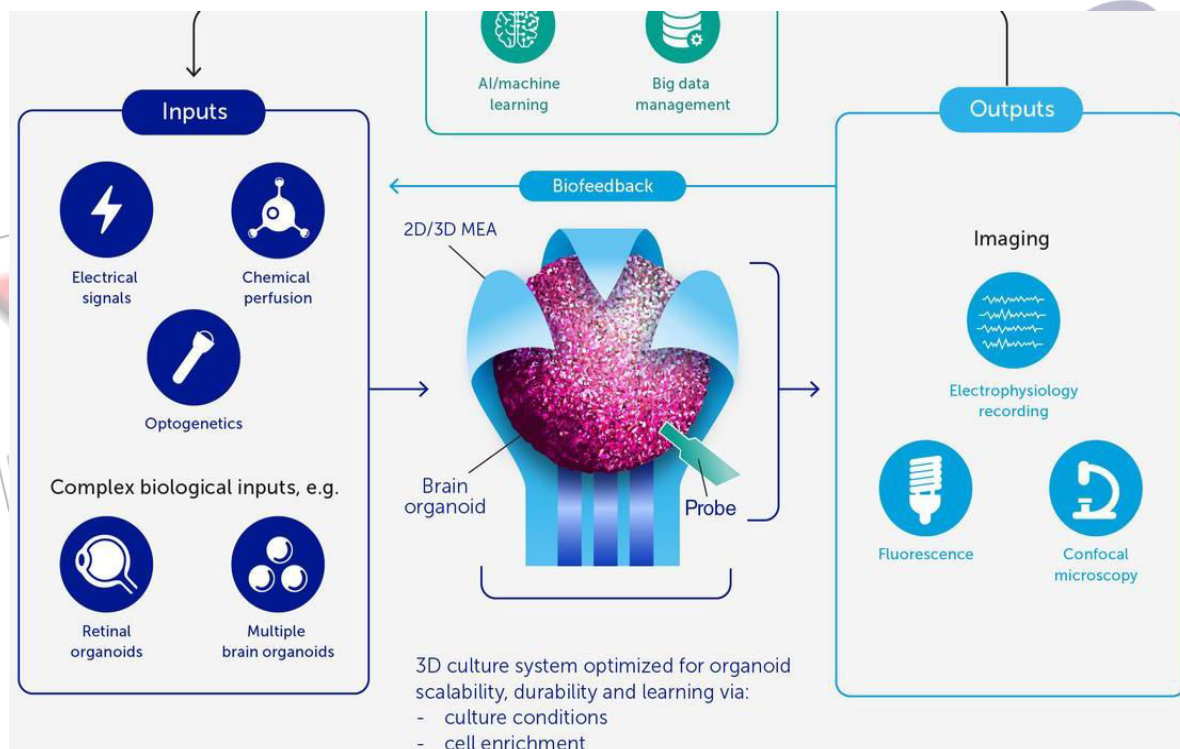


**SCIENCE AND TECHNOLOGY**

❖ **Bio-computers**

➤ **CONTEXT:** Scientists at Johns Hopkins University (JHU) recently outlined a plan for a potentially revolutionary new area of research called “organoid intelligence”, which aims to create “biocomputers”: where brain cultures grown in the lab are coupled to real-world sensors and input/output devices.

- The scientists expect the technology to harness the processing power of the brain and understand the biological basis of human cognition, learning, and various neurological disorders.
- **What is the premise of this technology?**
- Understanding how the human brain works has been a difficult challenge. Traditionally, researchers have used rat brains to investigate various human neurological disorders. While rats provide a simpler and more accessible system to study the brain, there are several differences in structure and function and obvious differences in the cognitive capacities of rodents and humans.
- In a quest to develop systems that are more relevant to humans, scientists are building 3D cultures of brain tissue in the lab, also called brain organoