of the Himachal Pradesh Forest Department in 2022.
 - Since the launch of the project, the department has so far documented 120 butterfly species.
- The species has never been photographed in Himachal Pradesh since its discovery in 1878.
- We have recorded and documented various uncommon butterfly species like the anomalous nawab, blank swift, tailed jay, siren, etc., which are frequently sighted, but the paintbrush swift has been sighted and photographed for the first time in the lower hills of the **Dhauladhar mountain range**.

About Paintbrush Swift Butterfly

- The paintbrush swift is **identified based on** two separated spots in the upper forewing cell.
- Other closely related species like the blank swift have no cell spot while the figure-of-eight swift has two conjoined cell spots. The species' larvae feed on bamboo and some other grass species.
- The paintbrush swift's **habitat distribution** is common in northeast, central and south India, and rare in Uttarakhand.
- This species is legally protected in India under **Schedule IV of the Wildlife (Protection) Act, 1972**.

India & Green Hydrogen

Context: India's plans to produce so-called 'green hydrogen' — where the gas is produced without resulting in fossil fuel emissions — may end up worsening pollution if proper checks and balances are not in place, according to a study by environmental and energy think-tank, Climate Risk Horizons (CRH).

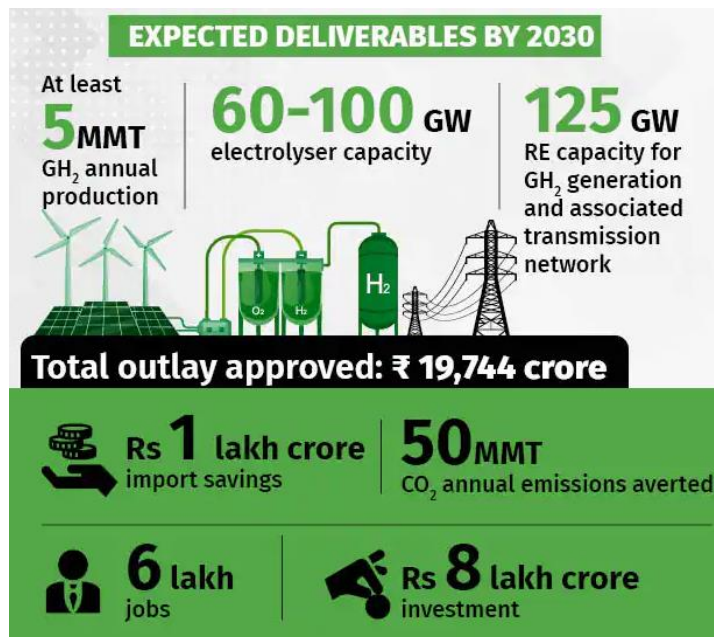
Key Highlights

- The National Green Hydrogen Mission, piloted by the Ministry of New and Renewable Energy (MNRE), expects to manufacture five million tonnes by 2030.
- This would require the installation of renewable energy capacity worth 125 GW and the use of 250,000 gigawatt-hour units of power, equivalent to about 13% of India's present electricity generation.
- As of August 2023, India's total renewable energy (RE) capacity stood at 131 GW.
- The 2030 green hydrogen plan thus envisages adding an equivalent RE capacity by 2030. This is over and above the 500 GW of RE capacity that India has committed to install by 2030 as part of the Paris Agreement.
 - To put that in perspective, India installed only 15 GW of new solar and wind capacity in 2023, against the 45 GW per year needed to reach the 2030 target.

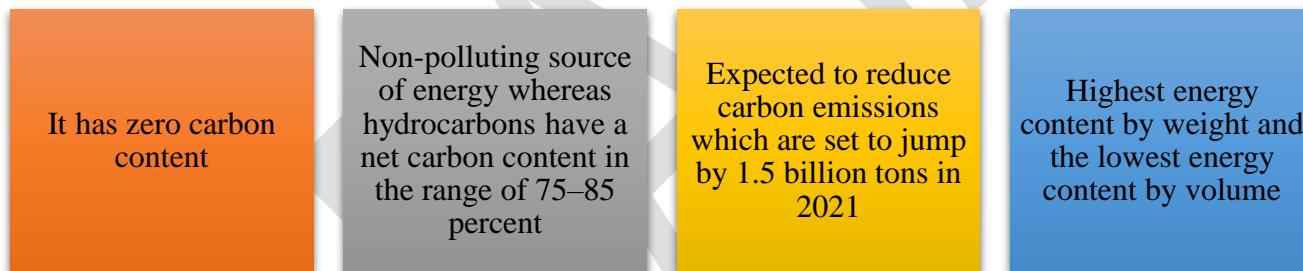
National Green Hydrogen Mission

- **Aim:** To make India a 'global hub' for using, producing and exporting green hydrogen.

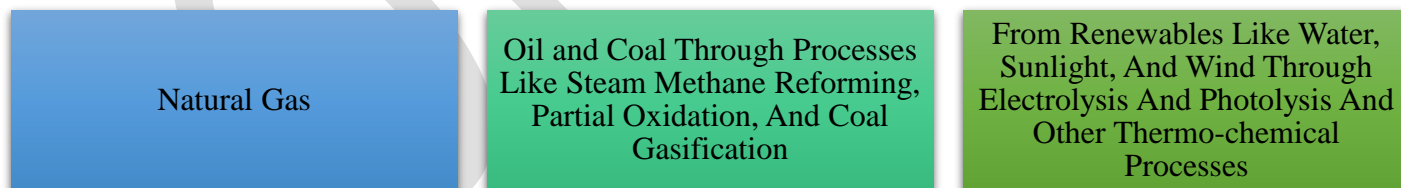
- It is a program to **incentivise** the commercial production of green hydrogen and make India a **net exporter** of the fuel.
- The **Mission will facilitate** demand creation, production, utilization and export of Green Hydrogen.
- **Objective:**
 - Developing green hydrogen production capacity of at least 5 MMT (Million Metric Tonne) per annum, alongside adding renewable energy capacity of about 125 GW (gigawatt) in India by 2030.
 - It aims to entail over Rs 8 lakh crore of total investments and is expected to generate six lakh jobs.
 - It will also lead to a cumulative reduction in fossil fuel imports by over Rs 1 lakh crore and an abatement of nearly 50 MT of annual greenhouse gas emissions.



How Is Hydrogen Energy Better?



It is the most abundantly available element on earth, but commercially viable Hydrogen can be produced from hydrocarbons including



Using Coal-Based Power

The MNRE has defined green hydrogen as hydrogen produced in a way that emits no more than two kg of carbon dioxide per kg of such hydrogen.

- Currently, producing one kg of ‘grey hydrogen’, as it is known, ends up emitting nine kg of carbon dioxide.
- “While a detailed methodology is awaited, the definition as it stands leaves a lot to interpretation,” said CRH’s chief executive Ashish Fernandes, in the report released.
- The main concern is that if electrolyzers were run 24x7, they would be expected to operate even at night when no solar power is available.

Where Will The Electricity Come From?

- If it comes from India’s coal-powered grid in general, it will in fact increase carbon emissions, since about 70% of the electricity on the grid is coal-generated — more in non-daylight hours when solar generation is nil,” the report notes.
- The vast majority of projects have not disclosed their source of electricity.
- It is also not clear if those few projects that have committed...to meet 100% of their requirement from these sources.

Developed Countries To Overshoot Carbon Emissions Goal

Context: Developed countries — responsible for three-fourths of existing carbon emissions — will end up emitting 38% more carbon in 2030 than they have committed to, going by current trajectories, shows a study published last week by the Delhi-based think tank Council for Energy Environment and Water (CEEW).

Key Highlights

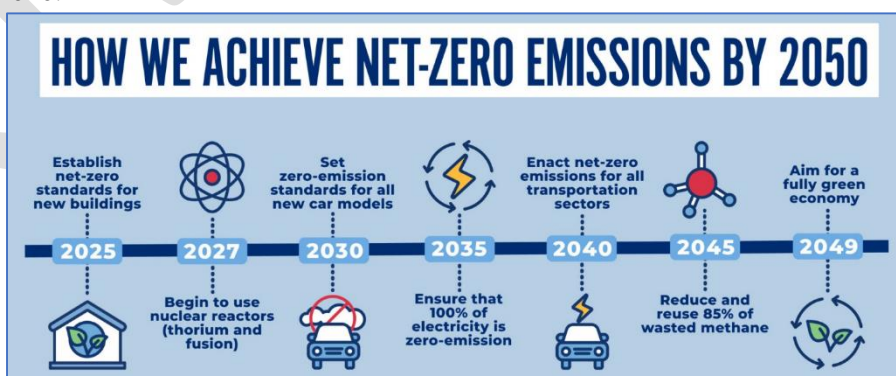
- The study, which comes ahead of the 28th Conference of Parties (COP-28) of the UN Framework Convention on Climate Change to be held in Dubai in November and December, shows that 83% of this overshoot will be caused by the U.S., Russia, and the European Union.
 - At COP-28, countries are expected to give an account of their Nationally Determined Contributions (NDCs), which are their commitments to the UN on emission cuts.
- The CEEW study noted that the NDCs of developed countries already fall short of the global average reduction of emissions to 43% below 2019 levels that is needed to keep temperatures from rising above 1.5 degrees Celsius. Instead, developed countries’ collective NDCs only amount to a 36% cut.
- For a fighting chance at keeping warming below critical tipping points, decades of negotiations have obliged developed countries to lead global efforts to reduce greenhouse gas emissions with legally binding targets.
- Collectively, developed countries were to reduce emissions by 5% from their 1990 levels between 2008 and 2012, and by 18% during 2013 to 2020.
- Several countries have committed to achieving net zero carbon emissions by 2050.
 - Doing so would require steady measurable cuts every decade until that year.
- As an intermediate objective, countries presented data to the UN on their projected cuts until 2030.
 - To keep temperatures below 1.5 degrees Celsius, developed countries need to cut emissions to 43% below their 2019 level.
- However, the CEEW study found that based on their current emissions trajectories, their cuts would likely amount to only 11% by 2030.

Missing targets

Developed countries are projected to emit 38% more carbon in 2030 than they have committed to

Party	2030 NDC target	Projected 2030 reduction
U.S.	50%	22%
Russia	70%	48%
Japan	46%	45%
U.K. and Northern Ireland	68%	56%
Canada	40%	30%
EU	55%	44%
Norway	55%	57%
Kazakhstan	15%	14%

■ Japan and Kazakhstan are set to miss their target by one percentage point



- Except for two countries — Belarus and Norway — none of the developed countries seem to be on the path to meet their 2030 targets, though Japan and Kazakhstan are close, and are expected to miss their targets by only a single percentage point.

A New Mushroom Species from the Western Ghats

Context: A tiny, fragile-looking mushroom sporting a honey-yellow ‘cap’ found on the campus of the Jawaharlal Nehru Tropical Botanic Garden and Research Institute (JNTBGRI) at Palode in Thiruvananthapuram, Kerala has been identified as a new species.

- Turning the spotlight once again on the remarkable Western Ghats biodiversity, the discovery also gives fresh impetus to the study of the region’s fungal diversity.



Key Highlights

- The new species belongs to the genus *Candolleomyces*.
- The new species has been named *Candolleomyces albosquamosus* - ‘albosquamosus’ for the white woolly scale-like structures on its pileus or cap.
- Delicate in build, the mushroom grows to a height of just about 58 mm.
- Seven species of the genus *Psathyrella* reported earlier from India are now recognised as *Candolleomyces*.
- The discovery of a new species of the genus *Candolleomyces* in India is special given that there are only 35 species in this genus worldwide.

Ecological Significance

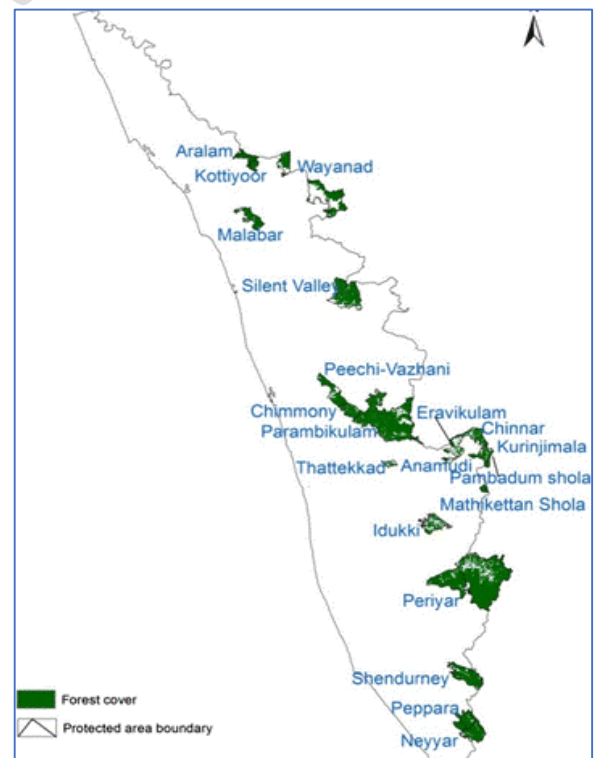
- Mushrooms like *Candolleomyces albosquamosus* play a crucial role in decomposing plant litter in tropical forests, contributing to the ecosystem’s nutrient cycling.
- The discovery highlights the ecological importance of secondary saprophytic fungi in the forest ecosystem.

‘Maoists’ open fire at Aralam Wildlife Sanctuary

Context: Suspected Maoists reportedly opened fire at the Aralam Wildlife Sanctuary in Kannur in Kerala. The attack occurred inside the sanctuary, near Chavachi.

About Aralam Wildlife Sanctuary

- Aralam Wildlife Sanctuary is the **northernmost wildlife sanctuary** of Kerala (in the Kannur District).
- It is **55 km² in area** and located on the western slope of the **Western Ghats**.
- It was established in 1984 with its headquarters near Iritty.
- The sanctuary **borders** Wayanad-Brahmagiri, Wayanad’s north slopes, Karnataka’s Brahmagiri Wildlife Sanctuary, and Coorg’s forests, with Katti Betta as its highest peak.
- It is nestled amidst the serene **Cheenkanni River** and the beautiful adjoining forests of Brahmagiri Hills.
- This is the **only protected area** of the West Coast Tropical Evergreen forest of Dipterocarpus-Mesua- Palaquium type.
- The presence of **Malabar Slender Loris** (*Loris lydekkerianus malabaricus*) with other five primate species is one of the main highlights of the sanctuary.



- Aralam Wildlife Sanctuary is listed as one of the “**Important Bird Area (IBA)**” by BirdLife International in 2003.
- The sanctuary is home for One Red data book species **Nilgiri Wood- Pigeon Columba elphinstonii**.

The Expansion Of Settlements Into Flood-Prone Areas

Context: India’s urban areas have been flooding more and more often, destroying lives and livelihoods. Yet, according to a **study led by the World Bank** and published in *Nature* on October 4:

- Flood risk in many cities is rising because they are expanding into flood-prone areas.
- According to the paper, since 1985, human settlements in flood-prone areas have more than doubled.
- Experts say the findings spotlight the risk of unsustainable urbanisation in India.
- The study also found that middle-income countries like India have more urban settlements in flood-prone zones than low- and high-income countries.

THE GIST

- India’s urban areas have been flooding more and more often, destroying lives and livelihoods. Yet, according to a study led by the World Bank and published in *Nature* on October 4, flood risk in many cities is rising because they are expanding into flood-prone areas.
- The risks are disproportionately higher for those living in informal structures.
- There has been a rise in eco-tourism resorts on forest land and the construction of large structures, including government buildings and even religious structures, on rivers’ floodplains.

How Is India At Risk?

India isn’t among the 20 countries whose settlements are most exposed to flood hazards, but it was the **third highest contributor to global settlements**, after China and the U.S., and also third — after China and Vietnam — among countries with new settlements expanding into flood-prone areas, all from 1985 to 2015.

- Researcher at the Indian Institute of Human Settlements (IIHS), Bengaluru, said this means India is at significant risk of flood-related problems that could worsen in the coming years if the country wasn’t careful.
- A geoscientist at WRI India, said the data in the study – from a database called EM-DAT – may not have the “granularity required for studying flood-prone areas in our urban areas and peri urban areas.”
- At the heart of flood-related hazards is “where we build or expand our cities,” Mr. Palanichamy had written in 2022.
 - He had estimated that the Bengaluru floods that year cost the city ₹225 crore.
 - In 1901-2022, the city’s population grew from around 1.6 lakh to more than a crore.
 - To accommodate these people, the city expanded — but new localities overlooked the local “topography”.

Who Are Most Affected?

Risks are disproportionately higher for those living in informal structures. The geography of environmental risk is also the geography of informal low-income housing. Informal housing in cities is on “land that is vacant and less desirable, so that they are not immediately driven off.” So they often lie in “low-lying, flood-prone areas”.

- An important reason why urbanisation has expanded into flood-prone areas is that “we don’t have the governance processes to say, ‘Look, this kind of development is environmentally unsustainable.’”
- When environmental regulations are applied to new constructions, they are often applied only to big infrastructure projects and not to medium- and small-scale modifications of localities.
- This contradicts the notion that certain localities are more flood-prone and that flooding and flood-risk are locality-level issues.
- People commonly violate existing government regulations. He invoked the examples of a rise in eco-tourism resorts on forest land and the construction of large structures, including government buildings and even religious structures, on rivers’ floodplains.

What Is To Be Done?

As cities continue to expand, that we can no longer avoid expanding into flood-prone areas. “Market forces tend to push expansion into flood-prone areas.”

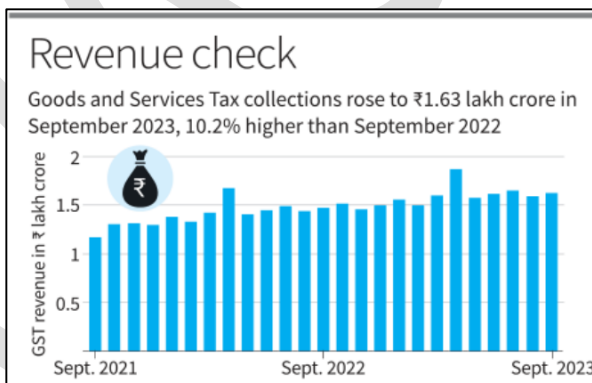
- **Recognising** what these areas are and that we are actually expanding into them is the first step towards **sustainable urban planning** that addresses the risks.
- Some forms of adaptation are necessary, and they need to **differentiate between low-income residents and unauthorised structures** erected for the elite.
- Every city needs to do a **proper scientific mapping** of the flood prone areas.
- Urban governments need to make **housing** in such areas more **flood-resilient** and **protect low-income housing**.
 - **Example:** riverside settlements that use stilt houses, like those used by the Mishing and the Miyah communities along the Brahmaputra.

Economy

Gross GST Revenue Growth Slowed to 10.2% in Sept

Context: Growth in India’s gross Goods and Services Tax (GST) revenues slowed to a 27-month low of 10.2% in September, from around 10.8% in the previous two months. However, collections improved 2.3% over August revenues to touch ₹1,62,712 crore.

- Revenues from domestic transactions, including services imports, were 14% higher than the tax collected from these sources during September 2022.
- This is the fourth time that the gross GST kitty has crossed the ₹1.60 lakh crore mark in 2023-24, the Finance Ministry said.



Key Highlights

- GST inflows from goods imports had recovered from two months of contraction to grow 3% in August, but shrank again in September, albeit by a fraction.
 - GST revenues from goods imports dropped 0.11% from last September.
- The last time that GST revenues grew at a slower pace was in June 2021, when collections rose a mere 2% amid the second wave of the COVID-19 pandemic.
- The revenues in that month were based on domestic transactions between June 5 and July 5, since taxpayers were given various relief measures in the form of waivers and reduction in interest on delayed filings for firms with an aggregate turnover up to ₹5 crore.
- Last month’s GST revenues, based on transactions carried out in August, included Central GST (CGST) collections of ₹29,818 crore, State GST (SGST) of ₹37,657 crore, and Integrated GST (IGST) of ₹83,623 crore, which included ₹41,145 crore collected on goods imports.
- GST compensation cess inflows were ₹11,613 crore, including ₹881 crore collected on the import of goods.
- “The government has settled ₹33,736 crore to CGST and ₹27,578 crore to SGST from IGST. The total revenue of Centre and the States in the month of September, 2023 after regular settlement is ₹63,555 crore for CGST and ₹65,235 crore for the SGST,” the Finance Ministry said.

Manipur Highest, Bihar Sees Contraction

- Revenues in strife-torn Manipur, which recovered from a contraction in August, recorded the highest growth among States in September, rising 47%.

- GST revenues in Telangana grew 33%, followed by Jammu and Kashmir (32%), Arunachal Pradesh (27%), Tamil Nadu (21%), and Karnataka (20%).
- As many as 17 States recorded revenue growth below the national average of 14%, while 12 States reported 14% or higher growth. States seeing a slower uptick included Gujarat, Uttar Pradesh, Kerala, Haryana, Odisha, and Jharkhand, with Delhi, Meghalaya, and Assam recording the weakest growth of 2%, followed by West Bengal (3%).
- Bihar was the only State to report an actual contraction in GST collections in September, with revenues down 5%.
- The Union Territories of Lakshadweep, and Andaman and Nicobar Islands also clocked a sharp decline in revenues, which fell 45% and 30% year-on-year, respectively.
- By contrast, revenues shot up 81% in the Union territory of Ladakh.

Kerala Registers 12% Growth In GST Revenues In Sept.

- Kerala has registered 12% year-on-year growth in Goods and Services Tax (GST) revenue in September.
- The collection for a given month pertains to the consumption of goods and services in the previous one. The State has recorded steady growth in GST revenues in the first and second quarters of the 2023-24 fiscal compared to the corresponding period last year.
- In the first quarter of the 2023-24 fiscal, Kerala had recorded 12% growth in GST revenues in April 2023, 11% growth in May and 26% growth in June compared to same months in 2022.
- In the second quarter, the State had recorded 10% growth in GST revenues in July and 13% growth in August compared to the same months in 2022. And as per the latest figures, 12% in September.
- The collection for July 2023 stood at ₹2,381 crore against ₹2,161 crore. The collection for August 2023 stood at ₹2,306 crore. It was ₹2,036 crore in August 2022.

Centre Unveils Tradeable Green Credit

Context: Special scheme to allow individual or entity to earn Green Credit, trade it on a dedicated exchange.

- Green Credit refers to a unit of an incentive provided for specified activities that deliver a positive impact on the environment; to obtain credits, one needs to register the activity via a website.
- “A Green Credit programme is being launched at the national level to leverage a competitive market-based approach for incentivising environmental actions of various stakeholders,” the Environment, Forest, and Climate Change Ministry said in a notification.
- This programme is a follow-up action of the ‘LiFE’-(Lifestyle for Environment) campaign. The notification added that the new programme is a voluntary one.

Trading green

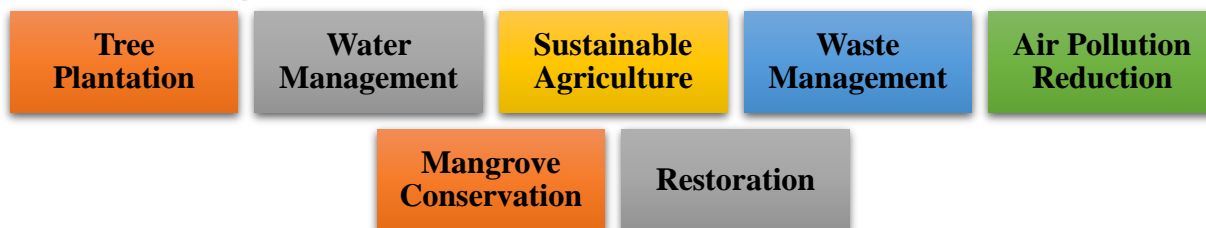
The programme will cover 8 types of activities, including tree plantation, water management and sustainable agriculture



- Applicant shall register activity via web site
- Activity will then be verified by a designated agency
- Based on its report, administrator shall grant credit certificate

Key Highlights

This programme will cover eight types of activities



- To get the Green Credit, one needs to register the activity with the administrator through a website.
- The activity will then be verified by a designated agency and based on its report, the administrator shall grant the applicant a certificate of Green Credit.
- The **calculation of Green Credit** shall be based on equivalence of resource requirement, parity of scale, scope, size, and other relevant parameters to achieve the desired environmental outcome.
- A Green Credit Registry will also be included.
- The administrator will establish and maintain a trading platform.
- The programme would incentivise environmentally-positive actions via a market-based mechanism and generate Green Credit, which shall be made available for trading on a domestic market platform.
- The **initiative aims** to encourage industries, companies, and other entities meet their obligations under any law that is in force for the time being. However, the Green Credit generated or procured to fulfil any obligation, in compliance with any law, shall not be tradeable.
- The notification clarified that the Green Credit programme is **independent of the carbon credit provided under the Carbon Credit Trading Scheme, 2023** under the Energy Conservation Act, 2001.
- An environmental activity generating Green Credit may have climate co-benefits, such as reduction or removal of carbon emissions... and may get carbon credit.

Urban Unemployment Rate Drops To 6.6% In Q1

Context: The Periodic Labour Force Survey (PLFS), carried out by the National Sample Survey Office (NSSO), has reported that unemployment rate in urban areas of the country has shown a decrease during the period April-June 2023.

Key Highlights

- For men, **urban unemployment** decreased from 7.1% to 5.9% and for women, it decreased from 9.5% to 9.1%, show NSSO data; the labour force participation rate in the urban areas increased from 47.5% to 48.8%.
- Similarly, the **labour force participation rate (LFPR)** for persons aged 15 and above and the worker-population ratio (WPR) have also **improved** during the period.
- This national survey processed details from 5,639 first-stage sampling units (FSUs) and 1,67,916 people from 44,190 urban houses.
- The **LFPR in urban areas** increased from 47.5% in April-June 2022 to 48.8% in April-June 2023. While it hovered around 73.5% for men during this period, for women, the LFPR increased from 20.9% to 23.2% during this period, the Ministry of Statistics and Programme Implementation said in a release.
- The **WPR in urban areas increased** from 43.9% in April-June 2022 to 45.5% for persons aged 15 and above. For men, it increased from 68.3% to 69.2% and for women, it increased from 18.9% to 21.1% during this period.

Decreasing Trend

The PLFS claimed a decreasing trend in unemployment rate (UR) for persons aged 15 and above.

“UR in urban areas decreased from 7.6% in April-June 2022 to 6.6% in April-June 2023 for persons of age 15 years and above,” the PLFS report said.

For men, it decreased from 7.1% to 5.9% during this period and for women, it decreased from 9.5% to 9.1%.

Key Indicators

- The Centre also claimed improvement in key labour market indicators in urban areas compared with those in pre-pandemic period (April-June 2018 to October–December 2019).
- The LFPR ranged from 46.2% to 47.8% during the pre-pandemic period and in the latest report it was 48.8%.
- The WPR was between 41.8% and 44.1% before the pandemic and now it is 45.5%.
- The unemployment rate ranged between 7.8% and 9.7% during the pre-pandemic period and at the latest survey it was 6.6%, which, according to the Centre, is lower than the unemployment rates observed in the quarters covered in the pre-pandemic period.

AI To Help Construction Industry Face Challenges

Context: The emergence of new technologies such as Artificial Intelligence (AI), 3D printing, and robotics, would transform the construction industry, one of the oldest and largest industries in the world and help it address multiple challenges effectively, according to a white paper by an advisory firm.

Key Highlights

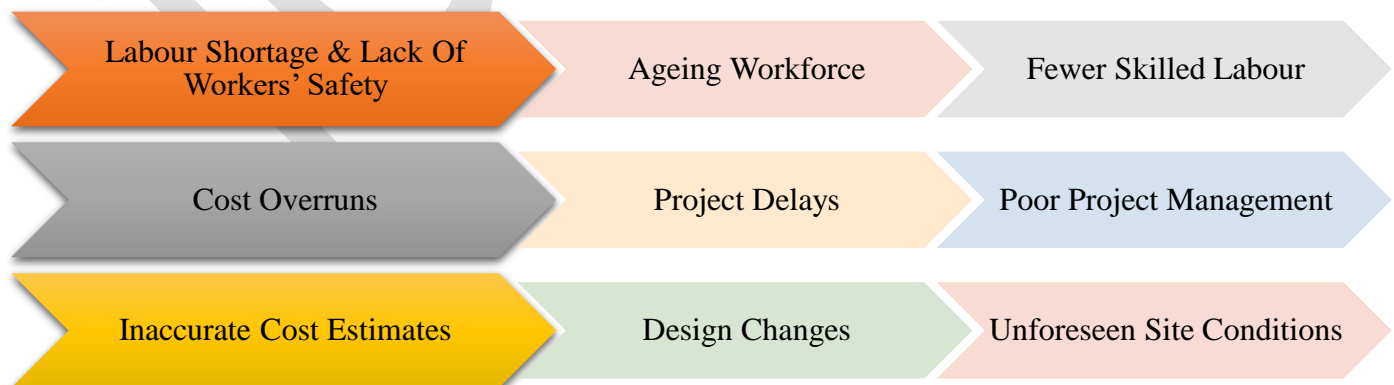
The construction industry which contributes to 13% of global GDP, is expected to grow significantly in the coming years — at an estimated CAGR of 11% — from \$8.2 trillion to \$17 trillion by 2029.

- This growth is driven by certain factors such as



- White paper said, “AI is poised to play a pivotal role in reshaping the sector by addressing a range of challenges and delivering significant advantages.
 - To meet industry needs, AI has the potential to accelerate growth and add value at all project stages, from design and financing to construction, operations, and business model changes.”
 - AI is estimated to boost industry productivity by increasing it by 1% to 1.5% annually.

Challenges Faced By Construction Industry





Apparel And Textile Production Witness Steep Declines

Context: India’s garment manufacturing output shrank by more than a fifth (22.6%) year-on-year in the April-August period in the wake of a **steep decline in exports and depressed demand both domestically and globally**. Manufacturers said textiles also witnessed a **decline of almost 2%** in the same period compared with last year.

- Data available with the Confederation of Indian Textile Industry (CITI) on the Index of Industrial Production for textiles and clothing shows that **textile production improved slightly (1.6%) in August, though there was a decline in the cumulative index for April-August**.
- While “wearing apparel” (meaning garments) index dropped 17.1% in August and 22.6% during April-August 2023 as against the corresponding period last year, textile exports grew 11.1% in September 2023 over the previous year while **apparel exports registered a decline** of 11.2% last month.

Key Highlights

There are several reasons for this decline in manufacturing and exports.

- The **Quality Control Order** recently introduced by the government, which mandates a Bureau of Indian Standards (BIS) certification for man-made fibre, including those that are imported, had led to steep decline in exports as textile manufacturers were unable to source these raw materials as per the government’s specifications in the international markets.
- Most garment exporters had **reduced workers’ shifts**, or done away with overtime production. “There is **production loss but no job loss**.”
- The recent announcement of a **drawback in duty increases** was expected to help revive exports.
- Clothing Manufacturers Association of India chief mentor Rahul Mehta said: “The **domestic market is slow** since mid-March”.

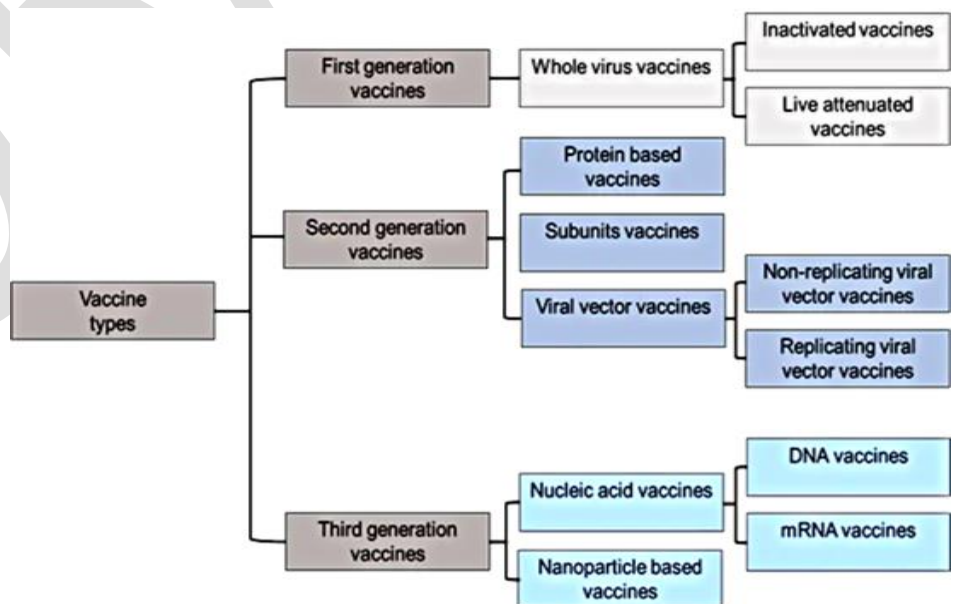
Science & Technology

Medicine Nobel 2023 & mRNA COVID Vaccines

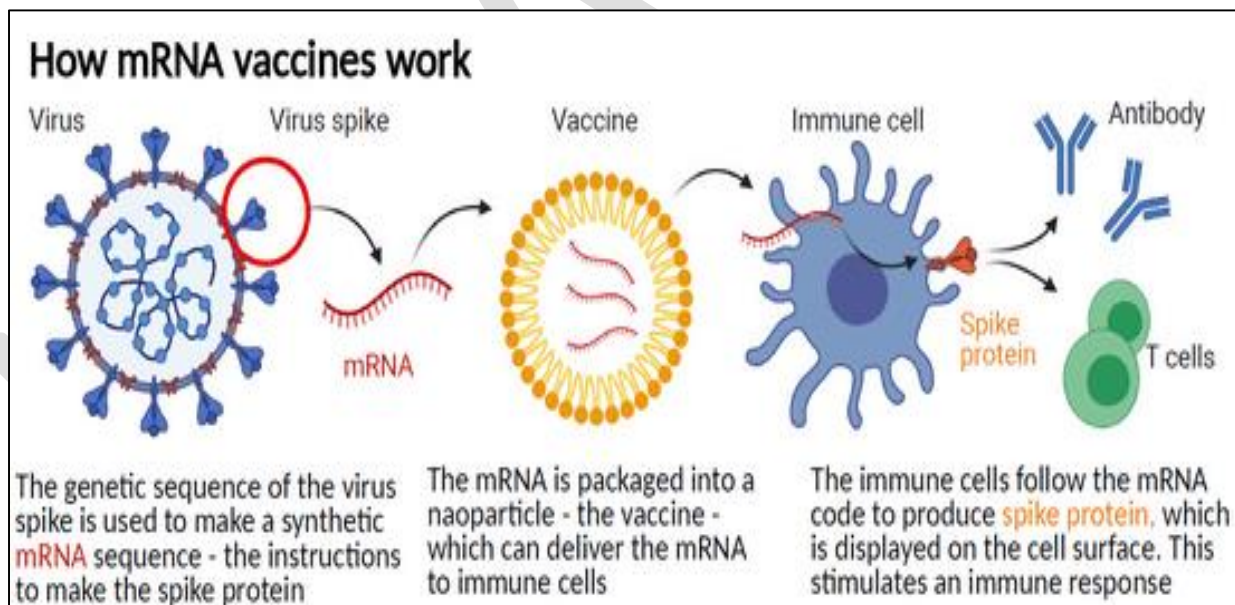
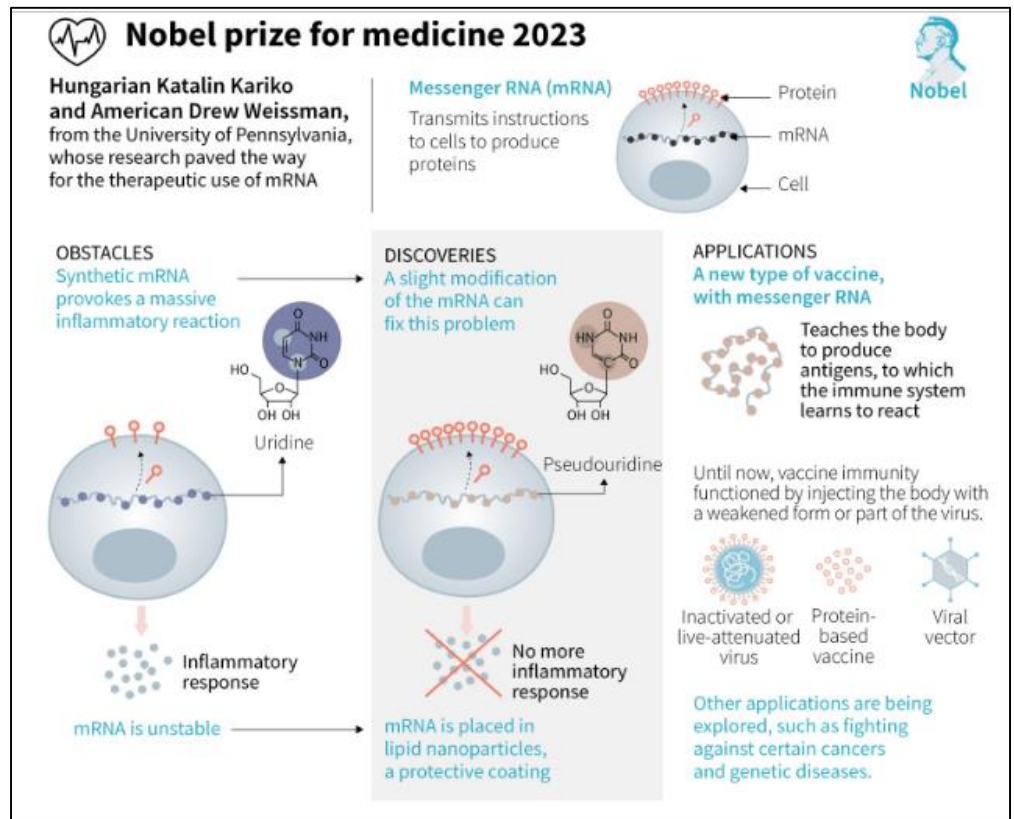
Context: The 2023 Nobel Prize in Physiology or Medicine has been awarded to Hungarian biochemist Katalin Karikó and American physician-scientist Drew Weissman. Announcing the names, the Royal Swedish Academy of Science said they had been feted for “**discoveries concerning nucleoside base modification that enabled the development of effective mRNA vaccines against COVID-19**”. Dr. Karikó is only the 13th woman to win the prize.

Key Highlights

- mRNA stands for messenger RNA, a type of molecule that carries instructions from the DNA to a cell’s cytoplasm, where those messages are ‘read’ to produce various proteins.
- In the late 1980s, scientists realised that mRNA could become the basis for a new kind of vaccines if some hurdles could be overcome.



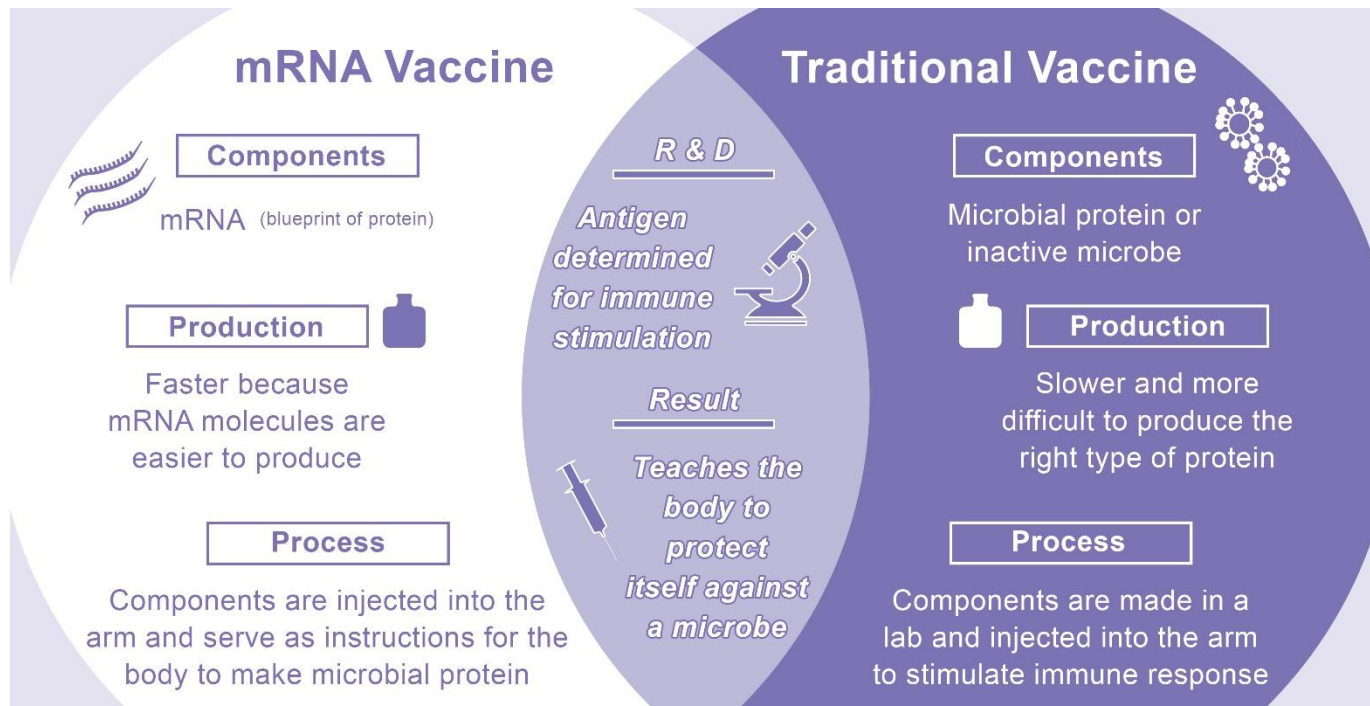
- The idea was to inject the body with a modified mRNA that would instruct cells to build a certain protein, which could then provoke the body's immune system to 'attack' it as well as prepare itself to encounters with the same protein in future.
- This protein could be something produced by a virus — such as the spike protein of SARS-CoV-2. But the mRNA would have to survive its journey inside the body and be able to enter a cell.



Advantages of mRNA Based Vaccines

- mRNA vaccines are considered safe as mRNA is non-infectious, non-integrating in nature, and degraded by standard cellular mechanisms.
- They are highly efficacious because of their inherent capability of being translatable into the protein structure inside the cell cytoplasm.

- Additionally, mRNA vaccines are fully synthetic and do not require a host for growth, e.g., eggs or bacteria. Therefore, they can be quickly manufactured inexpensively to ensure their "availability" and "accessibility" for mass vaccination on a sustainable basis.



Multimodal Artificial Intelligence

Context: In multimodal systems, users can engage with AI in several ways. If AI systems are to be as close a likeness of the human mind as possible, the natural course would have to be multimodal. The past couple of years have seen a stream of such AI systems being released.

- For anyone curious about what the next frontier of AI models would look like, all the signs are pointing towards multimodal systems, where users can engage with AI in several ways.
- People absorb ideas and form context by drawing meaning from images, sounds, videos and text around them.
- A chatbot, even though it can write competent poetry and pass the U.S. bar, hardly matches up to this fullness of cognition.
- If AI systems are to be as close a likeness of the human mind as possible, the natural course would have to be multimodal.

Key Highlights

As another good old tech race shapes up, leading AI companies are already playing catchup.

- On September 25, ChatGPT-maker OpenAI announced that it had enabled its GPT-3.5 and GPT-4 models to study images and analyse them in words, while its mobile apps will have speech synthesis so that people can have full-fledged conversations with the chatbot.
- The Microsoft-backed company had promised multimodality in March, during the release of GPT-4 and kept the addition on the backburner.
 - However, the company has rushed the release after a report by The Information revealed that Google's new yet-to-be-released multimodal large language model called Gemini, was already being tested in a bunch of companies.

- The report also stated that Google had an easy advantage over competitors in the multimodal world because of its readily available bank of images and videos via its search engine and YouTube. But OpenAI is moving fast to make inroads.
- The company is actively hiring multimodal experts with pay packages up to a hefty \$3,70,000 per year. It is also reportedly working on a new project called **Gobi** which is expected to be a multimodal AI system from scratch, unlike the GPT models.

How Does Multimodality Work?

- Multimodality itself isn't a novel thing. The past couple of years have seen a stream of multimodal AI systems being released.
 - Like OpenAI's text-to-image model, DALL.E, upon which ChatGPT's vision capabilities are based, is a multimodal AI model that was released in 2021.
 - DALL.E is built on another multimodal text-to-image model called CLIP that OpenAI released the same year.
- DALL.E is in fact the model which kick started the generative AI boom, and is underpinned with the same concept that runs other popular AI image generators like Stable Diffusion and Mid-journey — linking together text and images in the training stage.
 - The system looks for patterns in visual data that can connect with data of the image descriptions.
 - This enables these systems to generate images according to the text prompts that users enter.
- For multimodal audio systems, the training works in the same way. GPT's voice processing capabilities are based on its own open-source speech-to-text translation model, called Whisper, which was released in September last year. Whisper can recognise speech in audio and translate it into simple language text.

Applications of Multimodal AI

Some of the earlier multimodal systems combined computer vision and natural language processing models or audio and text together to perform some of the simpler but rather important functions like automatic image caption generation etc.

- And even if these multimodal systems weren't an all-powerful model like GPT-4 gunning for the ultimate dream of artificial general intelligence (AGI), they carried enough value to address very real-world problems.
- In 2020, Meta was working on a multimodal system to automatically detect hateful memes on Facebook.
- Meanwhile, Google researchers published a paper in 2021 about a multimodal system they had built to predict the next lines of dialogue in a video. But there are other more complex systems still in the works.
- In May this year, Meta announced a new open-source AI multimodal system called **Image Bind** that had many modes — text, visual data, audio, temperature and movement readings.
- Meta had speculated that future multimodal models could add other sensory data to them, like “touch, speech, smell, and brain fMRI signals.”
- The idea behind this is to have future AI systems cross-reference this data in similar ways that current AI systems do for text inputs.
- For instance, a virtual reality device in the future might be able to generate not just the visuals and the sounds of an environment but also other physical elements.
- A simulation of a beach could have not just the waves crashing on the shore, but also the wind blowing and the temperature there.
- If that sounds too futuristic, there are other uses that can be found closer to the world we live in now, like in autonomous driving and robotics.
- Other industries like medicine are “inherently multimodal,” according to a post by Google Research. Processing CT scans, or identifying rare genetic variations all need AI systems that can analyse complex datasets of images,

and then respond in plain words. Google Research's Health AI section has been working at this for some time now, having released papers around what the ideal method is to integrate multimodal AI systems in this field. AI models that perform speech translation are another obvious segment for multimodality. Google Translate uses multiple models as do others like Meta's SeamlessM4T model, which was released last month. The model can perform text-to-speech, speech-to-text, speech-to-speech and text-to-text translations for around 100 languages, the company said.

New 'Quantum Engine'

Context: New 'quantum engine' does work by flipping the identity of atoms.

- Physicists have created a 'quantum engine' to convert the energy difference between two quantum states of some atoms into work. .
- The device adapts the principles of a classical engine to the subatomic realm, allowing physicists to study the emerging field of quantum thermodynamics with more control.
- Physicists in Germany have come up with a way to convert the energy difference between two quantum states of a group of atoms into work.
- The device adapts the principles of the familiar classical engine to the subatomic realm, giving physicists a way to study the nascent field of quantum thermodynamics in more detail as well as, possibly, build better quantum computers.

THE GIST

All particles in a system are distinguished by four quantum numbers. The values of the four numbers together tell us something about how much energy a particle has. The exclusion principle states that, in a given system, no two particles can have the same four quantum numbers - that is, they can't occupy the same energy level

Physicists needed a way to convert some particles from being bosons to being fermions. In the early 2000s researchers found that if a collection of fermions were cooled almost to absolute zero and then prodded to interact with each other using a magnetic field, they could be made to behave like bosons

The quantum engine is still a proof of concept. Researchers have demonstrated that their design can be used to force a bunch of atoms to cyclically release energy as they are switched between bosonic and fermionic states. The researchers need to figure out how this energy can be moved from inside the trap to a system on the outside

Pauli's Principle

All subatomic particles can be classified as either **fermions** or **bosons**.

- **Fermions** are the building blocks of matter; **bosons** are particles that carry the forces acting between them.
- Now, when a bunch of particles are cooled to very nearly absolute zero, so that their quantum nature comes to the fore, they would all like to have the lowest energy possible - but they can't. This is known as **Pauli's exclusion principle**.

All particles in a system are distinguished by four quantum numbers, sort of like their Aadhaar numbers. The values of the four numbers together tell us something about how much energy a particle has.

- The exclusion principle states that, in a given system, no two particles can have the same four quantum numbers - that is, they can't occupy the same energy level.
- Fermions are particles that are bound by this rule. So they recursively occupy the lowest one available, until all possible energy levels are filled.
- Bosons are not bound by the exclusion principle principle: they can all occupy the same lowest energy level at a given low temperature. This is why, for example, superconductivity is possible.

Fermionic Energy

- So a system of fermions will have more energy at a low temperature than a system of bosons.
- For this to be the basis of an engine, physicists needed a simple way to convert some particles from being bosons to being fermions.

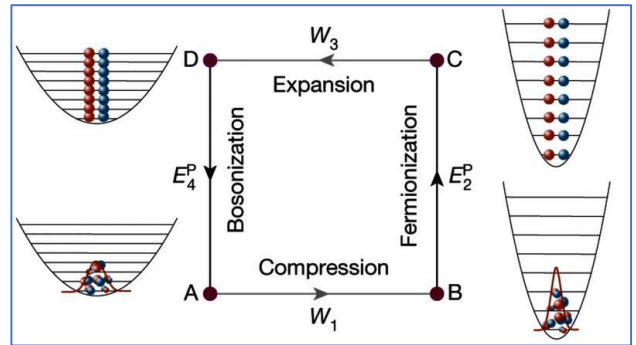
- A solution arrived in the early 2000s, when researchers found via multiple studies that if a collection of fermions were cooled almost to absolute zero and then prodded to interact with each other using a magnetic field, they could be made to behave like bosons.

In the new study, researchers with institutes in Germany, Japan, and Argentina did just this with a gas of lithium-6 atoms. (Entire atoms can behave like fermions or bosons if they satisfy a few basic requirements.) The team cooled them to just millionths of a degree above absolute zero, and confined them in a trap of oscillating electric and magnetic fields.

Fermions to Bosons and Back

Classical engines convert heat into work.

- For example, the internal combustion engine in a car uses the heat released by the combustion of petrol or diesel to push a piston. Overall the engine has four steps: the fuel is compressed, ignition causes the fuel-air mix to expand and push the piston out, the mix cools and stops expanding, and the piston is brought back to the first step.
- The quantum engine, or what the researchers are calling a ‘Pauli engine’, has a similar set of four steps.
 - **First**, the atoms collected in the trap are compressed and kept in a bosonic state.
 - **Second**, the strength of a magnetic field applied on the atoms is increased by a small amount. Interactions between the atoms and the field cause the former to slip into a fermionic state: they are forced to move out of the lowest energy level and progressively occupy higher levels.
 - **Third**, the compression applied in the first step is eased.
 - **Fourth**, the magnetic field strength is reduced to its original value.



The energy of the atoms increases during the third step and this can be converted to work. The **efficiency of the quantum engine is based on how much more energy is released in the third step relative to the energy added to the system in the first step**. Currently, according to the researchers’, their quantum engine is 25% efficient. The researchers expect to be able to increase this to 50% or more in future.

Quantum Thermodynamics

“Just observing the development and miniaturisation of engines from macroscopic scales to biological machines and further, potentially, to single- or few-atom engines, it becomes clear that for ... particles close to the quantum regime, thermodynamics as we use in classical life will not be sufficient to understand processes or devices.”

- There is a branch of physics called **quantum thermodynamics**, in which scientists study how thermodynamics ‘emerges’ in quantum-physical systems.
- And “some aspects of how to describe the thermodynamical aspects of quantum processes are even theoretically not fully understood,” Dr. Widera added.
- “The first important ‘application’ of our work in my opinion is that we now have a platform where we can study such open questions experimentally, with a high level of control.”

Proof of Concept

Another application could be in computing: to, say, cool the particles that make up a quantum computer – like an air-conditioner uses an engine to cool a room. “For this purpose, it would be perfect to have some nanoscopic device that could do the job beyond currently known methods”.

- That said, the quantum engine is still a proof of concept. The researchers have demonstrated that their design can be used to force a bunch of atoms to cyclically release energy as they are switched between bosonic and fermionic states.
- The researchers need to figure out how this energy can be moved from inside the trap to a system on the outside.

- “There is no definite plan, yet,” about achieving this. “But the setup or mechanism will need to be microscopic, just looking at the [amount] of work to be extracted. One option would be coupling some microscopic mechanical object to the gas.”

Ball Lightning

Context: One of the most rare and mysterious forms of lightning is ball lightning.

- It is a ball of luminosity that usually occurs near the impact point of a flash and moves horizontally at a speed of a few centimetres per second.
- It can penetrate closed windows, is usually accompanied by a hissing sound, and has a lifetime of several seconds.
- The colour is quite variable and the ball often ends with an explosion. However, it is not usually destructive.



Important Facts

- Also called globe lightning, it occurs at times of intense electrical activity in the atmosphere.
- These balls are said to be plasmas.
 - Plasma is a completely ionised state of matter, at high temperature, in which positive and negative ions freely move about.
- However, no theory has so far satisfactorily explained the behaviour of a ball as scientists have not been able to reproduce it in the laboratory.

Possible Causes of Ball Lightning

Ground Strike Theory

- Some scientists propose that ball lightning may result from ground strikes, initiating chemical reactions between oxygen and vaporized soil elements.
- This process creates ionized air or plasma, resembling phenomena like St. Elmo's Fire.

Glass-Related Hypothesis

- Another theory suggests that ball lightning might form due to the buildup of atmospheric ions on glass surfaces, creating an electrical field capable of generating discharges.

Microwave Radiation

- An alternative theory posits that ball lightning could be linked to microwave radiation produced when lightning strikes the Earth's surface, potentially encapsulating it in a plasma bubble.

Association with Earthquakes

- In rare instances, ball lightning has been observed in connection with earthquakes, displaying as bluish flames, sudden bright flashes from the ground, or floating orbs.
- A 2014 study exploring earthquake lights proposed that specific rock types release electrical charges during seismic waves, leading to luminous displays.

Study About Internal structure of Mars

Context: Mars's liquid iron core is likely to be surrounded by a fully molten silicate layer, according to a pair of studies published in Nature.

- These results offer a new interpretation of the interior of Mars, suggesting its core is smaller and denser than previously proposed.
- Seismological study of Mars to understand the interior of the red planet was carried out in 2019.
- The InSight Mars Lander used an instrument called the Seismic Experiment for Interior Structure (SEIS) to record seismic waves passing through Mars's interior.
- Data from three years of quakes in Mars, including two seismic events caused by meteorite impacts, were used for the study.

Measurement analysis

The analysis of measurements from the NASA InSight lander's Seismic Experiment for Interior Structure (SEIS) project in 2021 suggested the presence of a large but low-density core, composed of liquid iron and lighter elements such as sulphur, carbon, oxygen and hydrogen.

Lighter elements

- However, the result of the two studies published in Nature results suggest that the core has a higher proportion of lighter elements than is feasible according to estimates of the abundances of these elements early in Mars's formation history.
- The two studies found that the liquid iron-nickel core of Mars is surrounded by an approximately 150 km-thick layer of near-molten silicate rock, the top of which was previously misinterpreted as the surface of the core.
- This decrease in core radius implies a higher density than estimated in the earlier InSight study. These estimates can more easily be reconciled with our existing knowledge of chemical abundance on Mars.
- The molten state of this layer suggests that its temperature must be at least 2,000 Kelvin.
- This could be a sign that Mars had a turbulent interior following its formation, rather than a calmer one that more gently transported and shed heat to interplanetary space.

About Mars	
Size and Distance	<ul style="list-style-type: none"> • It is the fourth planet from the Sun and the second-smallest planet in the Solar System. • Mars is about half the size of Earth.
Similarity to the Earth (Orbit and Rotation)	<ul style="list-style-type: none"> • As Mars orbits the Sun, it completes one rotation every 24.6 hours, which is very similar to one day on Earth (23.9 hours). • Mars' axis of rotation is tilted 25 degrees with respect to the plane of its orbit around the Sun. This is similar to Earth, which has an axial tilt of 23.4 degrees. • Mars has distinct seasons like Earth, but they last longer than seasons on Earth. • Martian days are called sols—short for 'solar day'.
Other Features	<ul style="list-style-type: none"> • The reason Mars looks reddish is due to oxidation or rusting of iron in the rocks, and dust of Mars. Hence it is also called the Red Planet. • It has the largest volcano in the solar system i.e., Olympus Mons. • It has two small moons, Phobos and Deimos.

Cloud Seeding Can Produce Rainfall

Context: IITM Pune demonstrates cloud seeding can produce rainfall. The approximate cost of producing water through cloud seeding was 18 paisa per litre; the cost will drop by more than 50% if we use indigenous seeding aircraft.

Key Highlights

- A cloud seeding experiment carried out in Solapur city, which falls on the leeward side of the Western Ghats and hence gets low rainfall — 384 mm and 422 mm of total rainfall during the period June to September 2018 and 2019, respectively — was able to achieve 18% relative enhancement in rainfall, which is approximately 8.67mm more rainfall.

- The relative enhancement of accumulated rainfall was seen over two hours after seeding the clouds.
- In all, the total enhancement of water availability through cloud seeding experiments was 867 million litres.
- The experiment — Cloud Aerosol Interaction and Precipitation Enhancement Experiment (CAIPEEX phase-4) — was a scientific

Cloud seeding works if done correctly

Cloud seeding experiments were carried out in Solapur city, which gets less rainfall, from June to September in 2018 and 2019

- There was 18% increase in rainfall over a 100 sq.km area in Solapur city due to cloud seeding
- Approximate cost of producing water through cloud seeding was 18 paise per litre. The cost can drop by over 50% if indigenous seeding aircraft are used
- 20-25% of cumulus clouds produce rainfall if cloud seeding is done correctly
- Cloud seeding alone cannot mitigate droughts but can help produce additional rainfall that can partially address water requirements
- Calcium chloride flare was used for seeding the clouds. The seeding was done at the base of the warm convective clouds and at a time when the clouds were growing
- The study was carried out for two years to understand the microphysics and characteristics of convective clouds that can be targeted to enhance rainfall
- The work provides elaborate protocols and technical guidance to plan and conduct cloud seeding in India

Not all:
As microphysics of clouds vary widely, not all clouds produce rainfall through cloud seeding

investigation conducted in Solapur city during the summer monsoon period of 2018 and 2019.

- The primary objective was to investigate the efficacy of hygroscopic seeding in deep convective clouds and to develop a cloud seeding protocol.
- The experiment used two aircraft for studying various cloud parameters and for seeding the clouds.
- The study found that cloud seeding is an effective strategy for enhancing rainfall in a region under suitable conditions.
- A randomised seeding experiment was undertaken to study the effectiveness of cloud seeding in producing rainfall.
- In total 276 convective clouds were chosen, and 150 were seeded while the remaining 122 clouds were not seeded.

In our previous work we have found certain characteristics in a cloud such as the liquid water content in the cloud, the vertical motion in the cloud, which is an indicator of the growth of the cloud, will help inform us if the cloud will rain or not. Based on several criteria we know if a convective cloud has a potential to rain as all clouds cannot rain.

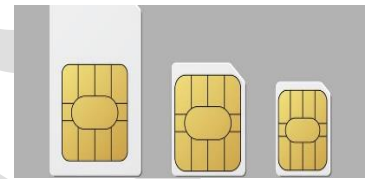
- Convective clouds with a depth of over one kilometre and likely to evolve into deep cumulus clouds were targeted.
- The seeded clouds produced more rainfall than the unseeded clouds,” Dr. Thara Prabhakaran from the Indian Institute of Tropical Meteorology, Pune and the corresponding author of the paper.
- **Calcium chloride flare** was used for seeding the clouds.
 - A cloud seeding flare releases these particles when triggered.
 - The seeding was done at the base of the warm convective clouds and at a time when the clouds were in their growing stage so that the seed particles could enter the clouds with minimum dispersion.
- The convective cloud bases are found at 500-1,500 metres altitude during the summer monsoon period and around 2,000 metres or more altitude during the monsoon break periods, which depends on the moisture content in the lower atmosphere.
- Since the clouds are found at lower heights, the base of the convective clouds is warm, around 15 degrees C.
- But cloud seeding alone cannot mitigate droughts but can help produce 18% more rainfall and partially address water requirements. Undertaking cloud seeding as catchment-scale projects can possibly help in managing drought conditions.

The study was carried for two years to first study and understand the microphysics and characteristics of convective clouds that can be targeted to enhance rainfall.

- The two-year study has helped develop a high-resolution numerical model that can help stakeholders to identify target locations, clouds that can be seeded, and a suitable seeding strategy to enhance rainfall in an area.
- One of the most important findings of the study was that not all cumulus clouds produce rainfall when cloud seeding is done.
- We found 20-25% of cumulus clouds produce rainfall if cloud seeding is done correctly.
- The micro physics of clouds vary widely and so not all clouds produce rainfall through cloud seeding. Though the relative enhancement of rainfall was 46% as measured by automatic rain gauges, the actual increase in rainfall over a 100 sq.km area was only 18%.

SIM Card: Its Functions And Working

Context: Over the years, the SIM card has shrunk from the SIM to the mini SIM to the micro SIM to the nano SIM. The latest on this path is the eSIM, with specifications defined by the Global System for Mobile Communications (GSM) Association.



- In 2021, there were more than 14 billion cellular devices in the world even though there were only seven billion people.
- The ubiquity of these devices — but especially smartphones — has come to define the contemporary era together with climate change, antimicrobial resistance, and war.
- But for smartphones' outsize mark on history, one essential component of theirs has flown somewhat under the radar: the SIM card.

What Is A SIM Card?

'SIM' stands for 'subscriber identification module'. Specifically, it is an integrated circuit, or a microchip, that identifies the subscriber on a given network.

- Imagine each cellular network is a city whose residents are identified by a number, called the international mobile subscriber identity (IMSI). The SIM card is a subscriber's ID card in this city.
 - When someone wishes to contact a subscriber in this city, the network uses the subscriber's SIM card to find them and confirm their identity.
- In order for a mobile phone to connect to any cellular network that follows the Global System for Mobile Communications (GSM) standard, a SIM card is mandatory.
- This relationship is established using a unique authentication key — a piece of data that a user needs to 'unlock' access to the network.
- Every SIM card stores this data and it is designed such that the user can't access it through their phone. Instead, signals sent by the phone into the network are 'signed' by the key, and the network uses the signature to understand whether the phone's connection is legitimate.
- It is possible to duplicate a SIM card by accessing its key and storing it in multiple cards.
- SIM cards also store information about its own ID number (the integrated circuit card identifier), the IMSI, the subscriber's location area identity (their current location), a list of preferred networks (to whom the subscriber can connect when roaming), emergency numbers, and — depending on the space available — the subscriber's contacts and SMS messages.

How Does A SIM Card Work?

SIM cards are designed according to the ISO/IEC 7816 international standard maintained by — as its name indicates — the International Organisation for Standardisation and the International Electrotechnical Commission. It applies to electronic identification cards, including smart cards.

- In this standard, the card itself consists of the integrated circuit, which is glued to a silicon substrate on the top side.

- On the other side of the substrate are metal contacts, which form the gold-coloured side of the SIM card.
- Wires connect the integrated circuit from its bottom side to the metal contacts on the top side, and the contacts interface with the phone's data connectors.
- The metal contacts have a segmented appearance. Each segment is called a pin and has a specific purpose.
 - For example, pin 1 collects the operating voltage that gives it the power to operate.
 - Pin 3 is to access the SIM's clock and pin 5 is the grounding.
 - Pin 7 transmits data in and out of the SIM.
 - These pin-wise roles are specified by the ISO/IEC 7816-2 standard; others, numbered 1 through 15, specify various functions of a SIM card and how they are to be implemented, from their "transmission protocols" to "cryptographic information applications". **This is the hardware side** (minus the phone's inner workings).
- **On the network side**, the SIM helps a phone establish its place within a cellular network.
 - When a subscriber dials a recipient's number, the phone sends data via the network — signed by the key on the SIM card — to a telephone exchange.
 - If the recipient is connected to the same exchange, the network establishes their identity and the call is routed to them.
 - If the recipient is 'located' elsewhere, a computer connected to the network routes the call there according to the most optimum route.

What Is An eSIM?

Over the years, the SIM card has shrunk from the SIM to the mini SIM to the micro SIM to the nano SIM. The latest on this path is the eSIM, with specifications defined by the GSM Association.

- In the eSIM paradigm, the SIM software is loaded on to a UICC that is permanently installed in the mobile equipment in the factory itself, that it can't be removed. (This is called the eUICC.)
- Users using mobile equipment with this capability — such as the Google Pixels 2, 3, and 4 or the iPhone 14 series — don't have to bother with physically replacing their SIM cards when they join or switch networks.
- Instead, the network operator simply has to reprogram the eSIM, which can also be done remotely.
- An eSIM has two immediate advantages.

First, it is considered to be environmentally friendlier than a physical SIM: its reprogrammability means no need for more plastic and metal for a new SIM.

Second, if a malicious person gains access to your phone, they won't be able to separately access the SIM application nor be able to duplicate it.

- There are also at least two disadvantages.

First, in some countries, including the U.S., eSIMs can be programmed by subscribers themselves. But this process might be difficult for those with low digital literacy, such as the elderly.

Second, an eSIM can in theory allow network operators to track subscribers' data, including inside apps on the device, especially in the absence of data privacy laws.

Health

An Ageing India Needs Age-Responsive TB Care

Context: India is moving towards a future where the elderly will make up a significant proportion of society, primarily due to advances in health care and increased life expectancy.

- In 2011, about 9% of India's population were over the age of 60. This is expected to increase to 12.5% by 2030.
- Tuberculosis (TB) affects over 25 lakh Indians every year, and kills at least 1,000 every day. India's
- National TB Prevalence Survey, 2021, revealed that the prevalence of TB in people over the age of 55 was 588 (per one lakh population), much higher than the overall national prevalence of 316.
- These findings were the starting point for a first-of-its-kind rapid assessment report on TB among the elderly, which we published earlier this year in collaboration with the National TB Elimination Programme and the U.S. Agency for International Development, highlighting TB's impact on the elderly and the need for age-specific TB guidelines.

How TB Impacts the Elderly

Interviews with older persons with TB revealed that their TB care journeys were fraught with challenges at every step, resulting in an overall sub-optimal experience.

Delayed or Missed Diagnosis

Complicated TB Management in Elderly

Access to Health services

Lack of Infrastructure

Lack of Nutritious Food

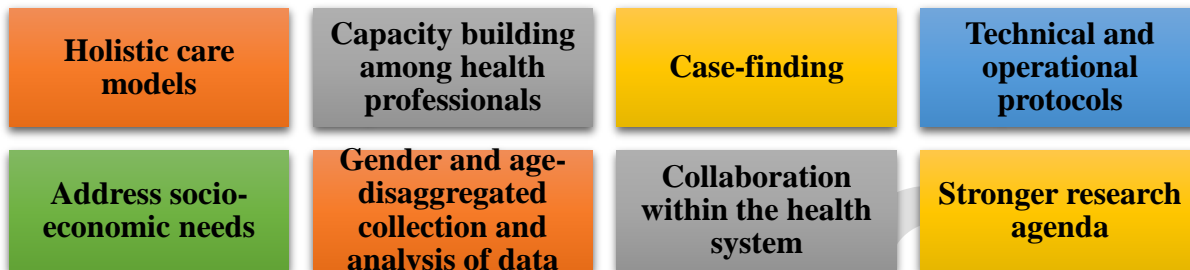
- **Delayed or Missed Diagnosis:** Symptoms of TB including cough, fatigue and weight loss are mistaken as signs of other diseases or dismissed as signs of old age. The risk of having a TB diagnosis delayed or missed altogether is higher for the elderly compared to other adults.
- **Complicated TB Management in Elderly:** Once diagnosed, management of TB among the elderly is often complicated by multiple comorbidities, particularly diabetes.
 - **At an individual level**, this means a higher pill count and an increased likelihood of side effects.
 - **At a health system level**, this can result in irregular treatment adherence and poor outcomes, including death.
 - Some older people with TB spoke about their lowered 'will to live', especially in the absence of social and emotional support systems.
- **Access to Health services:** Older people, and older women in particular, also face specific challenges in accessing health services.
 - For instance, in rural and hilly areas, they struggle to travel to health facilities by themselves.
 - Their access to reliable information on health is also limited — social networks inevitably shrink for the elderly.
- **Lack of Infrastructure:** Older persons also experience infrastructure-related challenges such as lack of adequate seating.
- **Lack of Nutritious Food:** They may not have access to high-quality nutritious food, which is critical for recovery.

All of this is augmented by a loss of economic independence. Most people over the age of 60 are no longer working; they are living off savings or they are completely dependent on families. There are some social welfare schemes for the elderly but these are limited in scope and difficult to access.



Building Age-Responsive Care

- We must move away from disease-specific, vertical care programmes to **holistic care models** that reduce the



need for the elderly to interact with multiple providers and facilities.

- We must also **build capacity among health professionals** at all levels for an improved clinical understanding of TB in the elderly and better management of multiple morbidities.
- Case-finding** among the elderly can be improved through effective sputum collection and transportation systems, access to mobile diagnostic vans and active case finding at geriatric OPDs, residential homes for the elderly and other institutional settings.
- Technical and operational protocols** that provide clear guidance on diagnosing and treating TB in the elderly — for example, sample extraction protocols, comprehensive assessment of co-morbidities and drug dosage adjustments — need to be developed.
- To **address socio-economic needs**, we must design and roll out well-considered support protocols, with inputs from elderly people with TB.
 - Examples include an elder-focused community care model with linkages to local caregivers; doorstep delivery of medicines; age-responsive peer support and counselling for older people and their families; special help desks for the elderly at facilities; and support with documentation to access social support schemes.
- At a macro level, we must ensure rigorous **gender and age-disaggregated collection and analysis of data**, to identify TB trends across age groups, and to make sure that the elderly are included as a separate age category in all TB reports.
- An important step towards building elderly-friendly systems is strengthening **collaboration within the health system**.
- We need a **stronger research agenda** focused on TB in the elderly, to better understand State-specific trends in case finding and outcomes among elderly people with TB; substance use; drug-resistance and co-morbidity patterns across geographies; uptake of TB preventive therapy in the elderly; and inter-sectionality with other aspects of equity such as gender, disability, class, and caste.

World Reported Twice as Many Cholera Cases in 2022 as in 2021: WHO

Context: World Reported Twice as Many Cholera Cases in 2022 as in 2021 says WHO. Most cholera cases continue to be reported from Africa and Asia, with Europe accounting for a few “imported cases”

Cholera	
About	<ul style="list-style-type: none"> It is a life-threatening infectious disease and a public health hazard. Cholera is an acute, diarrheal illness caused by infection of the intestine with the bacterium <i>Vibrio cholerae</i>. The infection is often mild or without symptoms, but sometimes can be severe.
Symptoms	<ul style="list-style-type: none"> Profuse watery diarrhoea Vomiting

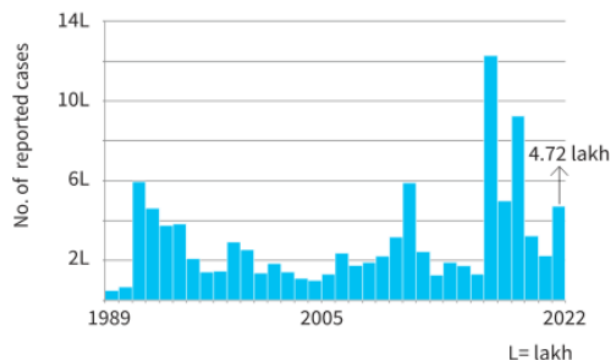


	<ul style="list-style-type: none"> • Leg cramps
Transmission	<ul style="list-style-type: none"> • A person may get cholera by drinking water or eating food contaminated with the cholera bacterium. • The disease can spread rapidly in areas with inadequate treatment of sewage and drinking water.
Vaccine	<ul style="list-style-type: none"> • Currently there are three WHO pre-qualified oral cholera vaccines (OCV), Dukoral, Shanchol, and Euvichol-Plus. • All three vaccines require two doses for full protection.
Initiatives to Curb Cholera	<ul style="list-style-type: none"> • A global strategy on cholera control, Ending Cholera: a global roadmap to 2030, with a target to reduce cholera deaths by 90% was launched in 2017. • Global Task Force for Cholera Control (GTFCC): WHO revitalized the Global Task Force for Cholera Control (GTFCC) to strengthen WHO’s work in eradicating cholera. <ul style="list-style-type: none"> ○ The purpose of the GTFCC is to support increased implementation of evidence-based strategies to control cholera.

Key Highlights

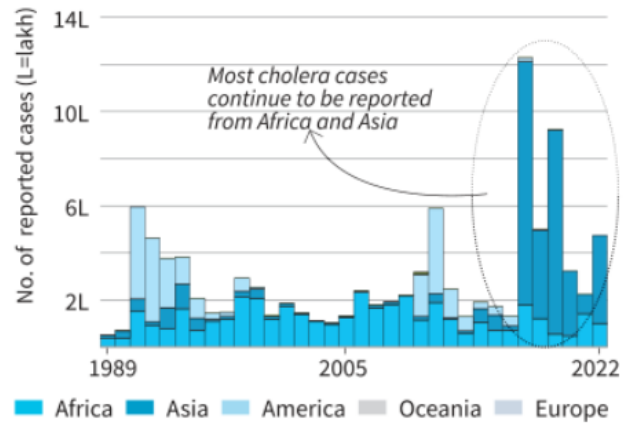
- Cholera is a water-borne disease caused by two strains called O1 and O139 of the bacteria *Vibrio cholerae*.
- Of these, O1 is responsible for almost all outbreaks; outbreaks of O139 are rare and none have been recorded outside Asia.
- According to the World Health Organization (WHO)’s weekly epidemiological record, published on September 22, the world reported more than twice as many cholera cases in 2022 as it did in 2021 (Chart 1).
- Between these years, more than twice as many countries also reported at least 10,000 suspected as well as confirmed cases of cholera.
- Both these trends suggest a reversal of a short-term trend, of declining prevalence since 2019. The reversal also complicates a target the WHO specified in 2017, to reduce the number of cholera deaths worldwide by 90% by 2030.
- According to the United Nations health body, “Cholera transmission is closely linked to inadequate access to clean water and sanitation facilities.” *Vibrio cholerae* bacteria also favour warmer waters with lower salinity.
- All these conditions are created as a result of climate change — which increases the likelihood of floods, heatwaves, intense monsoonal rains and storms, and the duration of warm periods — and war.
- The epidemiological record report blames the uptick on the decline of the COVID-19 pandemic, and its restrictions; “limited investments” in providing care to those most vulnerable to the disease; the effects of climate change; and increasing conflict.
- A 2021 study published in the journal *The Lancet Planetary Health* concluded that the length of the coastline favourable to the development of *Vibrio* bacteria could increase by 38,000 km by 2100 over the 1850-2014 average, in the SSP5-8.5 emissions scenario.
- A June 2023 study by researchers at the University of Florida found that “*Vibrio* pathogens have a unique ability to ‘stick’ to microplastics, and that these microbes might be adapting to plastic”, including in the open ocean, according to a statement by the National Science Foundation.

Chart 1 The chart shows year-wise reported cholera cases between 1989 and 2022

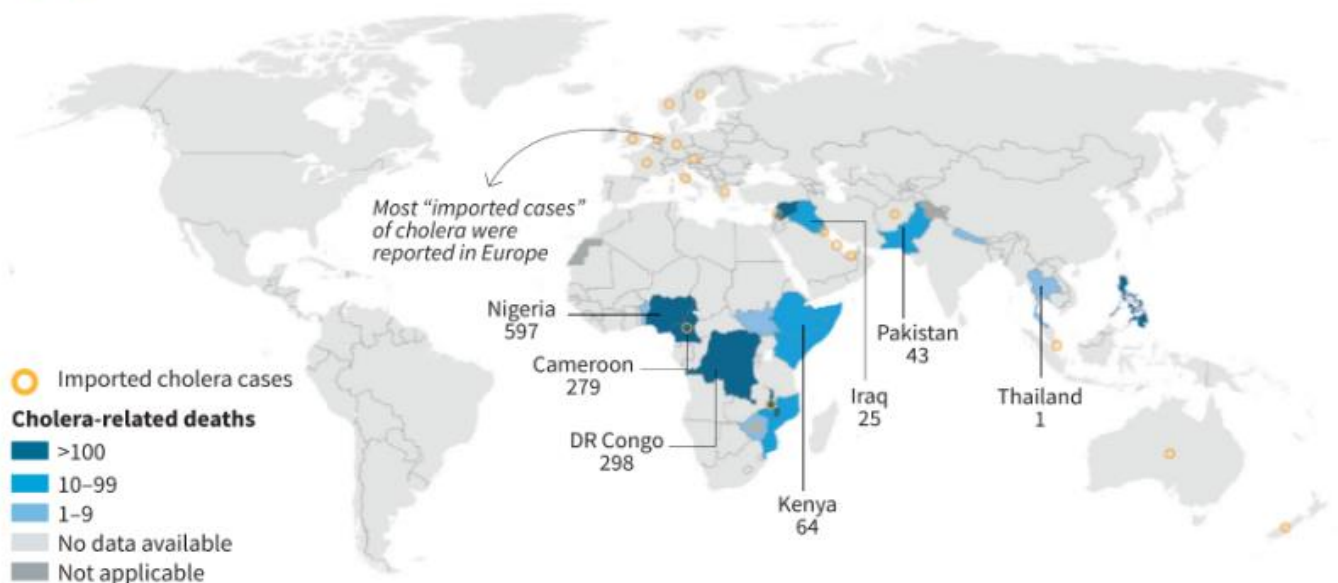


- In response to the world’s growing cholera burden, and while waiting for investments in manufacturing to bear fruit, the body that manages the emergency stockpile of the oral cholera vaccine shrank the recommended vaccination regime from two doses to one.
- According to the report, most cholera cases continue to be reported from Africa and Asia, with Europe accounting for a few “imported cases” (Chart 2 and Map 3).
 - In Africa, cases were more spread out in 2022 than they were in 2021, which the report qualifies as no single country having reported more than 25% of all cases and 30% of all deaths.
 - The report also says that between 2021 and 2022, the continent reported 29% fewer cases and 52% fewer deaths.

Chart 2 | The chart shows year-wise cholera cases reported to WHO across continents



Map 3 | The map shows the country-wise reported cholera deaths and imported cases in 2022



- This isn’t the good news it appears to be: in 2021, Nigeria had a large cholera outbreak that accounted for 78% of all cases in Africa that year.
- But in 2022, both the numbers of cases and of deaths in all the other countries (that reported data) more than doubled.
- Cameroon and Malawi in particular reported over 5,000 cases after more than a decade.
- Similarly, in Asia, both Lebanon and Syria have reported cases at all for the first time in a decade.
- Yemen had reported nearly 90% of the cases in West Asia in 2021 but didn’t report data in 2022.
- In Afghanistan, more than half of all cases were among those aged five years.
- But there is one silver lining: whereas 20% of the countries that declared cases in 2021 reported using rapid diagnostic tests, 56% did so in 2022.

WHO Approves Use of Malaria Vaccine with Adjuvant Tech

Context: The **R21/Matrix-M malaria vaccine** developed by the University of Oxford and the Serum Institute of India, leveraging Novavax's adjuvant technology, was recommended for use by the World Health Organization (WHO), after meeting required safety, quality and effectiveness standards.

- The vaccine was developed by the Jenner Institute at Oxford University and the Serum Institute of India with support from the European and Developing Countries Clinical Trials Partnership (EDCTP), the Wellcome Trust, and the European Investment Bank (EIB).
- Three countries — Nigeria, Ghana, and Burkina Faso — have already approved the use of the vaccine to immunise children aged less than 36 months.

War against malaria gets a shot in the arm

Three countries — Nigeria, Ghana, and Burkina Faso — have already approved the vaccine for children aged less than 36 months

- A phase-3 trial in 4,800 children was conducted at five sites in four countries with different malaria transmission intensities and seasonality
- The participants received three vaccine doses four weeks apart, and a booster shot at the end of 12 months after the last dose
- Primary vaccination was carried out prior to malaria season where it is seasonal or at any time of year in countries where malaria is perennial
- Vaccine efficacy at the end of one year in children aged 5-36 months was 75% where malaria is seasonal and 68% when malaria is perennial
- In children aged 5-17 months, who are more likely to die due to severe malaria, the vaccine efficacy was higher — 79% where malaria is seasonal and 75% where malaria is perennial
- In children aged 18-36 months, vaccine efficacy was 73% where malaria is seasonal and 63% when malaria is perennial
- The vaccine efficacy was well maintained to 18 months with a single booster dose given 12 months after the primary series



Humongous:
In 2021, there were 247 million malaria cases worldwide and 6,19,000 deaths

Adjuvant

- An adjuvant is an ingredient in a vaccine that enhances the immune system's response to that vaccine.
- Adjuvants help the immune system better recognize what's in a vaccine and remember it longer, increasing the amount of time that a vaccine may offer protection.
- Matrix-M adjuvant is derived from saponins, naturally occurring compounds found in the bark of the Quillaja saponaria tree in Chile. Saponins have a history of medicinal use.
- The Matrix-M component is a proprietary saponin-based adjuvant from Novavax, which is licensed to the Serum Institute for use in endemic countries, while Novavax retains commercial rights in non-endemic countries.

Features of R21

High efficacy when given just before the high transmission season: In areas with highly seasonal malaria transmission (where malaria transmission is largely limited to 4 or 5 months per year), the R21 vaccine was shown to reduce symptomatic cases of malaria by 75% following a 3-dose series.

Cost-effectiveness is favorable, with a price range of \$2 to \$4 per dose, making it comparable to other recommended malaria interventions.

Safety: The R21 vaccine was shown to be safe in clinical trials.

Significance: The R21 vaccine is the second malaria vaccine recommended by WHO, following the RTS,S/AS01 vaccine, which received a WHO recommendation in 2021.

Malaria

About	<ul style="list-style-type: none"> Malaria is a life-threatening disease caused by the Plasmodium parasite. This parasite is transmitted to humans through the bites of infected female Anopheles mosquitoes.
Plasmodium Parasite	<ul style="list-style-type: none"> There are 5 Plasmodium parasite species that cause malaria in humans and 2 of these species, P. falciparum and P. vivax, pose the greatest threat. P. falciparum is the deadliest malaria parasite and the most prevalent on the African continent. P. vivax is the dominant malaria parasite in most countries outside of sub-Saharan Africa. The other malaria species which can infect humans are P. malariae, P. ovale and P. knowlesi.
Symptoms	<ul style="list-style-type: none"> Mild symptoms are fever, chills and headache. Severe symptoms include fatigue, confusion, seizures, and difficulty breathing.
Prevalence	<ul style="list-style-type: none"> According to the WHO's World Malaria report 2022, there were 247 million cases of malaria in 2021 compared to 245 million cases in 2020. It is mostly found in tropical countries. Four African countries accounted for just over half of all malaria deaths worldwide: Nigeria (31.3%), the Democratic Republic of the Congo (12.6%), United Republic of Tanzania (4.1%) and Niger (3.9%)
Vaccine	<ul style="list-style-type: none"> Along with the recently confirmed R21/Matrix-M vaccine, WHO also recommends broad use of the RTS,S/AS01 malaria vaccine among children living in regions with moderate to high P. falciparum malaria transmission.
Elimination Strategies	<p>Global:</p> <ul style="list-style-type: none"> The WHO Global Technical Strategy for Malaria 2016–2030, updated in 2021, sets ambitious but achievable global targets, including: <ul style="list-style-type: none"> reducing malaria case incidence by at least 90% by 2030 reducing malaria mortality rates by at least 90% by 2030 eliminating malaria in at least 35 countries by 2030 preventing a resurgence of malaria in all countries that are malaria-free. <p>India:</p> <ul style="list-style-type: none"> National Framework for Malaria Elimination (2016-2030) Malaria Elimination Research Alliance-India (MERA-India)

Stroke Deaths

Context: Stroke, a highly preventable and treatable condition, could lead to nearly 10 million deaths annually by 2050, primarily affecting low- and middle-income countries (LMICs), warns a report published in the Lancet Neurology journal on Monday.

Key Highlights

- The projection comes from the collaborative effort of the **World Stroke Organization** and the **Lancet Neurology Commission** under which four studies have been published.
- The report underscores that stroke deaths are expected to surge from **6.6 million in 2020** to a daunting **9.7 million by 2050**.
- By 2050, it is estimated that the contribution of stroke deaths in LMICs will see an **increase from 86% to 91%**.
- The report has emphasised the critical role of evidence-based, pragmatic solutions in combating this looming crisis and notes that implementing and rigorously monitoring the commission's recommendations, which are firmly grounded in evidence, could lead to a significant reduction in the global stroke burden, effectively countering this ominous projection.
- The commission authors have presented their findings into 12 evidence-based recommendations.
- The recommendations include

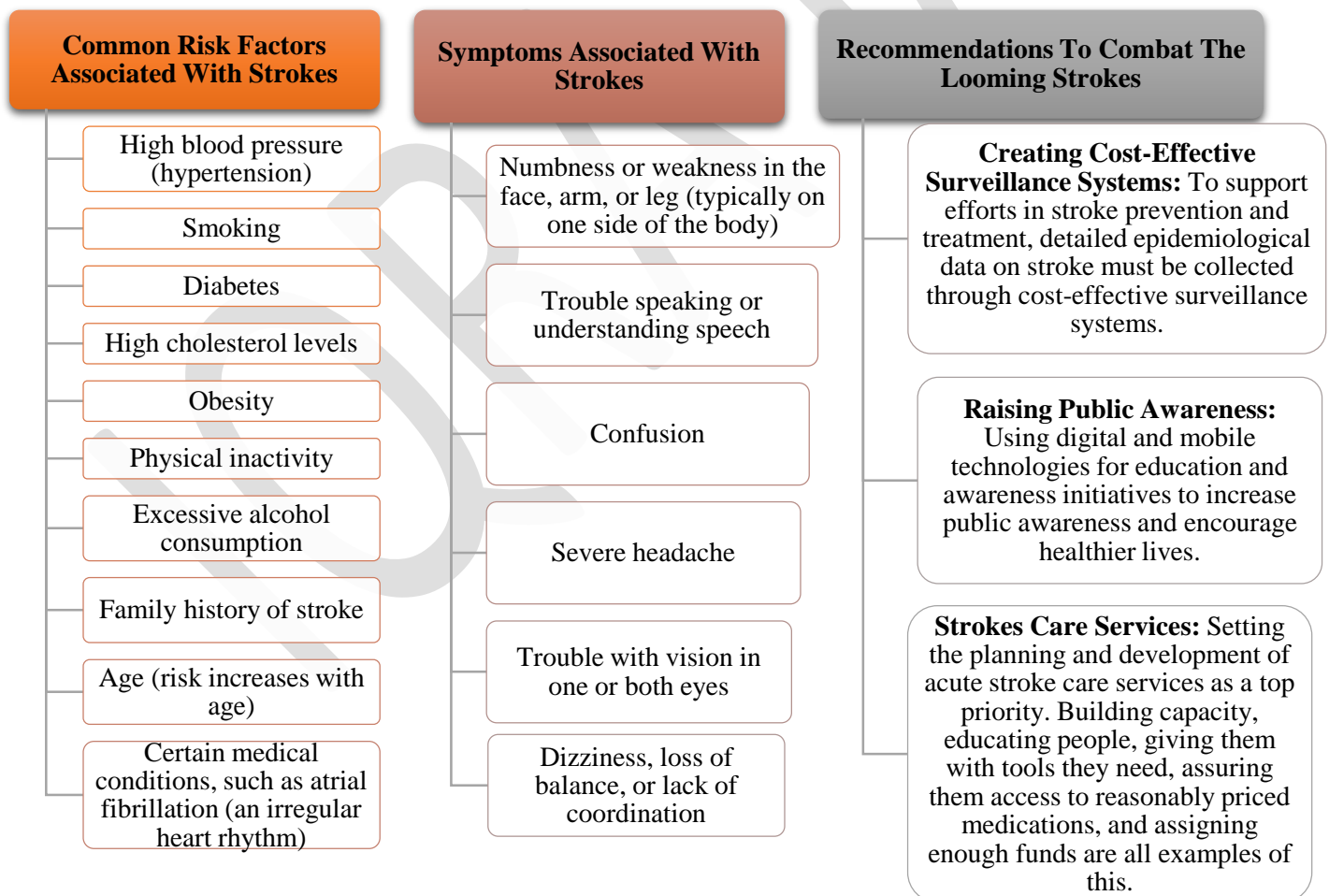
Establishing cost-effective surveillance systems for precise epidemiological stroke data to guide prevention and treatment	Elevating public awareness and fostering healthier lifestyles through the widespread utilisation of mobile and digital technologies	Including training and awareness and prioritising meticulous planning of acute stroke care services	Capacity building
Provisioning of equipment	Treatment	Affordable medicines	Training
			Allocating adequate resources

What is a Stroke Condition?

When there is a blockage in the blood supply to the brain or an unexpected increase in brain haemorrhage, a stroke may happen. There are two distinct stroke kinds:



- An ischemic stroke is one when there is a blockage of blood flow to the brain. Blood cannot supply the brain with nutrition and oxygen. Brain cells start to die within minutes of being deprived of oxygen and nutrition.
- Hemorrhagic strokes are caused by abrupt bleeding in the brain and are the most common type of stroke. Blood leakage causes pressure on brain cells, which harms them.



Surgical-Site Infections

Context: Want to keep surgery bill low? Avoid surgical-site infections. Investing in safe surgeries could significantly reduce the costs associated with surgeries in low-to-middle-income countries like India, according to a study. The findings show that surgical site infections extend hospital stays up to a month or more and worsen the financial burden on patients.

- Safety measures before a surgery aren't just to save lives – they can also significantly lower the health bill if followed in letter and spirit.
- Investing in safe surgeries could significantly reduce the costs associated with surgeries in low-to-middle-income countries like India, according to a study published in the Journal of Hospital Infection.
- The findings show that surgical site infections extend hospital stays up to a month or more and worsen the financial burden on patients and their families.

What Is A Surgical Site Infection?

A surgical site infection is a common complication in surgeries worldwide. It is an infection that occurs at the site of a surgery in the body.

- It could be a superficial skin infection or a deeper one, involving tissues. About 11% of patients who undergo surgery contract such infections, according to a 2018 WHO report.
- Surgical site infections increase healthcare costs by prolonging hospital stay and by demanding more human and medical resources to treat these infections.

What Did The New Study Do?

In the new study, the researchers investigated resource costs for patients who underwent abdominal surgeries across 13 hospitals in four countries – India, Mexico, Nigeria, and Ghana – between April and October 2020.

- The study considered a range of procedures, including caesarean sections, gastric perforation repair, hysterectomy, and umbilical hernia repair.
- The procedures were classified into two types:

Clean-Contaminated Surgeries

- Where surgeons cut into the gut, respiratory tract, or urinary tract in controlled sterile conditions

Contaminated-Dirty Surgeries

- Which includes accidental wounds, spillage from the gut, or a breach in the sterile conditions.

- About half the surgeries analysed in the study were for benign diseases, 39% were for obstetric issues, and the rest were trauma- or cancer-related surgeries.
- The study was a part of a larger randomised controlled trial (RCT) called FALCON, which involved 57 hospitals in seven countries to investigate the effects of interventions on surgical site infections. The trial was led by the National Institute for Health and Care Research, U.K.
- Researchers rarely study costs in RCTs and doing so is also complex. Several groups have estimated the costs associated with surgical site infections, but researchers have mostly carried out these studies at the single-hospital level, not across hospitals.
- Such studies have also estimated costs only up to the patient's discharge from the hospital, not after. This is the first multi-continental surgical cost study of its kind and reveals substantial additional postoperative costs associated with [surgical site infections] across a range of settings.

What Are The Study's Limitations?

- As the COVID-19 pandemic made recruiting patients for the study difficult, researchers included retrospective data for clean-contaminated surgeries, asking patients for the costs they incurred when they had a surgical site infection in the past. This, as the authors write, “may have affected the post-discharge healthcare estimates due to recall bias.”
- In addition, the number of samples and surgical site infections in Mexico and Nigeria were too low to draw any general conclusions about costs.
- Finally, the cost differences between different countries may have been influenced by several factors, such as the type of hospital in which the study was carried out (private or government, e.g.).

In their analysis, the researchers estimated the costs associated with the additional resources that patients with surgical site infections used when they were still at the hospital or returned after discharge, and the costs around patient care after discharge.

- They found that surgical site infections occurred in 27% of contaminated-dirty surgeries and 7% of clean-contaminated surgeries.
 - However, the healthcare costs associated with a surgical site infection following a clean-contaminated surgery (higher by 75%) were higher than in the case of a contaminated-dirty surgery (67%).
 - For clean-contaminated surgeries, patients with surgical site infection incurred healthcare costs of about €959 (₹ 85,300) after surgery. But their counterparts without surgical site infections incurred € 517.
- On the other hand, patients who suffered surgical site infections after undergoing contaminated-dirty surgeries incurred a total healthcare cost of about €828. But their counterparts without surgical site infections incurred €497.
- The bulk of these amounts were for post-surgery patient care in a hospital (96.4% of total cost after clean-contaminated surgery and 92.5% after contaminated-dirty surgery).
- The team also added travel costs and income loss to these figures. So people with and without surgical site infections after clean-contaminated surgeries incurred an estimated total expense of € 1064 and € 605; and those with and without surgical site infections after contaminated-dirty surgeries incurred € 997 and € 678.

How Did Costs Change In India?

Notably, India had the **highest increase in healthcare costs** associated with **surgical site infections following clean-contaminated surgeries**, at ₹ 46,000. It also **featured the lowest increase in healthcare costs** for **surgical site infections after contaminated-dirty surgeries**, at ₹ 20,000.

- The findings echo those from previous studies at a single-hospital level in different countries, including India.
- For example, one 2020 study suggested that 5.63% of patients who underwent a caesarean section at S.S.G. Hospital, Baroda, between July 2019 and March 2020 had surgical site infections. The total cost of illness because of the infection was almost thrice as much as the costs to patients without a surgical site infection.
- The average length of stay in the hospital for the former was 10 days longer than the latter. These patients were also treated with antibiotics for thrice as long as those without such infections.

How Can We Avoid These Costs?

- Bengaluru-based transplant surgeon said that a substantial number of surgical site infections occur in semi-urgent and emergency surgeries, and the financial burden associated with these infections is significant for patients in India, where insurance coverage is low and out-of-pocket expenses are high.
- The number of surgical site infections in India has also been consistently higher than the international average.
 - This is because of “late presentation of cases, higher levels of emergency surgery, poor hospital practices, and rampant use of antibiotics.”

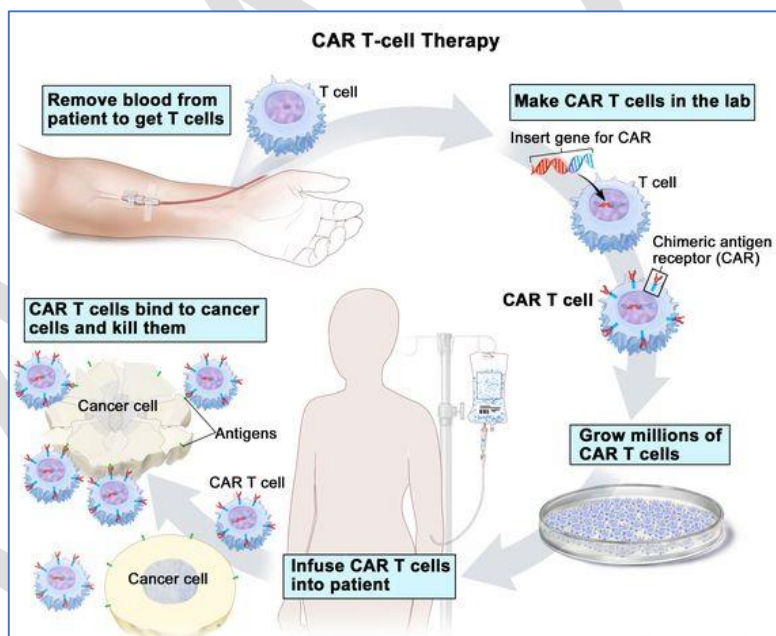
- Even a simple checklist of procedures like skin decontamination, adequate site marking before the surgical procedure etc., can reduce errors and morbidity.

In 2016, the WHO outlined such a checklist for surgical procedures. While they may look simple, adhering to them with discipline could considerably lower infection incidence.

ImmunoACT's Cell Therapy

Context: IIT Bombay-incubated Immunoadoptive Cell Therapy (ImmunoACT), in which drugmaker Laurus Labs holds about 34% stake, has received Central Drugs Standard Control Organisation's (CDSCO) marketing authorisation approval of the 'first' humanised CD19-targeted Chimeric Antigen Receptor T cell (CAR-T cell) therapy product for relapsed/refractory B-cell lymphomas and leukaemia (blood cancer) in India.

- ImmunoACT said it intends to make NexCAR19 (Actalycabtagene autoleucel), the CAR-T cell therapy, available to its partner hospitals as soon as possible.
- The **indigenously-developed** product will put the country on the world map of advanced cell and gene therapies, the company said.
- NexCAR19 is the result of a collaborative effort over a decade between IIT Bombay and Tata Memorial Centre. Designed and developed at IIT Bombay, NexCAR19 underwent integrative process development and manufacturing under cGMP at ImmunoACT.



CAR T-cell Therapy

CAR T-cell therapies are a major breakthrough in cancer treatment. Unlike chemotherapy or immunotherapy which involve taking drugs, CAR T-cell therapies use a patient's own cells. They are modified in the laboratory to activate T-cells and target tumor cells. CAR T-cell therapy has been approved for leukaemias (cancers arising from the cells that produce white blood cells) and lymphomas (arising from the lymphatic system).

- **Procedure:** T cells are taken from a patient's blood and then the gene for a special receptor that binds to a certain protein on the patient's cancer cells is added to the T cells in the laboratory. The special receptor is called a chimeric antigen receptor (CAR). Large numbers of the CAR T cells are grown in the laboratory and given to the patient by infusion.
- **Significance:** CAR T-cell therapies are even more specific than targeted agents and directly stimulate the patient's immune system to fight cancer, leading to greater clinical efficacy. That's why they're referred to as "living drugs."

What are T Cells?

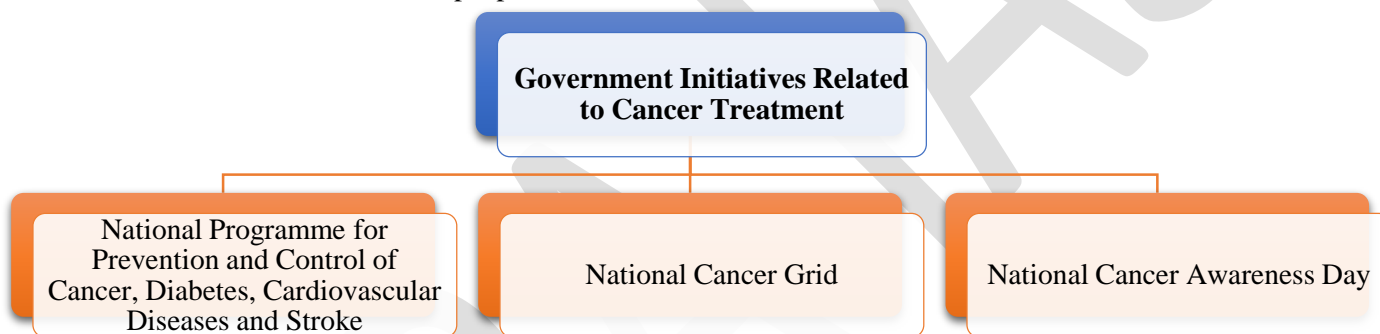
- ✓ T cells, also known as T lymphocytes, are a type of white blood cell that play a central role in the immune response.
- ✓ T cells are involved in cell-mediated immunity, which means they help the body recognize and respond to foreign substances, such as viruses, bacteria, and abnormal cells, such as cancer cells.
- ✓ There are two major types of T cells: the helper T cell and the cytotoxic T cell.
- ✓ As the names suggest, helper T cells 'help' other cells of the immune system, whilst cytotoxic T cells kill virally infected cells and tumors.



Challenges



- **Preparation:** The difficulty of preparing CAR T-cell therapies has been a major hindrance to their widespread use.
 - The first successful clinical trial was published a decade ago, and the first indigenously developed therapy in India was performed in 2021.
- **Side Effects:** In certain kinds of leukaemias and lymphomas, the efficacy is as high as 90%, whereas in other types of cancers it is significantly lower.
 - The potential side-effects are also significant, associated with cytokine release syndrome (a widespread activation of the immune system and collateral damage to the body's normal cells) and neurological symptoms (severe confusion, seizures, and speech impairment).
- **Affordability:** Introduction of CAR T-cell therapy in India can face challenges of cost and value.
 - Critics argue that developing CAR T-cell therapy in India may not be cost-effective as it will still be unaffordable for most people.



Centre Seeks Inclusion Of Traditional Medicine On WHO's List

Context: In a move meant to put the Indian system of medicine on the world map and provide it with a common standardised language, the Union government has sought the inclusion of Ayurveda and related systems in the **11th revision of the World Health Organization's International Classification of Diseases (ICD)**, as the second module of a supplementary chapter on traditional medicine conditions.

- The ICD provides a common language that allows health professionals to share standardised information across the world.
- The traditional medicine module of the 11th revision provides a list of diagnostics categories to collect and report on medicine conditions in a standardised and internationally comparable manner.

About International Classification of Diseases (ICD)

Purpose	Standardized system for classifying and coding diseases, health conditions, and related information.
Established	1893, by International Statistical Institute (WHO's predecessor)
Authority	Developed and maintained by the World Health Organization (WHO).
Scope	Covers a wide range of diseases, health conditions, injuries, and health-related factors.

Coding System	Assigns unique alphanumeric codes to each health condition for consistent recording and reporting.
Global Applicability	Internationally recognized and used for health data collection, analysis, and reporting.
Updates	Periodically updated to reflect advances in medical knowledge and changing health trends.
Latest Version	ICD-11 became effective in January 2022.
Uses	Clinical diagnosis, health record documentation, research, health policy, and resource allocation.

To Aid Research

“Ayurveda and related Indian traditional health care systems are a formally recognised and widely practised health care systems in India, which is making a strong and valid point for its inclusion,” said Mr. Kotecha, adding that efforts to effectively regulate traditional medicine as an integral part of the health system require standardised and evidence-based information.

- He explained that the traditional medicine chapter under ICD-11 is a formative step for the integration of such forms of medicine into a classification standard used in conventional medicine. “It also provides the means for doing research and evaluation to establish its efficacy,” he said.
- The Ministry added that this chapter would also help to respond to growing demands for more and better regulation of traditional medicine, and its integration in mainstream health care and health information systems.

Chinese Medicine

After a decade of repeated consultations, ICD-11 had facilitated the inclusion of Module-1, which covers traditional medicine conditions originating in ancient China, which are now commonly used in China, Japan, Korea, and elsewhere around the world.

- The 11th revision contains around 17,000 unique codes and more than 1,20,000 codable terms, which are now entirely digital.
- The joint use of ICD-11’s chapter on traditional medicine along with other chapters on neoplasm, patient safety, and injuries, can enhance the reporting of adverse events.
- It will enable the integration of traditional medicine into insurance coverage and reimbursement systems, in line with larger WHO objectives relating to universal health coverage.
- It will also link traditional medicine practices with global conventional medicine’s norms and standard development.

The development of Module-2 for Ayurveda-related diagnostic systems is being actively supported by the Ministry of Ayush. It banks on the implementation experience gained on the ground by the National Ayush Morbidity and Standardised Terminologies Electronic portal, and the Ayush Health Information Management System, the Ministry said.

Avian Influenza Viruses Undergo Major Evolutionary Changes

Context: A recent study published in Nature reveals major changes in the ecology and evolution of highly pathogenic avian H5 influenza viruses, including a shift in global distribution.

- The findings suggest that the epicentre of these viruses has extended beyond Asia to new regions including parts of Africa and Europe.

Key Highlights

Highly pathogenic avian H5N1 virus activity has intensified globally since 2021, infecting and killing increasing numbers of wild birds and poultry, as well as posing a risk to mammals (including humans).

- H5N1 emerged in China in 1996.
- The scale of H5 outbreaks in wild birds has escalated beyond Asia since 2014, but the origins of recent resurgences and the underlying evolution of these viruses has been unclear.
- Dr. Vijaykrishna Dhanasekaran from the University of Hong Kong and others examined the changing origins and trends of highly pathogenic avian H5 outbreaks using epidemiological data collected by the Food and Agricultural Organization and the World Organization for Animal Health between 2005 and 2022, alongside the analysis of more than 10,000 whole viral genomes.
- Key resurgent events were identified in 2016/17, with genome analysis revealing that the viral lineages originated in Asia.
- By contrast, two new H5 viruses identified between 2020 and 2022 that emerged from African and European bird populations indicate a notable shift in H5 epicentre away from Asia and into other continents.
- These strains were determined to have evolved through genetic reassortment with low pathogenic viral variants as they disseminated.
- The authors suggest that the increasing persistence of avian influenza in wild bird populations is driving the evolution and spread of new strains.
- “These results highlight a shift in the Highly Pathogenic Avian Influenza (HPAI) H5 epicentre beyond Asia and indicate that increasing persistence of HPAI H5 in wild birds is facilitating geographic and host range expansion, accelerating dispersion velocity and increasing reassortment potential,” they write.
- The authors suggest that these findings highlight the continued relevance of elimination strategies to limit viral spread and to control the prevalence of highly pathogenic avian influenza within global bird populations, as well as the importance of understanding viral evolution to mitigate and react to new strains.

Indian Osteoporosis Care Crisis

Context: The unpleasant reality is that only a small percentage of people in India receive care for their osteoporosis - a condition characterised by weakening of bones.

- People begin to stoop as they grow older. That is because of osteoporosis.
- The weakening of the bone not only causes long-term pain but also changes in posture and increases chances of fractures and nerve injury if the bone affected is the spine.
- All of these problems negatively impact the quality of life and increase disability and financial burden on the family, and yet osteoporosis is not receiving the attention it deserves in medical practice.

Key Highlights

- Projected data shows that at least 46 million women in India currently live with post-menopausal osteoporosis, which is only one type of osteoporosis.
- If you include women who had surgeries to remove their uterus, people who used steroid medication for a long time and, men who developed osteoporosis because of old age, the number may be over double.
- A 2019 study also revealed that India was the highest contributor to osteoporosis fracture-related deaths/disabilities worldwide.
- There are enormous gaps in knowledge about osteoporosis, even among doctors.

- ✓ **Osteoporosis**, which literally means porous bone, is a disease in which the density and quality of bone are reduced.
- ✓ **Occurrence:** Bone is living tissue that is constantly being broken down and replaced. Osteoporosis occurs when the creation of new bone doesn't keep up with the loss of old bone.

- Nobody with long-term pain is going to make an appointment with an endocrinologist (which is where all the knowledge about bone conditions is concentrated, as of date).
- They will either come to a general practitioner or, if it worsens, to an orthopaedic.
- And **in India, doctors in this capacity are ill-equipped to handle osteoporosis.**
- Considering that Indian women have many micronutrient deficiencies and do not set aside time for exercise, there needs to be a high index of suspicion for osteoporosis in every patient.
- Also of interest is that most of the Indian population does not have access to DEXA or the bone mineral density scan - the gold standard test for osteoporosis. A study found that in India, there are only 0.26 DEXA machines per million of the population.
- “If you look at guidelines for treatment, they say, perform a DEXA for diagnosis and start medication. The guidelines also ask us to repeat the DEXA yearly to see if treatment is working.
- This focus on a scan which is available to barely 10% of the population is unreasonable.
- In the realm of osteoporosis care, India’s infrastructure limitations can be overcome by acquiring proper knowledge and engaging in meaningful discussions within our context.

Osteoporosis Day

This osteoporosis day’s (20th October) the theme was ‘**Build better bones**’.

- To do so, we must realise that our nation is grappling with this silent epidemic.
- Millions suffer in silence as their pain goes unnoticed and their quality of life is compromised.
- To bridge the osteoporosis care gap in India we must promote awareness and aim for early intervention.
- It’s time to empower healthcare providers everywhere with context-specific knowledge to diagnose, treat, and prevent this debilitating condition, ensuring a healthier and pain-free future for all.

Report & Index

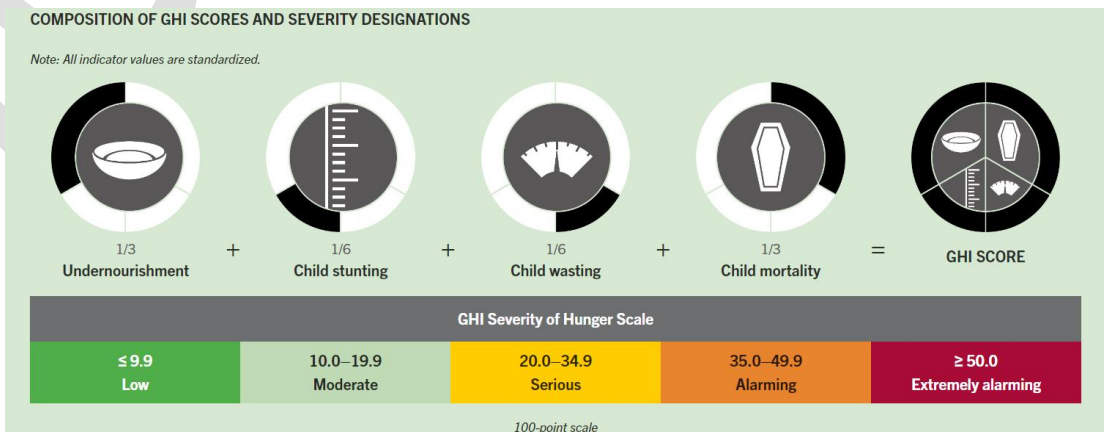
India Ranks 111 Out of 125 Countries in Hunger Index

Context: India ranks 111 out of a total of 125 countries in the **Global Hunger Index (GHI) 2023**, with its progress against hunger nearly halted since 2015, reflecting a global trend. The Union government, though, contested India’s performance for the third year in a row, citing flawed methodology.

Key Highlights

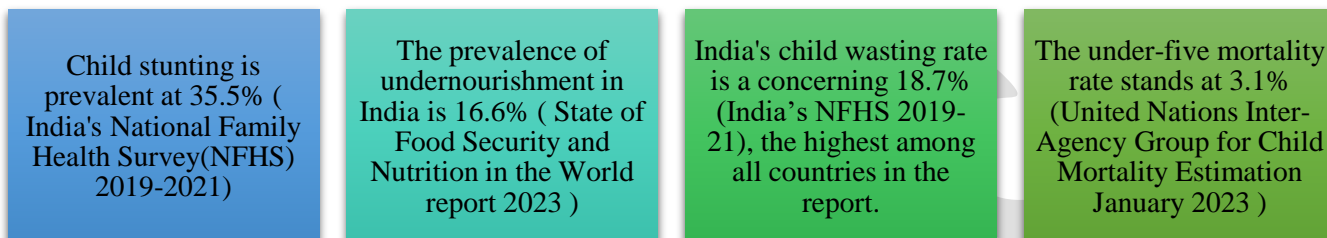
- Afghanistan, Haiti and 12 sub-Saharan countries performed worse than India on the GHI. India’s ranking is based on a GHI score of 28.7 on a 100-point scale, where 0 is the best score (no hunger) and 100 is the worst. **This categorises India’s severity of hunger as “serious”.**

The GHI score is based on a formula which combines **four indicators** that together capture the **multi-dimensional nature of hunger, including under-nourishment, child stunting, child wasting, and child mortality.**

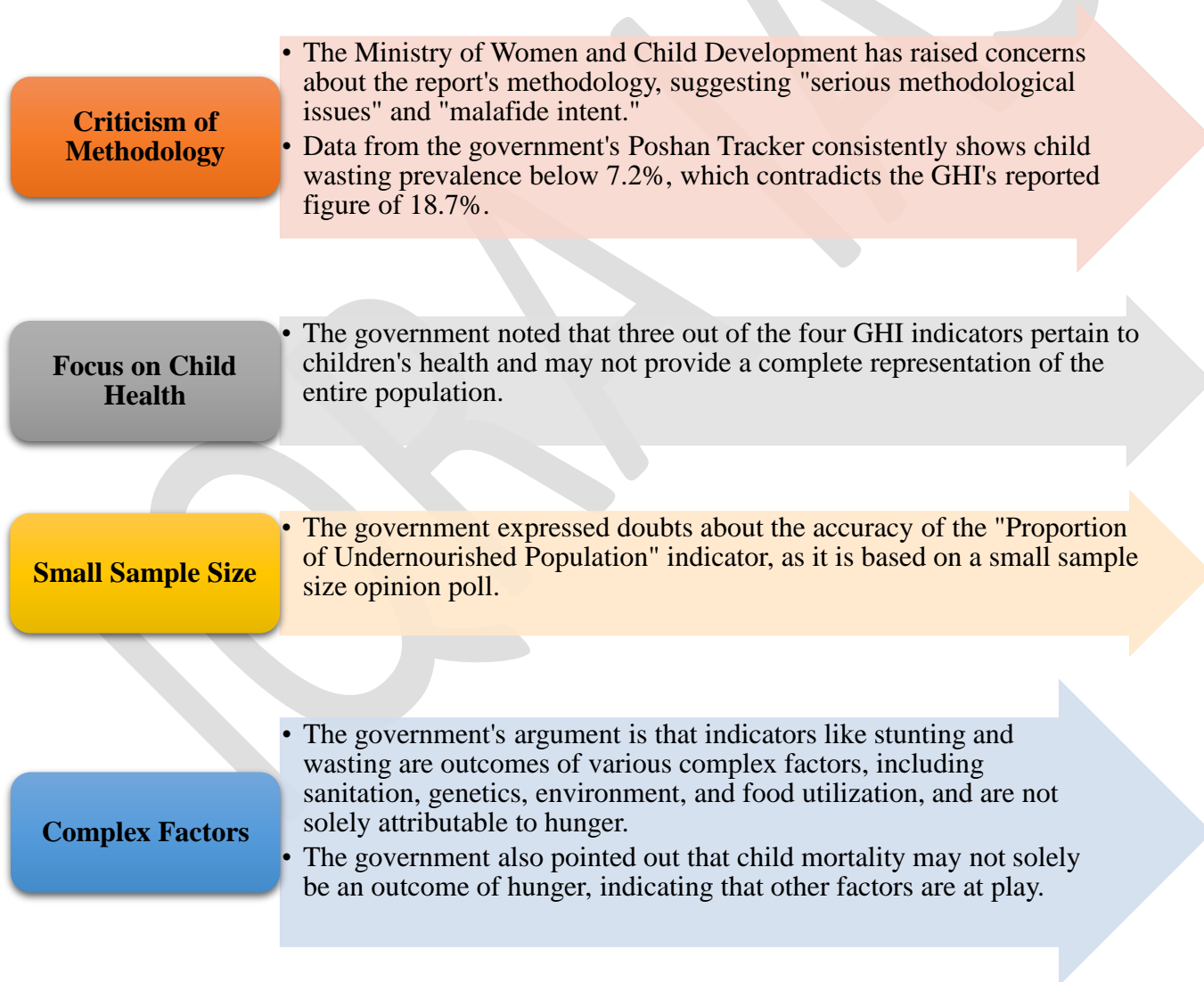


- The Ministry of Women and Child Development yet again questioned the GHI and called it a “flawed measure of hunger that doesn’t reflect India’s true position”.
- The GHI uses the same data sources for all countries to calculate the respective country scores. This ensures that all the rates used have been produced using comparable methodologies.

Related Data and References



Indian Government’s Response to GHI Report 2023



ISA To Release Report On Global Adoption Of Solar Technology

Context: The stocktake will also look at ways to broaden manufacturing of solar energy equipment, which is currently concentrated in China; the International Solar Alliance will meet in Delhi this Oct.

Key Highlights

- The International Solar Alliance (ISA), a gathering of 116 member countries formed to accelerate the global adoption of solar technology, will for the **first time compile and release a ‘global solar stocktake report’**.
- This is inspired by the first ever ‘Global Stocktake’ of the United Nations Conference of Parties, scheduled to be held in Dubai later this year.
- Here **countries are expected to give an account of the actions taken until now to transition their economies away from fossil fuel and lay out plans to course correct**, if their commitments are insufficient to prevent runaway global warming.
- The Global Stocktake follows from the Paris Agreement signed in 2015 and is expected to be held once in five years.
- The ‘solar stocktake’ would be released in mid-November.
 - It would take stock of the progress made by countries.
 - In 2020, nearly \$300 billion of investment in solar has taken place and around \$380 billion in 2022.
 - However, manufacturing is uneven with most of it concentrated in China. The stocktake will look at ways to broaden this.

International Solar Alliance

- The International Solar Alliance is an international organization with 109 member countries jointly set up by India and France.
- It was established at the 21st Conference of Parties (COP21) to the United Nations Framework Convention on Climate Change (UNFCCC) held in Paris in 2015.
- It works with governments, multilateral development banks, development financial institutions, public and private sector organizations, and civil society to improve energy access and security worldwide and promote solar power as a sustainable way to transition to a carbon-neutral future.
- Mission: Unlock US\$1 trillion worth of investments in solar energy by 2030 while reducing the cost of the technology and its financing.
- **Functions:** Promote the use of solar energy in the agriculture, health, transport, and power generation sectors.
 - It drives change by enacting policies and regulations, sharing best practices, agreeing on common standards, and mobilizing investments.
 - Identify, design, and test new business models for solar projects;
 - Support governments in developing solar-friendly energy legislation and policies
 - Improved access to finance and reduced costs by pooling demand for solar technology from different countries making the sector more attractive for private investment
 - Increased access to solar training, data, and insights for solar engineers and energy policymakers.
- **ISA Assembly:** The ISA Assembly is the apex decision-making body of the ISA, with representation from each member country.
 - It makes decisions related to the implementation of the ISA Framework Agreement and coordinates actions to achieve objectives. The Assembly meets annually at the ministerial level at the ISA’s seat.
 - It assesses the aggregate effect of programmes on criteria such as deployment, performance, reliability, cost, and scale of finance.
 - India holds the office of the President of the ISA Assembly, with France as the co-president.

Key Focus Area

The ISA, which is steered by India and France, is scheduled to hold its sixth annual meeting in Delhi later this month.

- A **key focus area** for the organisation is expanding solar installations in Africa and to that end the organisation has set up the Global Solar Facility.
- The **aim** is to boost the scale of solar investment there and following that expand to West Asia, Latin America, and the Caribbean.
- **The Global Solar Facility will have three funds:**

A Payment Guarantee Fund

An Insurance Fund To Mitigate Project Risks

An Investment Fund For Technical Assistance

- Solar photovoltaic installations globally touched 1,133 gigawatts (GW) as of 2022, with 191 GW being added in 2022.
- Nearly a fourth, or about 350 MW, is installed in China, which is not a member of the ISA.
- China is followed by the United States, a member country, at 111 GW.
- India ranks among the top five countries globally with 62 GW.

We believe that the ISA has a seminal role to play in energy transition as it is focused only on renewables and solar. India's experience in this regard has been substantial. The rate of growth of renewable energy capacity in our country has been among the highest in the world. We find that among the various renewables, solar energy has the edge. It is much more reliable, it is much more dependable and it is available for more months in a year. For universal energy access, solar energy is the solution," R.K. Singh, Union Minister for Power and Renewable Energy, said.

Important Days

World Arthritis Day

Context: When arthritis is mentioned in conversation, it conjures up the image of a senior citizen suffering from joint pain, and perhaps unable to move very well. But arthritis is not only a disease of the old: people of all ages, sexes and races can be affected. To help spread awareness about the existence and impact of rheumatic and musculoskeletal disease (RMDs), October 12 is marked as World Arthritis Day.

Key Highlights

- Arthritis refers to joint pain or joint disease, the inflammation or swelling of one or more joints.
- While there are more than 100 such conditions, two common ones are **osteoarthritis** and **rheumatoid arthritis**.
- In **osteoarthritis**, the cartilage, which is the connective tissue that covers the ends of your bones where they form a joint, wears down, causing the underlying bone to change.
 - It frequently occurs in the hands, knees, hips and spine. Its prevalence tends to increase with age.
 - As per a 2022 paper in the Osteoarthritis and Cartilage journal, 62.35 million people in India had osteoarthritis as of 2019.
- The other common condition, rheumatoid arthritis, is a form of autoimmune inflammatory arthritis.
 - In this the immune system attacks healthy tissue, causing painful swelling in the affected parts.
 - RA affects the lining of your joints, and can eventually lead to bone erosion and joint deformity.
 - While it is common in the hands, wrists and knees, in some people, it can damage a number of organs including the skin, eyes and heart.

How Is Arthritis Treated?

- When it comes to osteoarthritis, there are certain risk factors: women for instance, are more likely to develop it after the age of 50, and genetics too play a role.

- Treatment options include physical and occupational therapy, medication for the pain and surgical options if other treatment has not worked.
- The specific causes of rheumatoid arthritis are not known, but it is believed that environmental factors, including viral/bacterial infections or smoking, can trigger it in people born with specific genes.
 - While there is no cure for RA, it can be treated and managed with medication, physical therapy and self-management/care.

Prevention

- The first step, if you suspect you have symptoms of arthritis, is to get an accurate diagnosis and then explore treatment options.
- While there is no certain way of doing this, what you can do, if you currently have healthy joints, is maintain their mobility and function, says the website of the U.S.-based Arthritis Foundation.
- As is the case in the prevention of many other diseases, also eat healthy and avoid smoking!

World Food Day

Context: World Food Day is celebrated to commemorate the establishment of the United Nations Food and Agriculture Organisation (FAO) on 16th October 1945.

About World Food Day

- World Food Day, **celebrated on October 16th every year**, is a global event that aims to raise awareness about hunger, food security, and agricultural issues around the world.
- The day was **established** in 1979 by the Food and Agriculture Organization (FAO) of the United Nations and has since been observed in more than 150 countries.
- **The theme for World Food Day 2023**, "Water is life, water is food. Leave no one behind," underscores the critical role of water in sustaining life on Earth.

World Food Day's Mission

- ✓ **Appreciate the food we eat:** Emphasising the need for mindful consumption and reduced wastage to ensure a sustainable future for all
- ✓ **Encourage healthy, nutritious, and quality diets for all.**
- ✓ **To raise awareness** about the problem of hunger affecting 9.2% of the world population.
- ✓ **Discuss emerging challenges** to world food production systems like climate change, land degradation, water shortage.

Significance of Theme

- Only 2.5% of total water is fresh.
- **Water Management in Agriculture:** On World Food Day, it is important to note that agriculture alone accounts for 72% of global freshwater withdrawals, underscoring the critical role of water in food production and the significance of its sustainable management
- Freshwater resources per person have declined by 20% in the past decade.
- 2.4 billion people live in water stressed countries .
- On world food day it is important to understand that around 600 million people who depend, at least partially, on aquatic food systems are suffering effects of pollution, ecosystem degradation, and climate change.



Importance of World Food Day

World Food Day educates people globally about hunger, food security, and malnutrition, fostering empathy and understanding.

It provides a platform for governments, NGOs, and institutions to advocate policies enhancing food security, leading to improved agricultural practices and poverty reduction.

World Food Day emphasizes sustainable practices like crop rotation and conservation farming, promoting long-term food security while preserving natural resources.

It inspires individuals and communities to volunteer, support local farmers, and promote nutrition education, making a significant impact against hunger.

Emphasizes diverse diets rich in fruits, vegetables, and whole grains, reducing malnutrition and related health problems.

Provides a platform for discussions on climate change's impact on agriculture, food distribution inequalities, and the need for farming innovations.

Encourages collaboration between nations, NGOs, and organizations, leading to innovative solutions and joint efforts against global hunger.

Acts as a catalyst for year-round efforts, inspiring NGOs and community groups to carry out sustained programs, making hunger eradication a continuous priority.

Challenges in Achieving Global Food Security

Poverty

• Poverty and hunger both fuel and reinforce each other. Poverty prevents access to adequate food resources that inhibits human development.

Increasing population

• Population growth along with increased income has been an important driver of increased food demand.

Inequality

• Hunger is more prevalent in rural areas at 33.3% compared to 26% in areas. The Gender Hunger Gap is still 2.4%.

Dietary Choices

• Preference for meat and exotic foods has led to increased demand for land, water and fertilisers.

Food wastage

• Almost 1 billion tonnes of food- 17% of all food available to consumers worldwide is thrown away each year.

Land use Change

• On World Food Day, it is critical to address that Urbanisation, desertification, salinization, deforestation, commercial plantation are all reducing the availability and variability of food.

Climate Change

- Submergence of coastal lands, land degradation and erratic weather events have reduced food availability.
- Since 2000, flood-related disasters have increased by 134% and the number and duration of draughts increased by 29%

Conflict

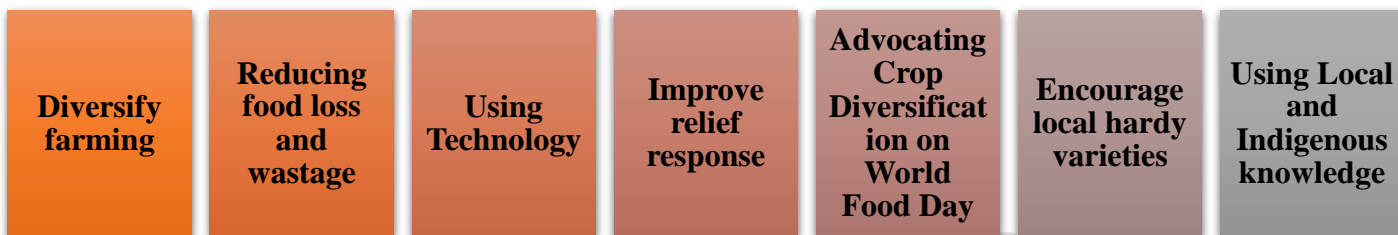
- Episodes like Russia-Ukraine conflict, political instability in West Asian and Africa has led to severe malnourishment in these regions and also affected global food supply leading to lower availability and higher prices.

Related Indian Initiatives

Eat Right India and Fit India Movement	Swachh Bharat Abhiyan, Jal Jeevan	Biofortified Varieties	Food Security Act, 2013	APMC (agricultural produce market committee) Acts
Minimum Support Price (MSP)	Farmer Producer Organisations (FPOs)	Amendments in the Essential Commodities Act, 1955	Make India Trans Fat free by 2022	New India @75
	International Year of Millets		Pradhan Mantri Garib Kalyan Anna Yojana (PMGKAY)	

- **Eat Right India and Fit India Movement** along with **Swachh Bharat Abhiyan, Jal Jeevan Mission** and other efforts will improve the health of Indians and heal the environment.
- Introduction of 17 new **biofortified varieties** of crops to overcome the shortcomings of the common variety of crops which lacks important micronutrients.
 - Example: MACS 4028 Wheat, Madhuban Gajar, etc.
- Increased ambit and effective implementation of the **Food Security Act, 2013**.
- Amendments to the **APMC (agricultural produce market committee) Acts** to make them more competitive.
- Steps to ensure that farmers get one and a half times the cost as **Minimum Support Price (MSP)**, which along with the government procurement, is an important part of ensuring the country's food security.
- Development of a large network of **Farmer Producer Organisations (FPOs)**.
- **Amendments in the Essential Commodities Act, 1955** to deal with the issue of grain wastage in India.
- The government is making efforts to **make India Trans Fat free by 2022**, a year ahead of the World Health Organisation (WHO) target, in synergy with the vision of **New India @75** (75 years of India's independence).
 - **Trans Fat** is a food toxin present in Partially Hydrogenated Vegetable Oils (PHVOs) (e.g., vanaspati, shortening, margarine, etc.), baked and fried foods.
- FAO supported India's proposal to declare 2023 as the **International Year of Millets**.
- For improving food access, especially for vulnerable populations, the Government of India drives programmes such as the **Pradhan Mantri Garib Kalyan Anna Yojana (PMGKAY)**.

Way Forward



- **Diversify farming:** Farmers should be encouraged to engage in non-crop agriculture (eg. Poultry, fishing, beekeeping) to insure against loss of income.
- **Reducing food loss and wastage:** This helps in stabilising availability even if overall production is reduced.
- **Using Technology:** Technological tools like Early Warning Systems, sensors, drones can help in better decision making by farmers and governments.
- **Improve relief response:** Improved insurance schemes for crops and animals and rapid relief during natural calamities can help reduce distress.
- **Advocating Crop Diversification on World Food Day:** Moving ahead of present monoculture practice to a much more diversified cultivation practice.
- **Encourage local hardy varieties** like coarse cereals and promote research for flood, draught, and salt resistant seed varieties.
- **Using Local and Indigenous knowledge:** Need to respect and catalogue traditional knowledge and develop best practices eg. Kuttanad Below Sea Level Farming system of Kerala.

World Thrift Day

Context: World Thrift Day is observed on October 31 to promote saving money and developing a sense of financial prudence.

About World Thrift Day

- Established on 31st October 1924 by the World Savings and Retail Banking Institute (WSBI) founding fathers as the 'World Thrift Day', the World Savings Day has been marked ever since.
- World Thrift Day is celebrated every year on 31st October worldwide to promote savings and financial security of individual and nation as a whole.
- World thrift day was established to inform people all around the world about the idea of saving their money in a bank rather than keeping it under their mattress or at home.
- In India due to death of late Prime Minister Indira Gandhi on the same day in 1984, this day is being celebrated on 30th October.

World Thrift Day 2023

- This year, the theme of World Thrift Day is "Saving prepares you for the future", closely linked with last year's theme that focused on the importance of savings.
- This year, as in the past, WSBI launched an awareness raising campaign, much in harmony with similar actions conducted by saving banks across the world.
- This kind of awareness raising campaigns and the subsequent increase in savings are especially meaningful to build "resilient" generations which is something that we all need regardless of where we live in this world. We believe that individual savings makes the society advance, as it is a collective movement.
- Encouraging the young generation to plan their finances will not only give them freedom and security, two things that are vital for them, but also it will help build a strong society aware of the importance of savings.



- The central message of the campaign is to "Conquer your Tomorrow" through savings!

Key Highlights

It so happens that our vast universe's scheme of operations also has an economical character. That is, our universe is thrifty as well.

- Physicists generally attribute this to the principle of least action. Action in physics is defined by the change in energy of a system over time.
- The conservation laws in physics follow from the principle of least action. They imply that all energy is conserved, as is the total momentum. Nothing is deleted or destroyed, only conserved.
- All the phenomena that happen, from the subatomic world to the galaxies, follow the path of least action.
- The word 'least' here doesn't mean minimality. Instead, it means that a physical system between any two points in space-time evolves along a path that minimises or maximises the action depending on the outcome of the process.
- The basic idea is that nature has a certain purpose to fulfil and thus follows an economical path. This is one of the most profound and far-reaching ideas in physics.
 - From the motion of planets around the sun to a ball thrown in the air, bodies go for the path that minimises the action involving their energy.
 - Such selection happens naturally, without any 'planning'. Water vapour is perfectly aerodynamic in the air but when it falls as rain, they do so as elongated spheres spreading out as little as possible to avoid increasing their surface tension.

Other Important Days

Date	Event	Details and Significance
1 October	International Day of the Older Persons	To raise problems faced by elder persons and to promote the development of a society for all ages.
2 October	International Day of Non-Violence	International Day of Non-Violence is observed on 2 October to mark the birthday of Mahatma Gandhi who had played an important role in India's Independence. On 15 June 2007, the General Assembly adopted a resolution establishing the International Day of Non-Violence to spread the message of non-violence including education and public awareness.
2 October	World Habitat Day	World Habitat Day is observed on the first Monday of October month throughout the world. It was declared by the United Nations General Assembly in December 1985 and in 1986, the first time it was celebrated across the globe.
3 October	World Nature Day	This day is celebrated to promote awareness of the importance of nature and to encourage people to protect it.
4 October	World Animal Welfare Day	This day is celebrated to raise awareness of animal welfare and to promote the protection of animals.
7 October	World Cotton Day	To provide an opportunity to recognise the importance of cotton worldwide.
8 October	Indian Air Force Day	Indian Air Force Day is celebrated on 8 October all over India. On 8 October 1932, Indian Air Force Day was established.

Date	Event	Details and Significance
9 October	World Postal Day	To raise awareness among people about the role of the postal sector for people and businesses every day. In 1874, the Universal Postal Union was established in Bern, Switzerland and its anniversary was declared as World Postal Day by the Universal Postal Union Congress in Tokyo, Japan in 1969.
10 October	National Post Day	It is observed to recognize the role played by the Indian Postal Department for more than 150 years. The British brought postal service to India. Lord Dalhousie established it in 1854.
10 October	World Mental Health Day	To raise awareness about the scale of suicide around the world and the role that each of us can play in preventing it. This day is organised by the World Federation for Mental Health. It is also supported by WHO, the International Association for Suicide Prevention, and the United for Global Mental Health.
11 October	International Day of the Girl Child	International Day of the Girl Child is observed on 11 October to raise voices for girls and stand up for their rights.
12 October	World Sight Day	The aim of celebrating World Sight Day is to increase awareness about attention to vision impairment and blindness.
13 October	International Day for Natural Disaster Reduction	International Day for Natural Disaster Reduction is observed annually on 13 October to raise awareness about the risk of disaster reduction. In 1989, the International Day of Disaster Risk Reduction was started by the United Nations General Assembly.
14 October	World Standards Day	To raise awareness among regulators, industry, and consumers to show the importance of standardization to the global economy.
15 October	Global Handwashing Day	Global Handwashing Day is observed on 15 October every year and it was founded by the Global Handwashing Partnership. This day provides an opportunity to design, test and replicate creative ways to encourage people to wash their hands with soap at critical times. In 2008, the first Global Handwashing Day was celebrated.
15 October	World White Cane Day	World White Cane Day is celebrated on 15 October by the National Federation of the Blind. White cane for blind people is an essential tool that gives them the ability to achieve a full and independent life. With the help of a white cane, they can move freely and safely from one place to another.
15 October	World Students' Day	World Students' Day is observed on 15 October annually to mark the birth anniversary of A.P.J. Abdul Kalam. This day honours and pays respect to him and his efforts in the field of science and technology and also the role of the teacher that he played throughout his scientific and political careers.
16 October	World Food Day	World Food Day is celebrated every year on 16 October to inspire people about healthy diets. On this day Food and Agriculture Organisation was established and launched by the United Nations in 1945.

Date	Event	Details and Significance
16 October	World Anaesthesia Day	World Anaesthesia Day is celebrated on October 16 to mark the first successful demonstration of diethyl ether anaesthesia in 1846.
16 October	World Spine Day	It is observed on 16 October to highlight the burden of spinal pain and disability around the world.
17 October	International Day for the Eradication of Poverty	International Day for the Eradication of Poverty is observed on 17 October every year. This day marks the adoption of the Convention on the Rights of the Child (UNCRC) on 20 November 1989.
20 October	World Statistics Day	World Statistics Day is celebrated every five years on October 20. The first such day was observed on October 20, 2010. This year the world witnessed the third World Statistics Day. The day was created by the United Nations Statistical Commission to acknowledge the importance of data authenticity and credibility across the globe.
24 October	World Development Information Day	World Development Information Day is celebrated on 24 October every year to draw the attention of the world to development problems and the need to strengthen international cooperation to solve them.
30 October	World Thrift Day	This day is devoted to the promotion of savings all over the world.
31 October	Rashtriya Ekta Diwas or National Unity Day	Rashtriya Ekta Diwas or National Unity Day is observed on 31 October every year to commemorate the birth anniversary of Sardar Vallabhai Patel. He had played an important role in unifying the country.

Important Editorials of the Month

Statistical Performance Indicators (SPI)

Why in News?

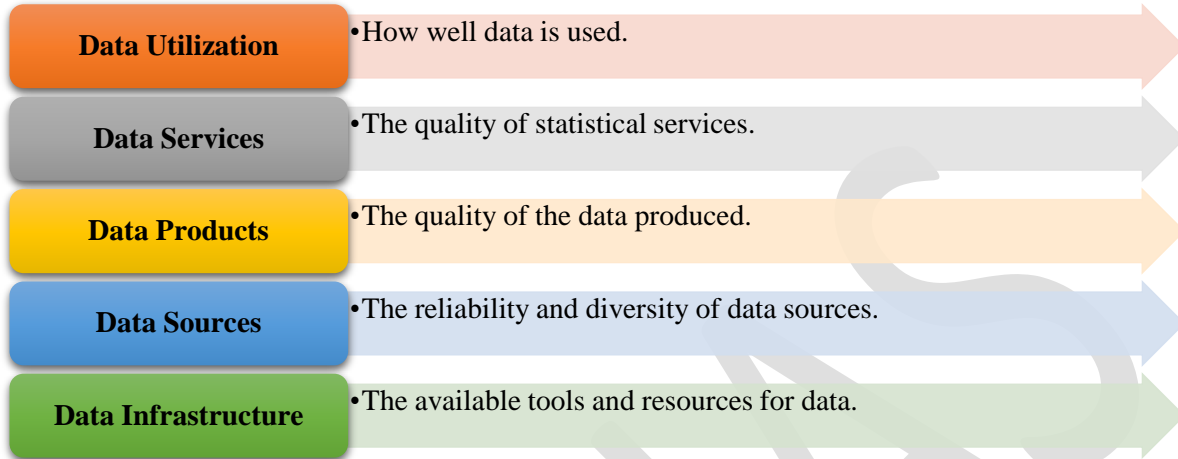
The World Bank's compilation of Statistical Performance Indicators (SPI) ranks India 67 among 174 countries in 2019. Analysis reveals both shortcomings and a commendable performance in various aspects of SPI.

Key Highlights

- As India celebrates its election to the United Nations Statistical Commission, India's own official statistical system has come under scrutiny within the country recently.
- **Questions have been raised about the credibility of the statistics** it produces and the competence of the official statisticians.
- Even acclaimed **statistical methods** devised to generate these statistics, which were subsequently adopted by other developing countries, now face questioning.
- What is even more surprising is the assertion that the **results** of statistical exercises, such as censuses and surveys, are **claimed to be of poorer quality** when compared to data from administrative sources, most of which suffer from uncertain coverage and conceptual shortcomings. In general, the statistical system is now facing a trial.
- In this context, looking at the international rankings of national statistical systems compiled by the World Bank can provide valuable insights.

What is a Statistical Performance Index?

The World Bank uses SPIs to evaluate how well national statistical systems perform in 174 countries. The SPI relies on five key areas of evaluation, often called the "five pillars" of a national statistical system:



PILLARS	DIMENSIONS				
Data Use (User Types)	Legislature	Executive	Civil Society	Academia	International Bodies
Data Services (Service Types)	Quality of Data Releases	Richness & Openness of Online Access	Effectiveness of Advisory & Analytical Services Related to Statistics		Availability & Use of Data Services
Data Products (Topics)	Social (SDG 1-6)	Economic (SDG 7-12)	Environmental (SDG 13-15)		Institution (SDG 16-17)
Data Sources	Statistical Office (Censuses & Surveys)		Administrative Data	Geospatial Data	Private Sector Data/Citizen Generated Data
Data Infrastructure	Legislation & Governance	Standards & Methods	Skills	Partnership	Finance (Domestically & From Donors)

As of 2019, India's overall SPI score is 70.4, ranking it 67th among the 174 countries assessed. When we look at the individual pillar scores, India performs lower in the 'Data Use' and 'Data Products' areas, scoring 80 and 60, respectively. This lower performance in these two areas results in India's comparatively lower rank.

The SPI And Dimensions

The **World Bank** compiles SPIs to assess the performance of national statistical systems across 174 countries.

- The SPI is based on the assessment of five dimensions of performance, commonly referred to as the **“five pillars”** of a national statistical system, i.e.,



India's Score 2019: SPI Overall Score: 70.4 ✓ Pillar 1 - Data use: 80.0; ✓ Pillar 2 - Data Services: 88.0; ✓ Pillar 3 - Data Products: 60.0; ✓ Pillar 4 - Data Sources: 68.9; ✓ Pillar 5 - Data Infrastructure: 55.0.	India's Rank 2019: SPI Overall Score: 67 ✓ Pillar 1 - Data Use: 101; ✓ Pillar 2 - Data Services: 35; ✓ Pillar 3 - Data Products: 105; ✓ Pillar 4 - Data sources: 31; ✓ Pillar 5 - Data infrastructure: 73.
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- The latest available scores are from 2019. According to these scores, India's overall SPI score stands at 70.4, placing it in the 67th rank (ranks are self-computed) among the 174 countries assessed.
- The pillar-wise scores show **India's lower performance in the 'Data use' and 'Data products' pillars**, with scores of 80 and 60, respectively, resulting in poor rankings of 101 (with an average rank of 116.5) and 105.
- The **score in the 'Data use' category depends on** how different sectors of society, including the legislature, executive, civil society, academia, and international bodies, utilise the statistics produced by the system.
- The **SPI assessment 2019 considered only data usage by international bodies**. India performs well in measures assessing the comparability of estimates of child mortality, debt reporting, drinking water, and labour force participation.
- However, it loses 20 points due to the unavailability of comparable poverty estimates for the World Bank over the last 10 years (from 2017).
- This stems from a new comparability indicator introduced by the World Bank's PovcalNet for poverty estimation.
- It is important to note that India did produce poverty estimates within this period through the NSS Consumption Expenditure Survey.

An India Assessment

- **The pillar 'Data Products' anchors the national statistical system's performance** around the essential data required for Sustainable Development Goals (SDGs).
 - To improve upon this, India has already taken the right step by conducting a Multiple Indicator Survey and Comprehensive Annual Modular Survey in the NSS 78th round (2020-21) and 79th round (2022-23), respectively, for collection of data on SDGs.
- Regarding **'Data infrastructure'**, India's score is 55, ranking 73 (with an average rank of 75.5).
 - This pillar encompasses **five sub-dimensions**:



- 'Skills' and 'Partnership' were not considered for SPI 2019.
- India's scores for **'Legislation and Governance'** are high, given that the national statistical legislation aligns well with the Fundamental Principles of Official Statistics.
- Nonetheless, the overall score for 'Data infrastructure' is diminished due to moderate performance in 'Standards and methods' and poor performance in 'Finance'.
 - In **'Standards and Methods'**, India fares well in indicators assessing the adoption of System of National Accounts (SNA) 2008, COICOP (Classification of Individual Consumption

According to Purpose), and the latest standards for the compilation of government finance statistics, monetary, and financial statistics.

- However, the score in this dimension decreases due to the non-adoption of the latest standards for classifying employment status (such as International Classification of Status in Employment or ICSE-93 or North American Industry Classification System or NAICS 2012), the accounting basis for reporting central government financial data, and the non-utilisation of the Generic Statistical Business Process Model (GSBPM).
- This is perplexing given that the process followed in NSS surveys closely mirrors and predates the adoption of the GSBPM.
- The **'Finance' category** receives a low score since, according to the World Bank, India's national statistical plan lacks full funding. India excels in data services (score 88, rank 35) and data sources (score 68.9, rank 31), securing a place in the top quintile for these pillars.
- Under **data sources**, three indicators are evaluated (with the fourth indicator not considered in 2019):

Censuses And Surveys

Administrative Data

Geospatial Data

- Among these indicators, censuses and surveys (score: 100/100 for censuses and 86.6/100 for surveys) contribute the most to India's ranking, followed by administrative data (score: 50/100), and finally, geospatial data (score: 38.9/100).
- The relatively **low score of administrative data** is mainly due to non-fulfilment of criteria of at least 90% registration of births under the Civil Registration System (CRS).
- The World Bank has taken the estimate of coverage under CRS from the UN SDG monitoring database, which shows estimates of coverage as 89% for children under five and 87% for children under one.
- However, these estimates are actually derived from the National Family Health Survey conducted between 2019 and 2021—a period significantly affected by lockdowns following COVID-19.
- Conversely, the publication of the Office of the Registrar General of India, "Vital Statistics of India", cites the coverage of births under CRS for 2019 at approximately 93%, which is a much more reliable source than NFHS for estimation of coverage of CRS.
- In the **'Data services' dimension**, India gets full points for data releases and data services, yet avenues for improvement remain in terms of online accessibility.
 - Enhancements in this area could be achieved by improving download options, providing more comprehensive metadata availability, and open terms for data usage. India's commendable rank of 40 in the 'Openness' score from Open Data Inventory deserves recognition.

SPI Score's Relevance

Highlighting India's Strong Performance Across All Aspects

- The SPI evaluates the capability and maturity of national statistical systems, to enhance development outcomes and monitor progress towards achieving the Sustainable Development Goals (SDGs).
- In the 2019 SPI assessment, India's notable performance stands out in the realm of censuses and surveys when compared to administrative data.
- It is through **identifying issues and establishing attainable goals** that a substantial rise in rankings can be achieved.
 - For instance, achieving a 20-point increase in each of the three pivotal pillars ('Data products', 'Data use', and 'Data infrastructure') would have positioned India at 34 in 2019.

Encouraging Countries to Build Robust National Statistical Systems

- The SPI framework provides countries with incentives to establish more effective statistical systems.

- Furthermore, it fosters the creation of data ecosystems that can evolve and adapt to meet the needs of governments and citizens, ultimately resulting in improved decision-making supported by better data.
- Moreover, proactive engagement with the World Bank to fortify the robustness of the SPI is warranted.
- Use of “Vital Statistics of India” in place of the NFHS for estimating the registration of births and deaths is one such case.

Concerns Related to the Indian Statistical System

There are many concerns related to the Indian Statistical System, some of them are listed below:

Institutional and Structural Issues

- The government have a timetable for the release of national accounts, the Index of Industrial Production and inflation. But there are no specific timelines for the release of labour force statistics and consumption expenditure surveys
- Under MoSPI, it has become part of the general bureaucracy and ceases to exist as an autonomous body.
- Moreover, the fear is that in the absence of the oversight of independent bodies like the CSI and NSC, the statistical system may become amenable to political interference.

Methodology

- Use of small surveys for estimations
- Challenges in price adjustment for GDP calculations

India's Statistical Machinery



Ministry of Statistics and Programme Implementation (MoSPI)

- Established as an Independent Ministry in 1999, following the merger of the Department of Statistics and the Department of Programme Implementation.
- Comprises two wings: Statistics and Programme Implementation.



Statistics Wing (National Statistical Office - NSO):

- Includes the Central Statistical Office (CSO), Computer Center, and National Sample Survey Office (NSSO).
- Also encompasses the National Statistical Commission (NSC) and the autonomous Institute of National Importance - the Indian Statistical Institute.



Registrar General and Census Commissioner:

This office conducts the decennial Population and Housing Census in India. It is responsible for collecting demographic data about the population and housing conditions across the country.

- The faulty approach in data collection and collation
- The incoherence of GDP data

Nature of Data

- Unreliable data on the unorganised sector
- Shortcomings in MCA21 data used for GDP calculations

Stop Taking Water For Granted

Why in News?

The theme for World Food Day (October 16) this year — ‘**Water is Life, Water is Food**’ — calls for urgent action in managing water wisely.

- Availability or a lack of water has become even more critical with increasing climate extremes.
 - Countries face severe challenges such as drought, floods, unseasonal rains and prolonged dry spells.
- With less than seven years left to achieve the UN Sustainable Development Goals (SDGs), the Food and Agriculture Organization of the United Nations (FAO), the International Fund for Agricultural Development (IFAD) and the United Nations World Food Programme (WFP) — the UN’s food agencies — lay stress on the need to adopt innovative and collaborative approaches for improved management, conservation and availability of scarce water resources.

Water

- ✓ The UN defines safe water as that which is free from contamination, accessible on the premises and available when needed.
- ✓ Water is crucial for human survival, healthy ecosystems, socio-economic development and also for food and energy production.
- ✓ Though nearly 70% of the world is covered by water, only 2.5% of it is fresh water.
- ✓ Just less than 1% of the freshwater is easily accessible in lakes and rivers.
- ✓ Of the remaining fresh water, one-third is underground water supplies or well springs while the other two-thirds are locked away in ice caps or glaciers.

Impact of Water Availability on Food

Water availability affects every aspect of human life, especially food and nutrition security.

- For instance, about 60% of India’s net sown area is rainfed, contributing to 40% of the total food production.
- However, rainfed agriculture depends directly on water availability, and rain and soil moisture variations can severely affect food and nutrition security.
- There is an urgent need to adapt to climate change by promoting technologies and practices that make rainfed production more resilient and sustainable.
- Sustainable water management is critical to address the impending food and nutrition security threats.
- In turn, irrigated agriculture accounts for 72% of global freshwater withdrawals, sometimes with lasting damaging effects on the sustainability of significant ecosystems, such as seasonal rivers and deep aquifers.

Water and Crop Production

Decades of poor water management, misuse and pollution, and the climate crisis have degraded freshwater supplies and ecosystems, adding to the vulnerability of small-scale producers to climate shocks and land degradation in some of the world’s most fragile ecosystems.

- About **40% of the planet’s total land area is degraded**, leaving farmers with less productive land.
- Small-scale farmers, who make up more than 80% of farmers globally, are especially affected as they often **lack access to finance, technology and irrigation** to maintain a level of production that can sustain their livelihoods.

- **Extreme weather events and variability in water availability** are severely affecting agricultural production, changing agro-ecological conditions and shifting growing seasons.
- **Changes in rainfall and higher temperatures** also affect crop productivity, reducing food availability.

India and Crop Production

The Government of India has assessed the impact of climate change in 2050 and 2080 using climate projections and crop simulation models.

- Without adaptation measures, rainfed **rice yields** in India are projected to reduce by 20% in 2050, and by 47% in 2080 scenarios, while irrigated rice yields are projected to decline by 3.5% in 2050 and 5% in 2080 scenarios.
- **Wheat yields** are projected to decrease by 19.3% in 2050 and 40% in 2080.
- **Kharif maize yields** could decline by 18% and 23%.

In every scenario, climate change without adequate adaptation measures reduces crop yields and lowers the nutritional quality of produce.

- The FAO, in Andhra Pradesh, Karnataka, Himachal Pradesh, and Maharashtra, is piloting a **crop forecasting framework and model incorporating climate (weather), soil characteristics and market information** to aid rainfed farmers in making informed decisions contributing to food security.
- **Irrigation** can also be an effective measure to make agriculture more resilient, and in most cases, enable farmers to transform their livelihoods by growing, consuming and selling high-value crops such as nutritious fruits and vegetables.
 - In this context, the **WFP supports soil and water conservation**, the building or fixing of irrigation canals, dams, ponds, and dykes, as well as flood barriers through food assistance in exchange for labour.
 - In 2021 alone, 8.7 million people across 49 countries benefited directly from such support.
- Similarly, IFAD supports Indian States in leveraging the **Mahatma Gandhi National Rural Employment Guarantee Act scheme**.
- Through safeguards during design and planning and encouraging participatory institutional development, IFAD ensures that micro-irrigation infrastructure is environmentally and socially sustainable and financially viable.

Climate Change Adaptation

- The **FAO** also supports the sustainable transformation of agrifood systems and climate-smart agriculture practices to improve water-use efficiency.
 - It supported the farmer water school programme in Uttar Pradesh, which helped smallholder farmers.
 - At the same time, the Andhra Pradesh Farmer Managed Groundwater Systems project reached out to 638 habitations in seven drought-prone districts, that included a hydrological monitoring programme.
- Similarly, **IFAD** has enshrined climate change adaptation in its core strategies.
 - It set ambitious targets in terms of leveraging climate financing to mitigate climate change by addressing the adverse impacts of agriculture and helping farmers to adapt to the increasing volatility of weather conditions, by investing in the restoration and preservation of soil health, water resources and merging modern technologies with indigenous knowledge systems to build productive and resilient production systems and value chains.
 - IFAD-supported projects in Maharashtra, Odisha, Uttarakhand, Nagaland and Mizoram incorporate climate-resilient seed varieties and crops, including millets, and train farmers in climate-sensitive agricultural practices and soil management to cope with increased water stress.
- The **WFP** is collaborating with the Government of Odisha to develop solutions for smallholder farmers, focusing on women.



- The goal is to enhance resilience through solar technologies, establish community-based climate advisory services to help manage climate impacts and promote a millet-value chain that reduces water usage and improves nutrition.

Current State of Water Scarcity

World	India
<ul style="list-style-type: none"> • Only 3% of the world’s water is freshwater, and two-thirds of that is tucked away in frozen glaciers or otherwise unavailable for our use. • As many as 87 countries are projected to become water-scarce by 2050. • One in four people on Earth face shortages of water for drinking, sanitation, agriculture and economic development. • Water scarcity is expected to intensify in regions like the Middle East and North Africa region, which has 6% of the global population but only 1% of the world’s freshwater resources. 	<ul style="list-style-type: none"> • Although India has 16% of the world’s population, the country possesses only 4% of the world’s freshwater resources. • In recent times, the water crisis in India has become very critical, affecting millions of people across India. • As many as 256 of 700 districts in India have reported ‘critical’ or ‘overexploited’ groundwater levels according to the most recent Central Ground Water Board data (from 2017). • Three-fourths of India’s rural families lack access to piped, drinkable water and must rely on unsafe sources. • India has become the world’s largest extractor of groundwater, accounting for 25% of the total. Some 70% of our water sources are contaminated and our major rivers are dying because of pollution.

Related Indian Initiatives

Jal Kranti Abhiyan

National Water Mission

National Rural Drinking Water Programme

NITI Aayog Composite Water Management Index

Jal Jeevan Mission

Jal Shakti Abhiyan

Atal Bhujal Yojana

Water Conservation – Solutions

- **Reusing Water**
 - Water left after washing vegetables can be used for gardening.
 - Water drained from RO filters at home can be used for mopping the floor.
- **Preventing Wastage**
 - Not leaving taps running while brushing.
 - Aerators save nearly 35-40% of water a minute when compared to normal taps.
 - Doing laundry when washing machine is fully loaded.
 - Trying bathing with one bucket of water instead of taking shower or installing water-saving shower heads to cut down 80% of water usage.
 - Installation of composting toilets.
 - Checking for leakages in the house.
- **Ground water level can be increased** by using Artificial Recharge Techniques.
- **Rainwater Harvesting Systems** in houses and localities can fight water shortage.
- **Cultivating less water intensive crops** is another solution. Also, use of drip and sprinkler systems for irrigation will help in conservation of water.
- **Avoiding usage of those synthetic ingredients that contaminate water bodies.** Water Purification is another solution for conservation of water.

Steps Needed/ Way Forward

- To achieve global food and nutrition security, political commitment is needed as much as concrete investment.
- The needed policies and investments must promote:
 - Innovative and proven technologies that allow farmers to increase their productivity
 - adapt to climate change and become more resilient to shocks
 - environmentally and socially sustainable and financially viable irrigation and water management strategies
 - reduce their climate footprint of agricultural production, as well as bio-hazards and environmental pollution
 - bring sanitation and drinking water supplies closer to rural households
 - adopt efficient food and water recycling strategies
 - strengthen institutional arrangements and capacity for sustainable and equitable water regulations, management, access and ownership

The UN's food agencies work closely with the Government of India and State governments on innovations such as **Solar 4 Resilience, Secure Fishing, and the revival of millets for renewable energy promotion, food security and nutrition.**

Capturing The Rain

Why in News?

India needs all-weather insurance against vagaries of global climate. For the first time since 2018, India has reported a deficit monsoon.

- From June to September this year, India received 82 cm of rainfall, nearly 6% lower than the 89 cm that is considered 'normal'.
- Beginning April, there were enough indications that the monsoon would be subdued with an **El Niño** on the horizon.
 - This cyclical warming of the central and eastern Pacific ocean usually corresponds to a decline in rainfall over India, particularly the north-west.
- Between 2019 and 2022, the Indian monsoon was significantly impacted by the converse phenomenon – a cooling **La Niña** — that sometimes is associated with above normal rainfall.
- By those metrics, the expectations of a normal monsoon in 2023 were muted. However, the experience of the monsoon this year was far from the ordinary.
 - About 9% of the country received 'excess' rainfall with 18% getting 'deficient' and the rest of the country, 'normal' rainfall.
 - While on one hand, August — the second-most important monsoon month — posted a third less than its normal, several
 - States in north India, which were expecting minimal rainfall, were deluged following multiple episodes of record rainfall.
 - July, for instance, saw exceptionally heavy rainfall in Chandigarh, Haryana and Himachal Pradesh, resulting in floods and landslides.
 - Several cities were left grappling with serious flooding over several days. Cloudbursts were reported in Himachal Pradesh in August.
 - It is worthwhile to note here that these episodes of intense rain were due to so-called **western disturbances** that are extra tropical storms from the Mediterranean region and normally not expected to play a major part in the monsoon. Thus, these are fingerprints of the wide-ranging impacts of anthropogenic warming.

- At the other end of the spectrum were drought-like conditions in Maharashtra. Extreme water stress was also reported out of Chhattisgarh, Bihar and Karnataka, where in the case of Karnataka, matters came to a head with neighbouring Tamil Nadu over the sharing of water from the Cauvery river.
- The India Meteorological Department has also forecast a **‘normal’ north-east monsoon** from October to December and **‘normal to above-normal rainfall’** over large parts of north-west India and south peninsular India. The signs are there of increased rains in several parts of south India.
- The spatial and temporal variance of the monsoon reiterates the need to **invest in more resilient infrastructure** that can be an **all-weather insurance** against the increasingly unpredictable vagaries of the global climate.
- The pattern in recent years is to **improve forecast models** that are better able to warn of significant changes in weather a week or two ahead than having approaches that fail to capture the dynamics of the Indian monsoon. **More money and expertise** should be directed towards this.

Precipitation

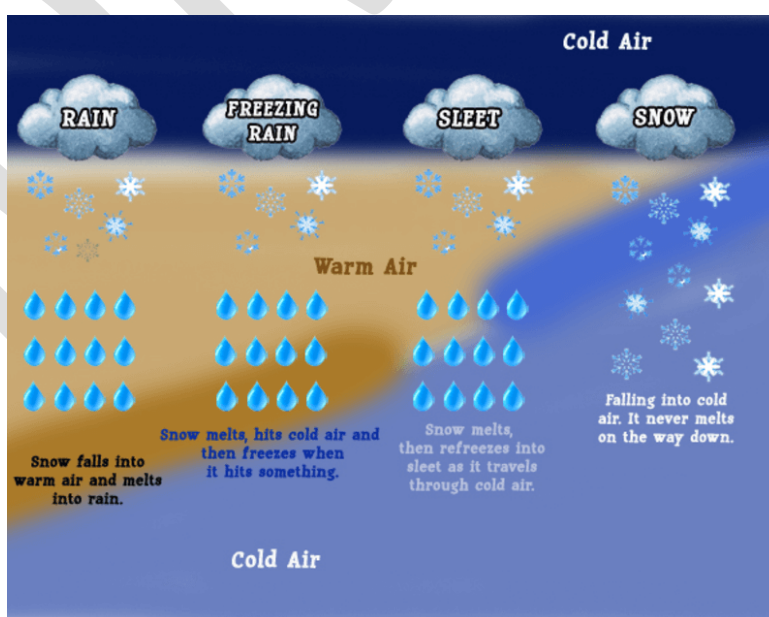
It is a process of falling atmospheric moisture on the surface in any form due to gravity. Precipitation occurs when a portion of the atmosphere becomes saturated with water vapor so that the water condenses and precipitates. There are five forms of precipitation:

Rainfall	•It is the fall of atmospheric moisture in the form of water due to gravity.
Snow	•Precipitation of white opaque crystals when cloud forms below zero degree Celcius.
Hail	•It falls in the form of small ice pellets and is a very destructive form of precipitation produced by thunderstorms or cumulonimbus clouds.
Sleet	•It is a mix of rain and snow or it is frozen rain that forms when rain passes through very cold air mass before reaching the land.
Drizzle	•Very small and uniform sized raindrops (less than 0.5 mm size)

Rainfall

It is the most common form of precipitation, especially in low latitudes. Monsoon or equatorial rains are good examples to understand.

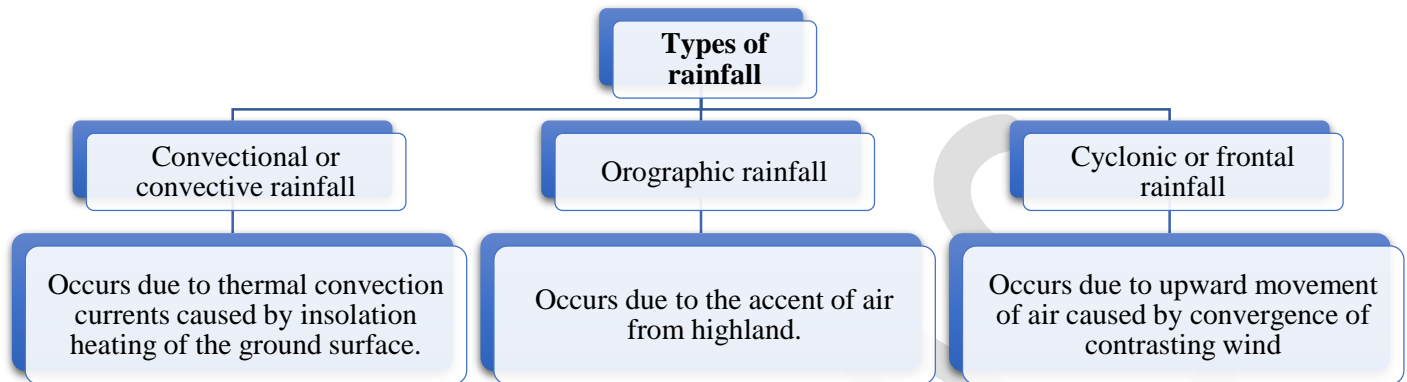
- The warm and moist air after being lifted upward becomes saturated and



nuclei
 rainfall formation such as:
 nt of evaporation from the
 the water vapour from one
 reasing the temperature of
 oplets change to raindrops.

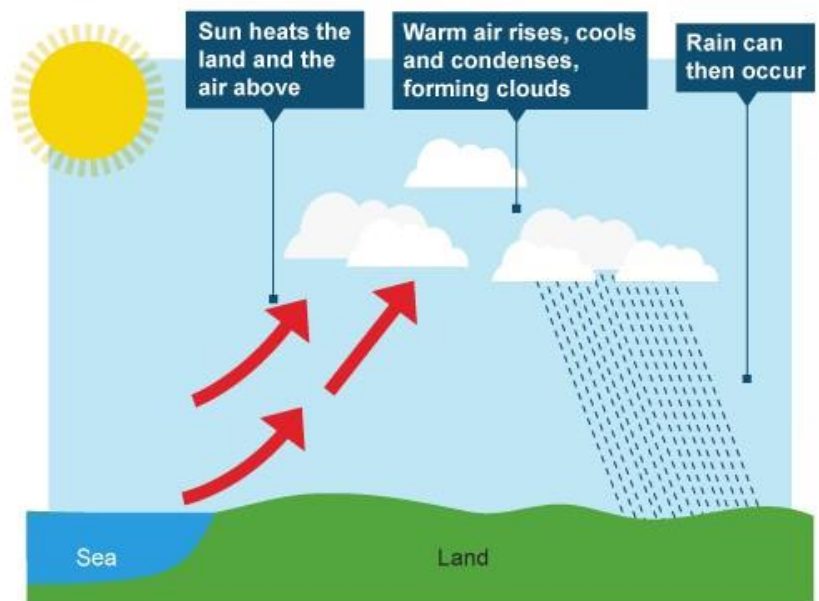
clouds are formed but the process of condensation begins only when the relative humidity of ascending air exceeds a hundred percent.

- Rainfall does not occur unless these cloud droplets become so large due to coalescence that the air becomes unable to hold them.



Conventional Rainfall

- The, air on being heated, becomes light and rises up in convection currents.
- As it rises, it expands and loses heat and consequently, condensation takes place and cumulous clouds are formed.
- This process releases latent heat of condensation which further heats the air and forces the air to go further up.
- Convectional precipitation is heavy but of short duration, highly localised and is associated with minimum amount of cloudiness.
- It occurs mainly during summer and is common over equatorial doldrums in the Congo basin, the Amazon basin and the islands of south-east Asia.



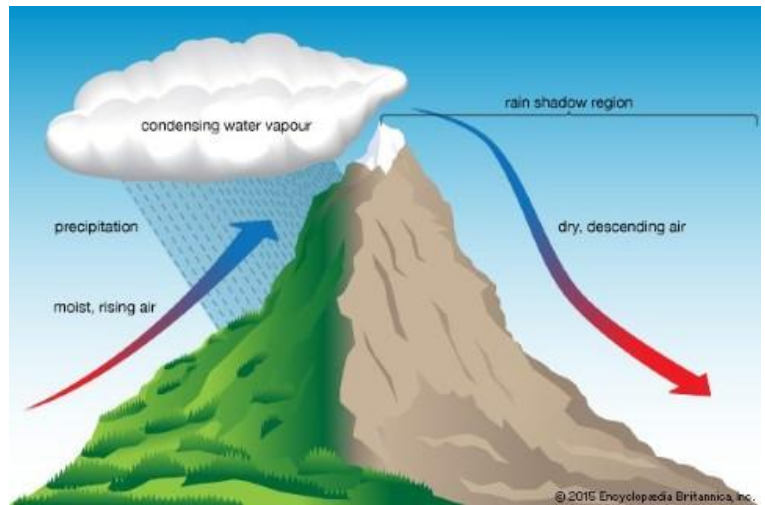
Orographic Rainfall

- When the saturated air mass comes across a mountain, it is forced to ascend and as it rises, it expands (because of fall in pressure); the temperature falls, and the moisture is condensed.
- This type of precipitation occurs when warm, humid air strikes an orographic barrier (a mountain range) head on.
- Because of the initial momentum, the air is forced to rise. As the moisture laden air gains height, condensation sets in, and soon saturation is reached. The surplus moisture falls down as orographic precipitation along the windward slopes.
- The chief characteristic of this sort of rain is that the windward slopes receive greater rainfall. After giving rain on the windward side, when these winds reach the other slope, they descend, and their temperature rises.

- Then their capacity to take in moisture increases and hence, these leeward slopes remain rainless and dry. The area situated on the leeward side, which gets less rainfall is known as the rain-shadow area. Some arid and semi-arid regions are a direct consequence of rain-shadow effect. It is also known as the relief rain.

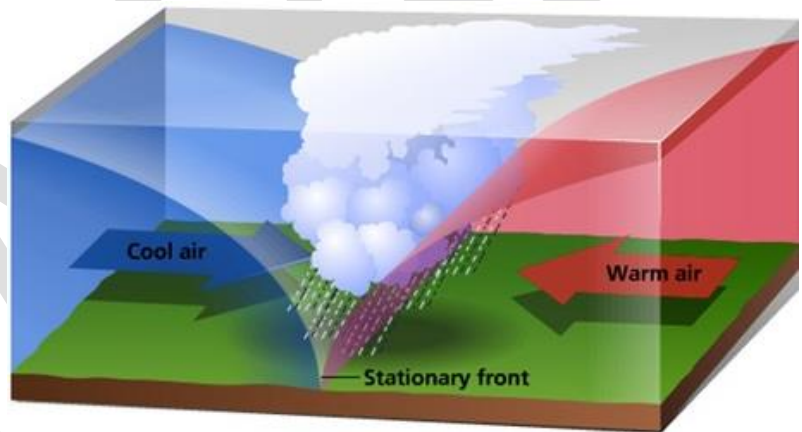
- Example: Mahabaleshwar, situated on the Western Ghats, receives more than 600 cm of rainfall, whereas Pune, lying in the rain shadow area, has only about 70 cm.

- The Wind Descending on the Leeward Side is heated adiabatically and is called Katabatic Wind.



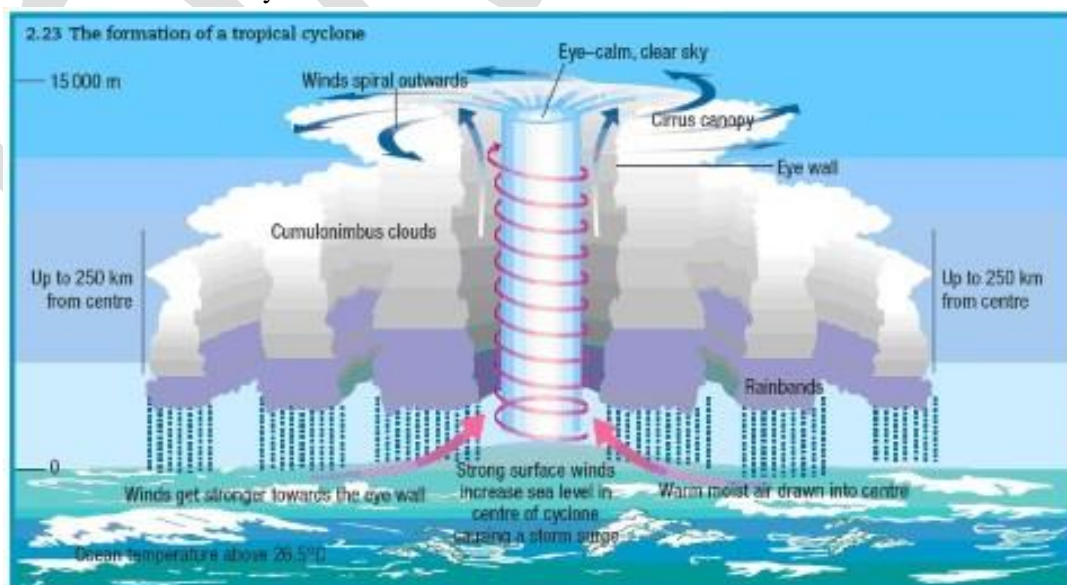
Frontal Precipitation

When two air masses with different temperatures meet, turbulent conditions are produced. Along the front convection occurs and causes precipitation (we studied this in Fronts). For instance, in north-west Europe, cold continental air and warm oceanic air converge to produce heavy rainfall in adjacent areas.



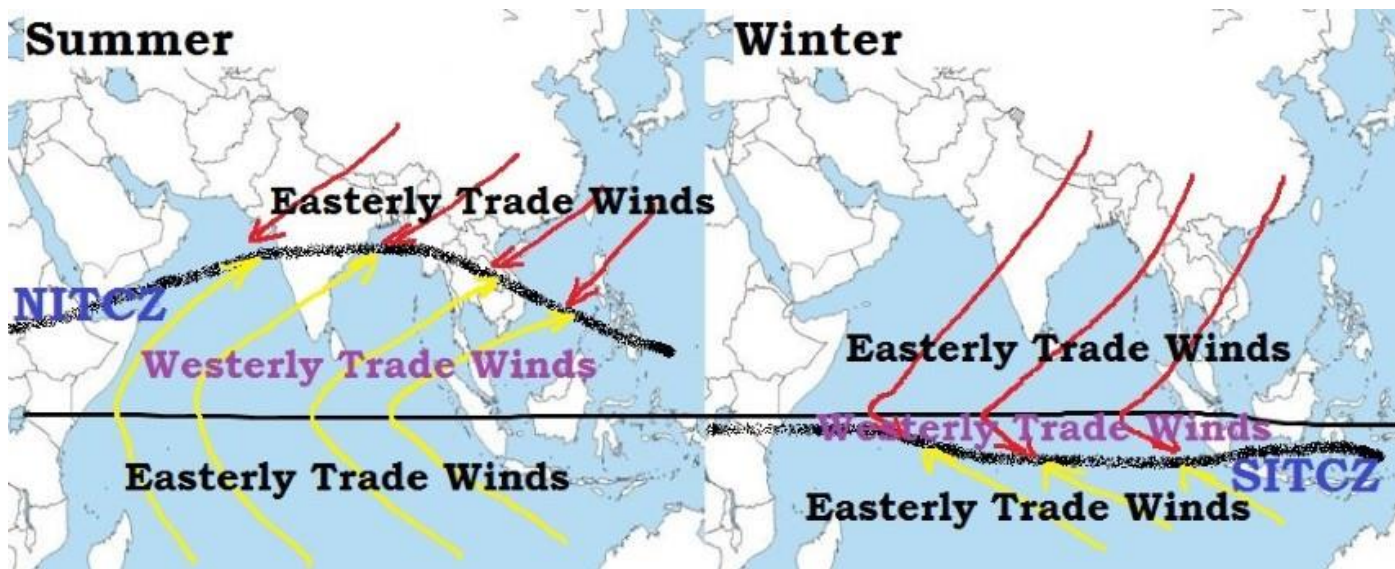
Cyclonic Rain

Cyclonic Rainfall is convective rainfall on a large scale. The precipitation in a tropical cyclone is of convective type while that in a temperate cyclone is because of frontal activity.

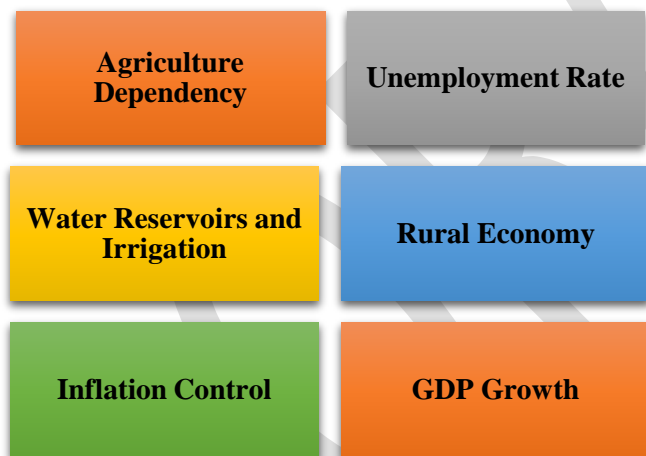


Monsoonal Rainfall

This type of precipitation is characterized by **seasonal reversal of winds** which carry oceanic moisture (especially the south-west monsoon) with them and cause extensive rainfall in south and southeast Asia. (More while studying Indian Monsoons).



Importance of Monsoon Rainfall



Agriculture Dependency

- India has a predominantly agrarian economy, contributing substantially to the country's food security. Insufficient rainfall, particularly during the month of August, has significantly hindered the timely sowing of the majority of kharif crops.

Unemployment Rate

- The all-India unemployment rate (UR) edged up to 8.1% in August 2023 from around 7% in June 2023 on account of higher UR in urban areas.

Water Reservoirs and Irrigation

- The monsoon season replenishes water reservoirs and helps in maintaining adequate water levels in rivers and lakes.
- Reliable monsoons reduce dependence on expensive irrigation methods and contribute to the sustainability of agriculture.
- Adequate monsoon rainfall ensures sufficient water levels in rivers and dams, facilitating hydropower generation.

Rural Economy

- Increased farm income contributes to higher rural spending, supporting various local businesses and services.
- States with low deficit or deficient rainfall have witnessed more demand for work under Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS).

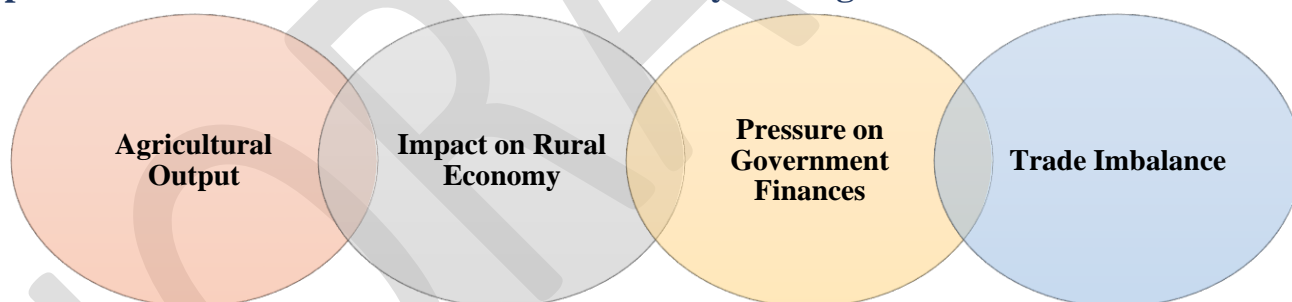
Inflation Control

- A good monsoon season helps in maintaining stable food prices by ensuring an adequate supply of agricultural commodities.
- Due to deficit rainfall, headline inflation stood at 6.8% with food inflation at around 10% in August 2023.

GDP Growth

- A robust agricultural sector contributes to higher GDP, as it is a major component of the country's economy. Conversely, poor monsoons can lead to agricultural distress and have a negative impact on economic growth.

Impact of Monsoon Rainfall on Indian Economy and Agriculture



- **Agricultural Output:** Insufficient rainfall can lead to crop failure, which in turn, impacts farmers' income, disrupts the supply of essential food items, and contributes to food inflation. The Indian economy suffers heavy losses due to floods and droughts almost every year.
- **Impact on Rural Economy:** Below normal monsoon, conditions can lead to a slowdown in economic activities in rural areas, affecting various businesses and services that depend on agricultural income.
 - For instance, about 800 million people live in villages and depend on agriculture, which accounts for about 15% of India's gross domestic product (GDP) and a failed monsoon can have a rippling effect on the country's growth and economy
- **Pressure on Government Finances:** The government may face increased financial pressure due to the need for relief measures to support affected farmers.
 - Subsidies, loan waivers, and other financial assistance programs may be required to mitigate the economic impact on the agricultural sector.

- **Trade Imbalance:** A decline in agricultural production due to below normal monsoons can affect India's export performance which can contribute to a trade imbalance and impact the country's foreign exchange earnings.
 - For instance, India's imports of pulses such as tur (pigeon pea) and urad (black matpe) have more than doubled in the April-June quarter of 2023-23.

Way Forward



Groundwater Conservation

- The **Atal Bhujal Yojana** is community-led groundwater management program helping improve rural livelihoods and build resilience in Indian states which have the highest rates of groundwater depletion.
- The “**Paani Bachao, Paisa Kamao**” (Save Water, Earn Money) scheme incentivizes farmers to reduce groundwater usage.
- For example, **switching from rice to millets** such as pearl millet & sorghum during the Kharif season and shifting from wheat to sorghum in the Rabi season could lower water consumption by 32%.

Ensuring Supply

- To check food inflation, the government needs to ensure domestic supplies of vegetables, pulses and other crops through imports.
- Recently, government resorted to imposing restrictions on the export of rice, wheat and sugar and took other regulatory measures because of the irregular nature of the monsoon.

Tackling Floods and Droughts

- Climate change is increasing unpredictability in weather patterns and leading to more extreme weather events.
- Government had drawn up **drought contingency plans** for 571 districts with help from the Central Institute for Dryland Agriculture; similarly **crop insurance through PM Fasal Bima Yojana** can help farmers tide over potential crop losses.

Research and Development

- **Water resources monitoring system** is getting expanded to cover the entire country, including the Indus, Ganga, and Brahmaputra-Barak river basins.
- **World Bank-supported hydrology projects** have introduced new systems and technology that give an accurate picture of the water situation for a comprehensive knowledge base that can improve the overall management of water resources in the country.

Artificial Rains

- Artificial rain making techniques involving cloud seeding can be used for bringing rain clouds to rainfall deficit areas.
- For instance, Maharashtra government is considering cloud seeding to tackle deficient rainfall, which could save kharif crops and address depleted water levels in dams.

Indian Himalayan Region & EIA

Why in News?

The Teesta dam breach in Sikkim in early October and the recent floods and landslides in Himachal Pradesh are a stark reminder of the havoc our development model is wreaking on our environment and ecology especially in the mountains. It is imperative to assess the worthiness of any significant human endeavour in terms of its impact on the environment.

Basis of the EIA

Environment Impact Assessment (EIA) is one such process defined by the United Nations Environment Programme (UNEP) as a tool to identify the environmental, social, and economic impacts of a project before it is implemented.

- This tool compares various alternatives for the proposed project, predicts and analyses all possible environmental repercussions in various scenarios.
- The EIA also helps decide appropriate mitigation strategies.
- The EIA process would need comprehensive, reliable data and would deliver results only if it is designed to seek the most appropriate, relevant and reliable information regarding the project. Hence, the base line data on the basis of which future likely impacts are being predicted are very crucial.

India & EIA

In India, a precursor to the **EIA began in 1976-77** when the Planning Commission directed the Department of Science and Technology to assess the river valley projects from the environmental point of view.

- It was later extended for all those projects that required approval from the Public Investment Board.
- Environment clearance then was just an administrative decision of the central government.
- On January 27, 1994, the Union Ministry of Environment, Forests and Climate Change under the Environment (Protection) Act 1986 (EPA), promulgated the first EIA notification making Environmental Clearance (EC) mandatory for setting up some specified new projects and also for expansion or modernisation of some specific activities.
- The notification of 1994 saw 12 amendments in 11 years before it was replaced by the EIA 2006 notification.
 - The hallmark of the 2006 notification was the decentralisation of the process of EC.
 - State governments were also given powers to issue EC in certain cases.
 - The 2006 notification has also been amended, in the name of fine-tuning the process several times.
 - The EIA 2006 notification lays down the procedure as well as institutional set-up to give environmental clearance for the projects that need such clearance as per this notification.
- Only projects enumerated in the schedule attached to the notification require prior EC.
- An EIA is not required for many projects as they do not fall within the ambit of this notification.
 - This notification has categorised projects under various heads such as mining, extraction of natural resources and power generation, and physical infrastructure.
 - Unfortunately, the threshold limits beyond which EIA is warranted for all these projects is the same across the country.

Flaws in the Graded Approach: IHR Missed

The **Indian regulatory system uses a graded approach**, a differentiated risk management approach depending on whether a project is coming up within a protected forest, a reserved forest, a national park, or a critical tiger habitat.

- The stringency of environmental conditions proposed in the terms of references at the scoping stage of the EIA process is proportionate to the value and sensitivity of the habitat being impacted by the project.
- One unfortunate miss from this graded approach for differentiated risk management has been the **IHR**.
 - Despite its special needs and as an area of immense ecological importance to the entire country (it serves as a water tower and the provider of ecosystem services), this region is treated like any other part of the country.
- While categorising projects it is important that the impacts of all such projects and activities are seen in the IHR in the context of this region's fragility and vulnerability vis-à-vis ecology and environment.
- We have enough systemic understanding that the Himalayas are inherently vulnerable to extreme weather conditions such as heavy rains, flash floods, and landslides and are seismically active.

- Climate change has added another layer of vulnerability to this ecosystem. Despite this understanding of the fragility and vulnerability of the Himalayas, there is no mention of a different set of environmental standards needed if the project is located in the IHR.
- The increasing frequency with which the Himalayan States are witnessing devastation every year after extreme weather conditions shows that the region is already paying a heavy price for this indifference.

The **needs of these mountains could be addressed at all four stages of the EIA** — screening, scoping, public consultation, and appraisal — if the yardstick for projects and activities requiring EC in mountainous regions is made commensurate with the ecological needs of this region.

General conditions mandated for all projects at the end of the notification could also have had a clause about the IHR or mountains above a certain altitude, or with some specified characteristics that could increase the liability of the project proponent.

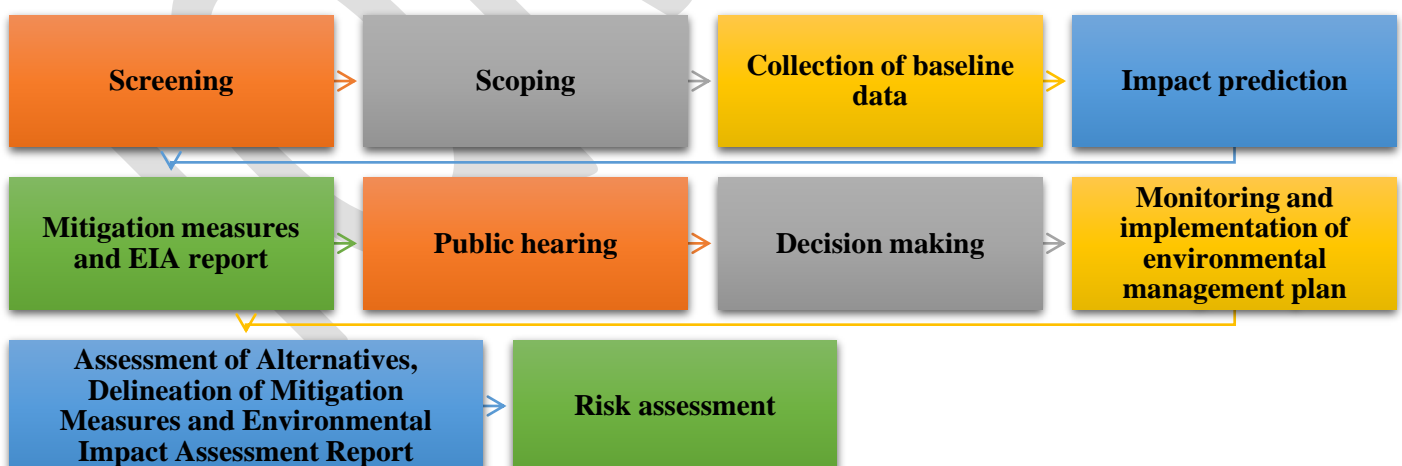
What Ails the EIA?

- There is no regulator at the national level, as suggested by the Supreme Court of India in 2011 in Lafarge Umiam Mining (P) Ltd.; T.N. Godavarman Thirumulpad vs Union of India to carry out an independent, objective and transparent appraisal and approval of the projects for ECs and to monitor the implementation of the conditions laid down in the EC.
- The EIA process now reacts to development proposals rather than anticipate them. Due the fact that they are financed by the project proponent, there is a veering in favour of the project.
- The process now does not adequately consider cumulative impacts as far as impacts caused by several projects in the area are concerned but does to some extent cover the project’s subcomponents or ancillary developments.
- In many cases, the EIA is done in a ‘box ticking approach’ manner, as a mere formality that needs to be done for EC before a project can be started.

The consequences of all these limitations are amplified in the IHR as on top of the inherent limitations of the process, the EIA process is not at all cognisant of the special needs of the IHR.

Policymakers would do well to explore other tools such as the strategic environmental assessment which takes into account the cumulative impact of development in an area to address the needs of the IHR as a fundamental policy.

EIA Process



Generalized EIA Process Flowchart



EIA involves the steps mentioned below. However, the EIA process is cyclical with interaction between the various steps.

- **Screening:** The project plan is screened for scale of investment, location and type of development and if the project needs statutory clearance.
- **Scoping:** The project's potential impacts, zone of impacts, mitigation possibilities and need for monitoring.
- **Collection of baseline data:** Baseline data is the environmental status of study area.
- **Impact prediction:** Positive and negative, reversible and irreversible and temporary and permanent impacts need to be predicted which presupposes a good understanding of the project by the assessment agency.
- **Mitigation measures and EIA report:** The EIA report should include the actions and steps for preventing, minimizing or by passing the impacts or else the level of compensation for probable environmental damage or loss.

- **Public hearing:** On completion of the EIA report, public and environmental groups living close to project site may be informed and consulted.
- **Decision making:** Impact Assessment Authority along with the experts consult the project-in-charge along with consultant to take the final decision, keeping in mind EIA and EMP (Environment Management Plan).
- **Monitoring and implementation of environmental management plan:** The various phases of implementation of the project are monitored.
- **Assessment of Alternatives, Delineation of Mitigation Measures and Environmental Impact Assessment Report:** For every project, possible alternatives should be identified, and environmental attributes compared. Alternatives should cover both project location and process technologies.
 - Once alternatives have been reviewed, a mitigation plan should be drawn up for the selected option and is supplemented with an Environmental Management Plan (EMP) to guide the proponent towards environmental improvements.
- **Risk assessment:** Inventory analysis and hazard probability and index also form part of EIA procedures.

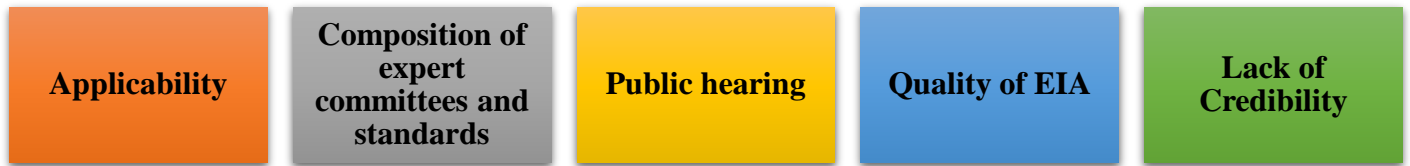
Stakeholders in the EIA Process



Importance of EIA

- EIA links environment with development for environmentally safe and sustainable development.
- EIA provides a cost effective method to eliminate or minimize the adverse impact of developmental projects.
- EIA enables the decision makers to analyse the effect of developmental activities on the environment well before the developmental project is implemented.
- EIA encourages the adaptation of mitigation strategies in the developmental plan.
- EIA makes sure that the developmental plan is environmentally sound and within the limits of the capacity of assimilation and regeneration of the ecosystem.

Shortcomings of EIA Process



- **Applicability:** There are several projects with significant environmental impacts that are exempted from the notification either because they are not listed in schedule I, or their investments are less than what is provided for in the notification.
- **Composition of expert committees and standards:** It has been found that the team formed for conducting EIA studies is lacking the expertise in various fields such as environmentalists, wildlife experts, Anthropologists and Social Scientists.
- **Public hearing:** Public comments are not considered at an early stage, which often leads to conflict at a later stage of project clearance.
 - A number of projects with significant environmental and social impacts have been excluded from the mandatory public hearing process.
 - The data collectors do not pay respect to the indigenous knowledge of local people.
- **Quality of EIA:** One of the biggest concerns with the environmental clearance process is related to the quality of EIA report that are being carried out.
- **Lack of Credibility:** There are so many cases of fraudulent EIA studies where erroneous data has been used, same facts used for two totally different places etc.
 - Often, and more so for strategic industries such as nuclear energy projects, the EMPs are kept confidential for political and administrative reasons.
 - Details regarding the effectiveness and implementation of mitigation measures are often not provided.
 - Emergency preparedness plans are not discussed in sufficient details and the information not disseminated to the communities.

Way Forward



- **Independent EIA Authority**
 - Sector wide EIAs needed.
 - Creation of a centralized baseline data bank.
- **Dissemination of all information** related to projects from notification to clearance to local communities and the general public.

- **Applicability:** All those projects where there is likely to be a significant alteration of ecosystems need to go through the process of environmental clearance, without exception.
 - No industrial developmental activity should be permitted in ecologically sensitive areas.
- **Public hearing:** Public hearings should be applicable to all hitherto exempt categories of projects which have environmental impacts.
- The **focus of EIA needs to shift** from utilization and exploitation of natural resources to conservation of natural resources.
- It is critical that the **preparation of an EIA** is completely independent of the project proponent.
- **Grant of clearance:** The notification needs to make it clear that the provision for site clearance does not imply any commitment on the part of the impact Assessment agency to grant full environmental clearance.
- **Composition of expert committees:** The present executive committees should be replaced by expert people from various stakeholder groups, who are reputed in environmental and other relevant fields.
- **Monitoring, compliance and institutional arrangements:** The EIA notification needs to build within it an automatic withdrawal of clearance if the conditions of clearance are being violated and introduce more stringent punishment for noncompliance.
 - At present the EIA notification limits itself to the stage when environmental clearance is granted.
- The **composition of the NGT** needs to be changed to include more judicial persons from the field of environment.
- **Citizen should be able to access the authority for redressal** of all violation of the EIA notification as well as issues relating to non-compliance.
- **Capacity building:** NGOs, civil society groups and local communities need to build their capacities to use the EIA notification towards better decision making on projects.

Mental Health & Informal Workforce

Why in News?

The theme of World Mental Health Day this year is 'mental health as a universal human right'. A **segment often overlooked** when it concerns mental health is the **informal worker**.

- A study by the International Labour Organization (ILO) says that 15% of working-age adults, globally, live with a mental disorder.
- On one hand, decent work influences mental health in a positive way while on the other, unemployment, or unstable or precarious employment, workplace discrimination, or poor and particularly unsafe working environments, can all pose a risk to a worker's mental health.
- Workers in low-paid, unrewarding or insecure jobs, or working in isolation, are more likely to be exposed to psychosocial risks, thus compromising their mental health.

The Indian Experience

Gender
disparities

United Nations
Development
Programme
(UNDP)

Lokniti group

Youth
unemployment

ILO report

State of
Inequality in
India Report
2022

India's informal workforce accounts for more than 90% of the working population.

- **Challenges Faced:** These workers often operate without regulatory protection, work in unsafe working environments, endure long hours, have little access to social or financial protections, suffer high uncertainty and deep precarity, and face discrimination — all of which further undermine mental health and limit access to mental health care.
- **Gender disparities** are also stark, with over 95% of India's working women engaged in informal, low-paying, and precarious employment, often without social protection, in addition to suffering patriarchal structures and practices in their social and familial spaces.
- According to the **United Nations Development Programme (UNDP)**, unemployment and poor-quality employment have consistently been detrimental to mental health.
- **The Lokniti group within the Centre for the Study of Developing Societies**, which interviewed 9,316 youth aged between 15 to 34 years across 18 States in India, has shown that they are highly susceptible to negative emotions.
- **Youth unemployment** is one of the highest in India which, along with the stigma around unemployment, significantly impacts their mental health.
- Moreover, an **ILO report** highlights how young workers are shifting to more precarious and informal work, accepting less pay and poorer working conditions, out of desperation, and, sometimes, giving up and exiting the labour force altogether.
- The **State of Inequality in India Report 2022** observes that the unemployment rate actually increases with educational levels, particularly for educated young women who show an unemployment rate of 42%.

With this phase of demographic dividend, where half of India's population is of working age and projected to remain so for two decades, it is pertinent to think about the quality of employment and long-term social security for them.

- India will also become an aging society in 20 years, with no apparent social security road map for this rapidly growing group that is especially vulnerable to poor mental health.
- The **Census of India 2011** shows that 33 million elderly people are working post-retirement in informal work.
- Another **study, by the ILO on elderly employment in India**, shows high poverty among them, in terms of economic dependency and access to financial assets.
 - The absence of proper financial and health-care security among the working elderly can severely impact their physical and mental health, aggravating their vulnerability.

Social Security

Informal workers face mental distress due to accumulating debt and rising health-care costs, which are intertwined and mutually reinforcing.

- **A study by Women in Informal Employment: Globalizing and Organizing (WIEGO)** among informal workers in Delhi, mostly migrants, indicates that recovery post COVID-19 remains uneven among informal worker cohorts.
 - Many still report food insecurity, skipped meals, or reduced consumption.
- As observed by the Keshav Desiraju **India Mental Health Observatory**, mental health and well-being are impacted by factors such as food security, access to livelihood and financial stability.

- ✓ Employment guarantee programmes can indeed improve mental health outcomes. Thus, **social security can be: promotional, aiming to augment income; preventive, aiming to forestall economic distress and protective, aiming to ensure relief from external shocks.**
- ✓ A relook at the **Code on Social Security 2020** shows how glaring issues concerning the social security of India's informal workforce still remain unheeded. While India should universalise social security, the current Code does not state this as a goal.

- While **certain schemes** have received a higher allocation this year, others such as the Mahatma Gandhi National Rural Employment Guarantee Scheme (MNREGS) have seen their funding slashed.
- In 2021, the **National Crime Records Bureau (NCRB)** reported that 26% of the people who died by suicide were daily wage earners.

Care Needs Drastic Improvement

Informal workers, despite their significant contribution to national income, are perennially exposed to various economic, physical, and mental vulnerabilities.

India's budgetary allocation for mental health (currently under 1% of the total health budget) has over-focused on the digital mental health programme.

As the **World Mental Health Report 2022** observed, addressing mental health involves strengthening community-based care, and people-centred, recovery-oriented and human rights-oriented care.

There is an **urgent need for proactive policies** to improve mental health recognition and action.

This is **critical in upholding the basic human right** to good health, including mental health, and in advancing to the Sustainable Development Goals (SDGs), especially SDG 3 on 'good health and well-being' and SDG 8 on 'decent work for all/economic growth'.

Mental Health

Definition	Significance
<p>According to WHO, mental health is a state of mental well-being that enables people to cope with the stresses of life, realize their abilities, learn well and work well, and contribute to their community.</p> <ul style="list-style-type: none"> • It is an integral component of health and well-being that underpins our individual and collective abilities to make decisions, build relationships and shape the world we live in. 	<ul style="list-style-type: none"> • Mental health is a basic human right and a crucial aspect of personal and community development. • It is also a global issue that requires collective action and awareness. • That is why every year on October 10, the World Federation for Mental Health (WFMH) organizes World Mental Health Day to promote mental health education, advocacy, and support.

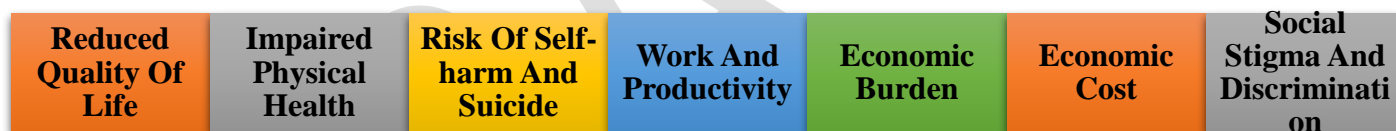
How Does Informal Work Impact Mental Health?



- **Lack of Regulatory Protection:** The lack job security, legal rights, and access to benefits, creating a constant sense of vulnerability and stress, which can negatively impact mental health.

- **Unsafe Working Environments:** Many informal workers toil in unsafe working conditions, which can lead to physical and psychological health problems. The fear of workplace accidents and injuries can contribute to anxiety and stress.
- **Long Hours and Uncertainty:** Informal workers often endure long working hours and have unpredictable incomes. This instability and uncertainty can lead to chronic stress, anxiety, and depression, as they struggle to make ends meet.
- **Limited Access to Social and Financial Protections:** Informal workers have limited or no access to social safety nets, such as health insurance or pension schemes. This lack of financial protection can increase feelings of insecurity and contribute to mental health issues.
 - Informal workers face mental distress due to accumulating debt and rising health-care costs, which are intertwined and mutually reinforcing.
 - In India, the share of Out-of-Pocket Expenditure (OOPE) in total Health Expenditure is 47.1%.
- **Gender Discrimination:** Gender disparities are also stark, with over 95% of India's working women engaged in informal, low-paying, and precarious employment, often without social protection, in addition to suffering patriarchal structures and practices in their social and familial spaces.
- **Youth Unemployment:** High levels of youth unemployment in India have a significant impact on the mental health of young people. The stigma associated with unemployment can lead to feelings of inadequacy, anxiety, and depression among the youth.
- **Shift to Precarious Work:** Young workers often accept low-paying and precarious jobs in the informal sector out of desperation, which can negatively impact their mental health. Poor working conditions and low wages contribute to job dissatisfaction and stress.

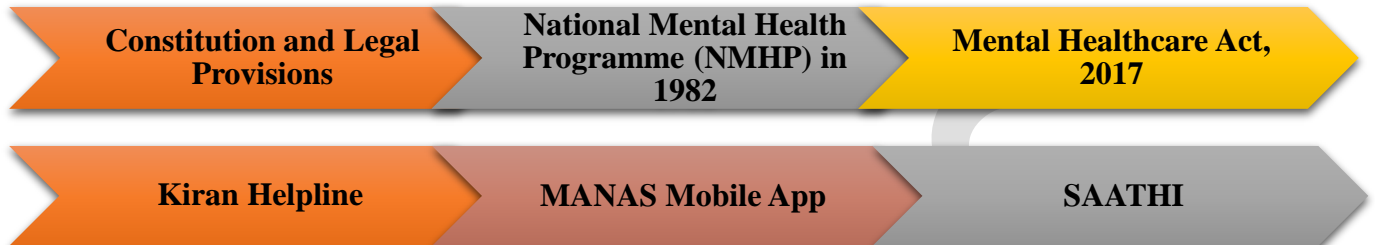
Impacts of Poor Mental Health



- **Reduced Quality of Life:** People with mental health conditions may experience lower levels of well-being, happiness, and satisfaction. They may also face difficulties in coping with stress, fulfilling their potential, and enjoying their relationships.
- **Impaired Physical Health:** There is a strong connection between mental and physical health. Poor mental health can lead to physical health problems such as chronic stress, sleep disturbances, and increased susceptibility to illness.
- **Risk of Self-Harm and Suicide:** Poor mental health is a significant risk factor for self-harm and suicide. It's essential to provide appropriate support and intervention for individuals at risk.
 - The National Crime Records Bureau (NCRB) reported that 26% of the people who died by suicide were daily wage earners.
- **Work and Productivity:** Poor mental health can lead to decreased productivity, absenteeism, and difficulty concentrating at work or school. This can result in job loss, academic underachievement, and financial difficulties.
- **Economic burden:** People with mental health conditions may incur high costs for treatment, travel, and care. They may also lose income and productivity due to absenteeism, presenteeism, or unemployment. Moreover, poor mental health can affect the economic development and growth of countries and regions.
- As per the WHO, the **economic cost** of poor mental health in the country will be over \$1.03 trillion between 2012 and 2030.

- **Social stigma and discrimination:** People with mental health conditions may face negative attitudes, stereotypes, and prejudices from others. They may also encounter barriers and inequalities in accessing education, employment, health care, and social services.

Govt. Initiatives Associated With Mental Health



Constitution and Legal Provisions

- Article 21: The right to a dignified life extends to the right to seek Mental Health care.
- Article 47: Duty of the state to raise the level of nutrition and the standard of living and to improve public health.

National Mental Health Programme (NMHP) in 1982

- To ensure the availability and accessibility of minimum mental healthcare for all in the foreseeable future, particularly to the most vulnerable and underprivileged sections of the population.

Mental Healthcare Act, 2017

- It was passed in 2017, came into effect in May 2018 and replaced the Mental Health Act of 1987.
- The act decriminalised suicide attempts in India. It also included WHO guidelines in the categorisation of mental illnesses.
- The most significant provision in the act was “advanced directives”, which allowed individuals with mental illnesses to decide the course of their treatment and also appoint someone to be their representative.
- It also restricted the use of electro-convulsive therapy (ECT), and banned its use on minors, finally introducing measures to tackle stigma in Indian society.

Kiran Helpline

- The helpline is a giant step towards suicide prevention and can help with support and crisis management.
- The helpline aims to provide early screening, first-aid, psychological support, distress management, mental well-being, and psychological crisis management and will be managed by the Department of Empowerment of Persons with Disabilities (DEPwD).

MANAS Mobile App

- To promote mental wellbeing across age groups, the Government of India launched MANAS (Mental Health and Normalcy Augmentation System) in 2021.

SAATHI

- It is a South-Asian Mental Health Outreach Program of ASHA International that aims to:
 - Promote awareness about mental health and emotional wellbeing
 - Improve access to care.

Way Forward

Universalize Social Security	Reevaluate and amend the Code on Social Security, 2020	Increase Funding for Mental Health	Diversify Mental Health Programs
Promote Awareness and Recognition	Support Economic Stability	Ensure Basic Human Rights	Collaboration and Partnerships

- **Universalize Social Security:** Ensure that social security measures are accessible to all, including informal workers. This could involve expanding the coverage of existing schemes or creating new ones specifically tailored to their needs.
- **Reevaluate and amend the Code on Social Security, 2020** to explicitly include universal social security as a goal. Policy reform is essential to address the specific needs of informal workers.
- **Increase Funding for Mental Health:** Allocate a higher percentage of the total health budget to mental health services. Given the significant mental health challenges faced by daily wage earners and other vulnerable groups, investing more in mental health infrastructure is crucial.
 - India's budgetary allocation for mental health is currently under 1% of the total health budget. That too is over-focused on the digital mental health programme.
- **Diversify Mental Health Programs:** Expand mental health programs beyond just digital initiatives. While digital mental health programs can be valuable, they should be complemented with community-based care and human rights-oriented approaches, as recommended by the World Mental Health Report 2022.
- **Promote Awareness and Recognition:** Implement proactive policies to improve mental health recognition and awareness, especially among informal workers. This may involve conducting mental health awareness campaigns and training programs to reduce stigma and encourage early intervention.
- **Support Economic Stability:** Promote employment guarantee programs like the Mahatma Gandhi National Rural Employment Guarantee Scheme (MNREGS) to provide job security and financial stability to daily wage earners. Economic distress is a significant contributor to mental health issues, and stable employment can help alleviate this.
- **Ensure Basic Human Rights:** This is critical in upholding the basic human right to good health, including mental health, and in advancing to the Sustainable Development Goals (SDGs), especially SDG 3 on 'good health and well-being' and SDG 8 on 'decent work for all/economic growth'.
- **Collaboration and Partnerships:** Collaborate with non-governmental organizations (NGOs), healthcare providers, and community organizations to expand mental health services and outreach to marginalized communities.

An Opportunity To Recast India's Food System

Why in News?

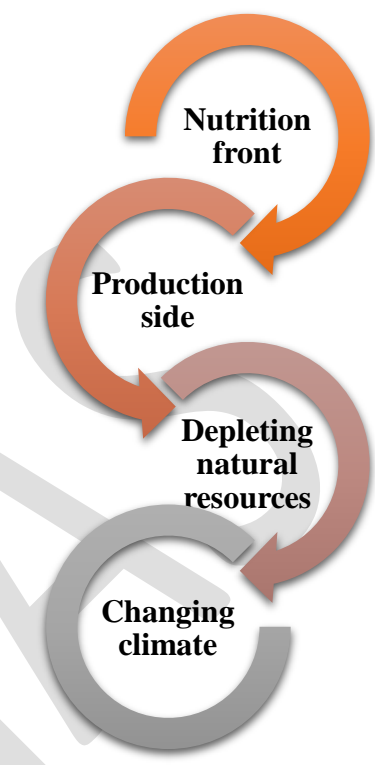
We celebrated World Food Day (October 16), but we rarely look at food as a system. No country can better understand the challenges of a food system than India, which feeds the largest population in the world.

- While the primary goal of a food system is to ensure nutrition security for all, it can only be achieved sustainably if the producers producing the food make reasonable economic returns that are resilient over time.

- This resilience, in turn, is intricately linked with the resilience of our natural ecosystem because the largest inputs to agriculture — soil, water and climatic conditions — are all but natural resources.
- Appreciating this interconnectedness of nutrition security with livelihood and environmental security is essential to making our food system truly sustainable.

Nutrition, Livelihoods, Environment Security

- **On the nutrition front**, India faces a double burden of malnutrition.
 - **At one end**, despite making great progress over the years, a sizable proportion of Indians exhibit nutrient deficiencies.
 - As in the **National Family Health Survey, 2019-21**, 35% of children are stunted, and 57% of women and 25% of men are anaemic.
 - **At the other end**, due to imbalanced diets and sedentary lifestyles, 24% of adult women and 23% of adult men are now obese.
 - India has been stepping up efforts to reduce malnutrition, which has included even the Prime Minister calling for a mass movement to eradicate it.
- **On the production side**, farm incomes are insufficient to meet the ends of marginal and small farmers.
 - According to a **report by the Transforming Rural India Foundation**, more than 68% of marginal farmers supplement their incomes with non-farm activities.
 - The **Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA)** and other forms of casual labour are picking up the slack, indicating a lack of skills or opportunities for income diversification.
- Further, **depleting natural resources and changing climate** are making India's food production highly vulnerable.
 - As in the **2023 soil health survey**, almost half the cultivable land in India has become deficient in organic carbon, which is an essential indicator of soil health.



About World Food Day

World Food Day is observed on October 16th every year.

- The theme for this year is 'Water is Life, Water is Food' which calls for urgent action in responsible water management as the frequency of water-related challenges like drought, floods, unseasonal rains and prolonged dry spells have increased.

History of World Food Day

The member countries of the Food and Agriculture Organisation established World Food Day in November 1979 at the organisation's 20th General Conference and called for the observance of World Food Day on 16 October 1981.

- This decision was ratified by the UN General Assembly on 5 December 1980 and urged governments and international, national and local organizations to contribute to celebrating World Food Day.
- Since 1981, World Food Day has been held every year.

- **Groundwater**, the largest source of irrigation, is rapidly declining. In States such as Punjab, more than 75% of the groundwater assessment locations are over-exploited, threatening the resilience of farm incomes.

Food System

A food system encompasses all the processes, activities, and resources involved in the production, distribution, consumption, and disposal of food.

- It includes the entire journey of food from farm to table and beyond, covering aspects such as farming, processing, transportation, marketing, and waste management.

Significance of Food system

Food Security

A well-functioning food system is essential for providing a stable and reliable food supply, ensuring that people have access to sufficient, safe, and nutritious food.

Nutrition

It influences the availability and accessibility of diverse and healthy food options, which directly impacts the nutritional well-being of a population.

Economic Growth

The food system is a significant contributor to the economy, providing livelihoods for millions of people. Efficient food systems can stimulate economic growth and reduce poverty.

Environmental Impact

Food systems have a substantial environmental footprint. Their sustainability is crucial for mitigating the impact of agriculture on climate change, land use, and water resources.

Health Outcomes

A well-functioning food system can positively influence public health by making healthier food choices more accessible and affordable.

Social Equity

It plays a role in social equity by ensuring that all members of society have access to food, regardless of their economic status or geographic location.

Cultural and Traditional Values

Food systems are deeply linked to cultural and traditional values. Preserving and promoting these values is essential for maintaining cultural diversity.

Innovation and Technology

Food systems often drive innovation in agriculture, processing, and distribution, which can improve productivity and reduce waste.

Status of Food Security Globally

- According to the World Bank, hunger affected around 9.2% of the global population in 2022, marking an increase from 7.9% in 2019.
- The issue of moderate to severe food insecurity impacted a significant 29.6% of the world's population, which translates to approximately 2.4 billion individuals in 2022. Among them, 11.3% were in the category of severely food insecure.
- The World Food Programme (WFP) projects that over 345 million people are grappling with high levels of food insecurity. This alarming figure is more than double the number reported in 2020.

Adopt A Three-Sided Approach/ Way Forward

To solve these interconnected challenges, we need a triad approach that engages all three sides of the food system:



- First, **consumer demand needs to be shifted** towards healthy and sustainable diets.
 - We need to shift to a food plate that is healthier for people and the planet.
 - The **private sector** drives the aspirational consumption patterns for India's billion-plus population.
 - What **corporations** have done to mainstream imported oats or quinoa in India, can be done for locally-grown millets.
 - **Civil society and the health community** could partner with social media influencers who can shape healthier and sustainable consumption for millions.
 - Alongside, the public sector, through its innumerable touch points such as the Public Distribution System, mid-day meals, railways catering, urban canteens, and **public and institutional procurement**, can help improve what at least 70% of Indians are consuming.
 - Even **religious institutions** can shape food choices. For instance, the Tirumala Tirupati Devasthanam, which serves nearly 70,000 people daily, has started procuring naturally-farmed produce.
- Second, to **ensure resilient incomes**, we must support farmers' transition towards remunerative and regenerative agricultural practices.
 - The **National Mission on Natural Farming** is a step in this direction, but the overall funding for sustainable agriculture is less than 1% of the agricultural budget.
 - We need to **broaden and scale up such initiatives** to various agro-ecological practices such as agroforestry, conservation agriculture, precision farming, and much more.
 - Further, **agriculture support** should move from input subsidies to direct cash support to farmers per hectare of cultivation.
 - It would promote efficient use of inputs, while enabling a level playing field for agroecological practices to thrive.
 - **Agricultural research and extension services** should also earmark a proportion of their respective budgets to focus on sustainable agricultural practices.
- Third, **shift farm-to-fork value chains** towards more sustainable and inclusive ones.
 - A critical approach to enhance rural (farm) incomes is to enable more value addition of agricultural produce in rural areas.
 - **Middlemen**, such as corporations supplying raw and processed food to consumers, should prioritise direct procurement from farmers, incentivise procurement of sustainably harvested produce, and implement well-established approaches such as fair trade.
 - **Various young agri-tech enterprises** such as DeHaat and Ninjacart are enabling such farm-to-buyer linkages.

- Moreover, since all farmer families in a farmer producer organisation (FPO) are consumers of other farming goods, **enabling trading of produce between FPOs** is another way to ensure a greater value share for farmers, as showcased by a few FPOs in Odisha.

Shifting an entire food system, however, is no mean feat. But the scale of the challenge must not deter our ambitions. If we act fast, India has a unique opportunity to showcase to the rest of the world how to get its food system right.

Unhealthy Urban India

Why in News?

India's urban population is estimated to reach 675 million in 2035, the second highest in the world. Although there is widespread recognition that cities have been fuelling India's rapid rise to economic superpower status, almost all are failing their inhabitants in terms of delivering on health, environmental and equity targets.

Multiple Health Risks

India's urban inhabitants experience multi-scalar health risks including the world's highest levels of air and noise pollution, limited greenery, lack of access to sidewalks and parks that limit active lifestyles, archaic modes of transport that contribute to air pollution, pernicious access to nutritionally dense unhealthy foods and unprecedented exposure to toxic chemicals and heavy metals.

This concatenation of exposures dramatically magnifies health risks for heart disease and diabetes, referred to as cardiometabolic disease, especially when combined with a lack of physical activity.

Of all behaviours well known to mitigate the development of cardiometabolic disease, physical activity is by far the most effective deterrent.

Not surprisingly, the cities of India are amidst an epidemic of historic proportions in these disorders.

Addressing the diverse and multi-scaled social, environmental, and infrastructure risk factors that contribute to cardiometabolic risk in cities, by transforming the design of the built local environment as well as provisioning systems, represents a new paradigm for public health.

Globally, there are seven key physical provisioning systems that provide food, energy, mobility-transportation, housing, green infrastructure, water and waste management that lie at the core of human health, well-being, equity and sustainability.

Dysfunctional provisioning systems consume more than 90% of the world's water and global CO₂ emissions and facilitate an estimated 19 million premature deaths annually.

The socio-spatial-political design of urban provisioning systems in India, many of which are legacies of a colonial past, manifests in and exacerbates social inequalities in cities, by class, race, age, migrant and disability status, translating to vast disparities in health risks and outcomes.

Based on the primal importance of India's cities for its future, a new narrative for improving health and well-being in cities is needed. This is reflected in several high-level policy frameworks, such as the United Nations Sustainable Development Goals (SDG) framework, the New Urban Agenda, and the Health in All Policies approach.

Double or Triple-Duty Actions

Investments such as clean energy and electric mobility which are underway in India offer a once in a lifetime opportunity to improve health through their immediate and dramatic impact of air pollution levels, while also helping meet India's climate and equity goals.

- While these developments are extraordinarily important, the magnitude of their impact on health outcomes is at risk of being limited, if not simultaneously accompanied by changes in other provisioning systems such as food, mobility and green infrastructure.
- Indeed, studies show that even small changes in the latter systems may have a large catalytic effect on health and productivity and serve as double-duty or triple duty interventions.
 - For example, making way for safe walking and biking lanes, pavements and no-car zones, can help not only improve physical activity and reduce sedentary lifestyles but also reduce the risk from air pollution.
- Regular physical exercise has been to effectively mitigate the impact of other risk factors such as poor diets, particularly those rich in calories and saturated fats.
- The dietary ingestion of excess calories without adequate physical expenditure fuels a vicious cycle of insulin spikes, excess fat deposition that together with inflammation sets the stage for heart disease.
- In this regard, it is well known that exercise may not only help expend excess calories, promoting weight loss and reducing diabetes risk but also act as an effective bulwark against heart disease.
- Walking and biking on many Indian roads is not only hazardous but also nearly impossible, as sidewalks are overwhelmed by building and human waste, parked vehicles or street hawkers.
- Health impact studies indicate that the health and economic benefits of increasing mobility and active transportation vastly exceed that which may be divined by transitioning to electrifying transportation alone.

Towards Holistic Urban Policy

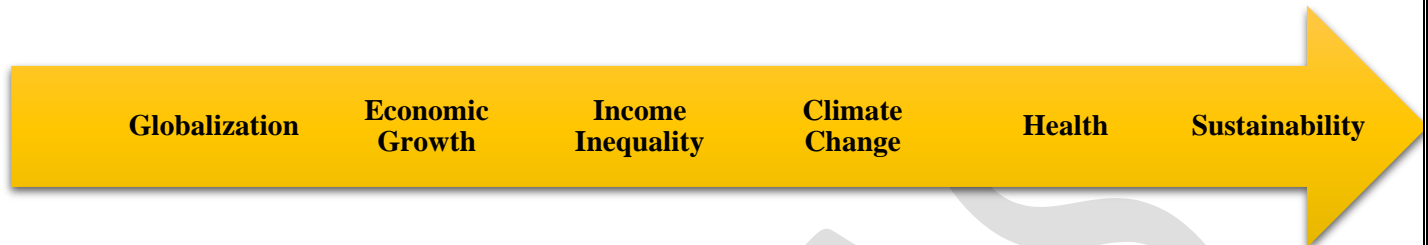
Studies that have modelled the economic and health impact of the clean energy transition in the transportation sector are currently based almost entirely on the reduction in air pollution and its associated health impact.

- Ensuring that the transition to electric cars also paves the way for active transport options such as walking paths and bicycling lanes may not only provide a mechanism to connect the "last mile" but the health and consequent economic benefits of active transportation accrue on top of the benefits of reducing air pollution, making such investments even more economically viable.
- Thus, increasing active transportation by any means must be a critical component of a clean energy policy.
- Similarly, policies that encourage fresh fruits and vegetables and limit sugars and salt in beverages, which may have the largest impact on health outcomes such as obesity, Type 2 diabetes (T2D) and cardiovascular disease, may help contribute to not only better health outcomes but also economic productivity.
- Urban policies are powerful public health interventions that can serve to promote population health. Health is, unfortunately, an afterthought in most national urban planning policies and mostly non-existent in national urban policy documents from lower and middle-income countries.
- Unhealthy diets, reduced physical activity and air pollution in cities in India pose a greater risk to morbidity and mortality than most other risk factors combined including drugs, tobacco, alcohol and accidents.
- These need to be dealt with on a war footing if India is going to make progress in its fight against cardiovascular disease, obesity and T2D. This will necessarily entail a street fight.

Urbanization and Population Growth in India

India is experiencing **rapid urbanization and population growth**.

- Approximately 7.5 million people are added to urban areas each year. The UN projected India's urban population to nearly triple from 367 million in 2010 to 915 million in 2050.
- Urbanization interacts with various factors, including

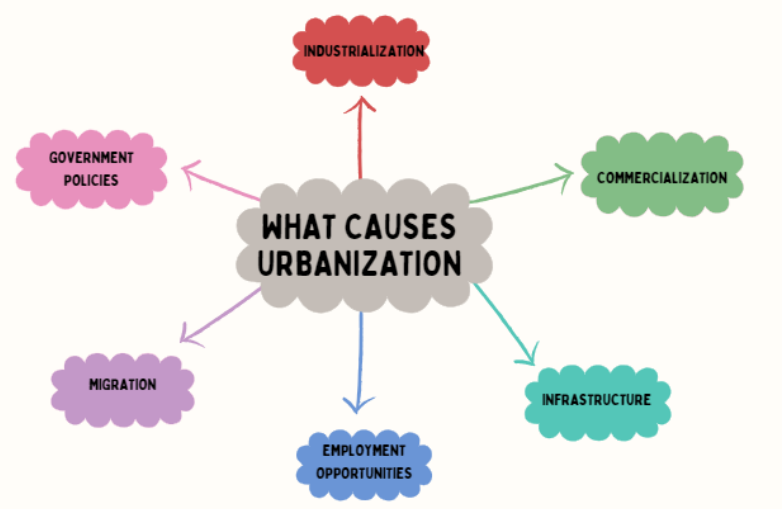


- More than **75% of the urban population in the country is concentrated in 10 states**, namely Maharashtra, Uttar Pradesh, Tamil Nadu, West Bengal, Andhra Pradesh, Gujarat, Karnataka, Madhya Pradesh, Rajasthan, and Kerala.
- Leading the pack is Maharashtra, with a staggering 50.8 million individuals, constituting 13.5% of the nation's total urban population.
 - Uttar Pradesh closely follows with approximately 44.4 million residents, trailed by Tamil Nadu with 34.9 million.
 - Interestingly, Goa stands out as the most urbanized state, boasting a remarkable 62.2% urban population.
 - Tamil Nadu, Kerala, Maharashtra, and Gujarat have all achieved urbanization rates exceeding 40%.
 - In the North-Eastern states, Mizoram takes the lead with a 51.5% urban population.
 - On the other hand, Bihar, Odisha, Assam, and Uttar Pradesh continue to lag behind the national average in terms of urbanization.
 - For those seeking the most urban environments, the National Capital Territory of Delhi and the Union Territory of Chandigarh claim the top spots, with urban populations of 97.5% and 97.25%, respectively, closely followed by Daman and Diu and Lakshadweep.

What Causes Urbanization?

Urbanization refers to the process of population migration from rural areas to urban or metropolitan areas, resulting in the growth and expansion of cities and towns.

- It involves a shift in the demographic composition of a region, with an increasing proportion of the population residing in urban areas.
- Urbanization is primarily driven by several interconnected factors:
 - **Industrialization:** Urbanization is driven by industrialization, which has expanded employment opportunities in modern sectors





that contribute to economic development. The availability of better job prospects has led to a significant rural-to-urban migration since the onset of the Industrial Revolution.

- **Commercialization:** The perception that towns and cities offer superior business prospects and higher returns compared to rural areas is closely tied to the process of urbanization.
- **Infrastructure:** Urban living provides several social advantages, including access to improved educational facilities, higher living standards, better sanitation and housing, enhanced healthcare services, improved recreational amenities, and a richer social life.
- **Employment Opportunities:** The growth of services and industries generating higher value-added jobs contributes to the creation of additional employment opportunities, fostering urbanization.

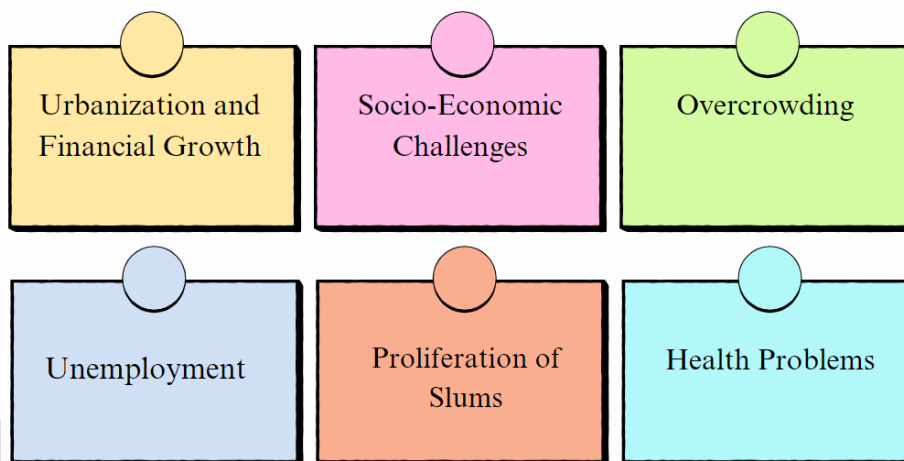
Problems Related to Urbanization

Urbanization can contribute to a country's financial growth; it can also lead to various socio-economic problems if not managed sustainably and planned carefully. Urbanization presents several major issues, including

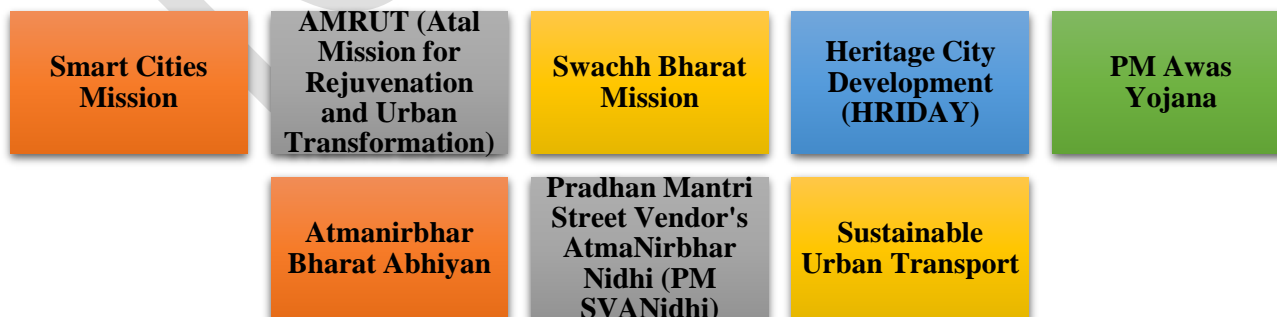
- Overcrowding, leading to competition for limited resources;
- Unemployment, as urban areas struggle to provide enough jobs for the growing population;
- The proliferation of slums due to high living costs;
- Environmental degradation caused by pollution, deforestation, and
- Increased demand for transportation.
- Several health problems, including waterborne diseases and respiratory issues.
- Transport challenges like traffic congestion and accidents.
- Inefficient sewage systems and water scarcity; mounting garbage problems.
- Higher rates of urban crime, with both the poor and affluent involved in criminal activities.

Addressing these issues requires careful planning and cooperation between society and authorities to ensure sustainable urban development and access to basic amenities for a healthy urban life.

URBANIZATION MAJOR ISSUES



Government Initiatives to Manage Urbanization in India



The Indian government has implemented several initiatives to manage urbanization and promote sustainable urban development. Some of the key government initiatives in this regard include:

- **Smart Cities Mission:** Launched in 2015, this mission aims to transform cities into smart, sustainable, and livable urban centers through the application of technology-driven solutions.
- **AMRUT (Atal Mission for Rejuvenation and Urban Transformation):** Focused on urban rejuvenation, AMRUT seeks to ensure access to clean water, sewerage connections, green spaces, and non-motorized transport options in cities.
- **Swachh Bharat Mission:** Launched in 2014, this mission aims to achieve universal sanitation coverage, promote open defecation-free behavior, and improve waste management.
- **Heritage City Development (HRIDAY):** Launched in 2015, HRIDAY seeks to integrate urban planning, economic growth, and heritage conservation to preserve the cultural heritage of historic cities.
- **PM Awas Yojana:** This initiative focuses on providing housing facilities for slum dwellers, with both urban and rural components to address the diverse housing needs across the country.
- **Atmanirbhar Bharat Abhiyan:** A campaign launched in response to economic challenges, it emphasizes self-reliance and includes economic stimulus packages and reforms.
- **Pradhan Mantri Street Vendor's AtmaNirbhar Nidhi (PM SVANidhi):** This scheme was launched to provide working capital loans to street vendors to help them resume their livelihoods that were affected by the COVID-19 pandemic. Supporting the informal sector is crucial for urban resilience.
- **Sustainable Urban Transport:** The government is also promoting sustainable urban transport solutions, such as the development of metro rail systems, Bus Rapid Transit (BRT) systems, and cycling infrastructure to reduce congestion and pollution in cities.

Gaganyaan

Why in News?

The Indian Space Research Organisation (ISRO) commenced the first uncrewed developmental flight of its 'Gaganyaan' human spaceflight mission from Sriharikota, designated TV-D1

Key Highlights

- The launch vehicle, a single-stage rocket, carried a crew module fit with a crew-escape system (CES) to an altitude of 12 km. There, the CES detached itself with the crew module from the rocket and climbed up to 17 km.
- In response to a command, the CES separated from the crew module, leaving the module to reorient itself before dropping over the Bay of Bengal. Its descent was slowed first by drogue parachutes and then by the main parachutes.
- Finally, the module splashed into the Bay a short distance from Sriharikota, where the Indian Navy hauled it out. The CES also splashed down farther down range.
- The flight tested the CES's ability to protect the crew in case the rocket malfunctioned, and collected data via sensors to inform future tests. The test's value will be based on this data.
- According to ISRO chairman S. Somanath, ISRO has many tests planned to develop confidence that the organisation can safely launch humans to orbit. Even the parachutes used for TV-D1 underwent 16 tests.
- The automatic launch sequence held back the launch with a few seconds on the clock. Mr. Somanath subsequently announced that TV-D1 would be postponed. But ISRO personnel were able to quickly identify and resolve the problem, and the launch was rescheduled.
- These checks and balances are expensive, but are in place to prevent greater costs later. Plans for the programme were first readied in 2009 at an estimated ₹12,400 crore.

- The Union Cabinet granted its approval in December 2018 at ₹9,023 crore assuming first flight by 2022. But the COVID-19 pandemic and other commitments have caused delays such that the earliest the first crewed flight can happen is currently 2025.
- Last week, Prime Minister Narendra Modi called on ISRO to launch humans to the moon by 2040.
- Even with the requisite financial support, this would be a very tight deadline, but as with fastidiousness, contemporary geopolitics has also rendered returning to the moon non-negotiable.
- Fortunately, with ‘Gaganyaan’, ISRO has indicated how a balance can be struck: plan ahead, boost local manufacturing, test exhaustively, launch when ready.
- The deadline may be missed, but the mission can be undertaken with confidence while also improving local capabilities.

Gaganyaan

The Gaganyaan project **aims** to showcase the ability to send a crew of three individuals into space, where they will orbit at a distance of 400 km for a mission lasting three days. The ultimate goal is to ensure their safe return to Earth, with a landing in the waters of the Indian Sea.

- Gaganyaan is a **mission initiated by ISRO**.
- ISRO & Indian Navy has carried out initial recovery trials of the Crew Module in the Navy’s Water Survival Test Facility (WSTF) in Kochi. The **Gaganyaan schedule includes sending three flights into orbit**.
- A **total of three flights** are planned to be launched under the Gaganyaan program. The Gaganyaan programme involves sending three spacecraft into orbit.
- As per the Gaganyaan schedule, there will be three missions launched into orbit.
 - **Two flights** will be unmanned, while **one flight** will have human crew members.
- The project is successfully completed by utilising an optimal strategy that takes into account the in-house expertise, the experience of the Indian industry, the intellectual capabilities of Indian academia and research institutions, as well as the cutting-edge technologies available from international agencies.
- The prerequisites for the Gaganyaan mission encompass the development of several crucial technologies. These include

A human-rated launch vehicle designed to safely transport the crew to space

A life support system that can create an environment similar to earth for the crew in space

Provisions for emergency crew escape

The ongoing refinement of crew management aspects such as training, recovery, and rehabilitation.

- Before embarking on the Human Space Flight mission, several precursor missions are scheduled to demonstrate the **Technology Preparedness Levels**.
- The **demonstrator missions** consist of

Integrated Air Drop Test (IADT)

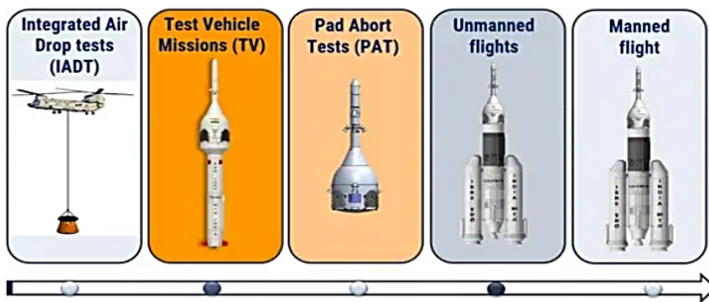
Pad Abort Test (PAT)

Test Vehicle (TV) flights

- The safety and reliability of all systems will be demonstrated through unmanned missions that will take place before the manned mission.

GAGANYAAN

OVERVIEW AND SIGNIFICANCE



Overview

The Gaganyaan project represents a pioneering effort aimed at showcasing India's capacity for human spaceflight. This ambitious undertaking involves launching a crew of three individuals into orbit at an altitude of 400 kilometers for a mission spanning three days, followed by a safe return to Earth through a controlled descent into the Indian sea.

The initial phase of this project involves conducting an uncrewed trial flight, which is scheduled for the conclusion of 2023 or the beginning of 2024. Subsequent missions will include the deployment of Vyom Mitra, a humanoid, and eventually, the inclusion of a full crew.

This upcoming manned mission marks a significant milestone as it will be the first human spaceflight mission conducted by the Indian Space Research Organisation (ISRO). Up to this point, only the United States, Russia, and China have achieved human spaceflights.

The Gaganyaan Mission will be launched using ISRO's Geosynchronous Satellite Launch Vehicle GSLV Mk III, a three-stage heavy-lift vehicle, underscoring India's growing presence in the field of space exploration.



Significance of the mission

Self-Reliance:

- Achieves self-reliance, aligning with the Atma Nirbhar Bharat vision.
- Boosts satellite launch capacity under Make in India Initiative.
- Reduces dependence on foreign cooperation.

R&D and Robotic Advancements:

- Enhances research and development in space technology.
- Supports sustained human and robotic exploration of the solar system.

Regional Focus:

- Addresses regional needs beyond a single International Space Station (ISS).

Global Partnerships:

- Strengthens international partnerships for global security and peaceful goals.

Payloads

- The payload will include a **crew module**, which is a spacecraft designed to carry human beings.
- The **service module** is equipped with two liquid propellant engines for power.
 - The service module is powered by a pair of liquid propellant engines.
 - Two liquid propellant engines provide the necessary power for the service module.
- The vehicle will come equipped with **emergency escape and emergency mission abort capabilities**.
- The GSLV Mk III, also known as the LVM-3 (Launch Vehicle Mark-3), is a three-stage heavy lift launch vehicle.
- It has been selected to launch the Gaganyaan mission due to its sufficient payload capability.

Technologies for ISRO's Gaganyaan Mission

The Gaganyaan Mission demanded advanced technologies to ensure crew safety. Key components included a Human-Rated Launch Vehicle, a habitable Orbital Module, Crew Escape Systems, and a Life Support System.

Human-Rated LVM3

- This modified version of ISRO's reliable LVM3 rocket serves as the launch vehicle for the Gaganyaan Mission.
- It is adapted to safely transport humans into the designated orbit and consists of a three-stage propulsion system.

Orbital Module (OM)

- The OM orbits Earth and consists of the Crew Module (CM) and Service Module (SM).
- It is equipped with advanced avionics systems for redundancy.

Crew Module (CM)

- This habitable space module provides a human-friendly environment for the crew.
- It features a double-walled rigid construction, combining a pressurized metallic inner structure with an unpressurized external structure containing a Thermal Protection System (TPS).
- The CM includes essential systems for crew safety, communication, navigation, guidance, avionics, and re-entry capabilities.

Service Module (SM)

- The SM supports the Crew Module during orbit.
- It is an unpressurized structure housing propulsion, thermal, power, and avionics systems.

Crew Escape System

- To ensure astronaut safety, In-flight Abort Demonstrations have been conducted.
- The Flight Test Vehicle Abort Mission-1 (TV-D1) demonstrated the Crew Escape System's safety mechanisms and confirmed its ability to separate the crew module from the rocket during mid-flight emergencies, ensuring a safe escape for the crew.

Challenges

Within the sphere of space exploration, a multitude of significant environmental challenges are present. Some of the challenges are given following:

Hostile Space Environment

- The space environment is characterized by its hostility, featuring the absence of gravity and atmosphere, along with the constant danger of radiation exposure.

Medical Concerns for Astronauts: Astronauts are susceptible to a range of medical issues:

- **Microgravity Effects:** The shift from one gravity field to another can significantly impact hand-eye and head-eye coordination, resulting in orientation loss, visual impairments, muscle weakness, reduced aerobic capacity, and more.
- **Psychological Challenges:** Isolation within the confines of a spacecraft, coupled with reliance on limited resources, may lead to various behavioral issues. These challenges can manifest as depression, cabin fever, fatigue, sleep disorders, and other psychiatric conditions.

Artificial Atmosphere Dilemma: Two options exist for creating an artificial atmosphere:

- **Earth-Like Mixture:** One choice is to use a mixture of oxygen in an inert gas, simulating Earth's atmosphere.
- **Pure Oxygen Risk:** Alternatively, a pure oxygen atmosphere is an option, but it comes with inherent toxicity and poses a fire risk, particularly during ground operations.

Aerospace Technology Challenges: Space travel presents unique technological challenges:

- **High Velocities:** Rockets require velocities significantly higher than those in conventional air transportation. The journey in a rocket can be likened to sitting on an explosive device, with speeds soaring from 0 to over 25,000 km per hour in mere minutes.
- **Launch Uncertainties:** The launch phase, as well as pre and post-launch activities, are fraught with uncertainties, including the potential for rocket explosions.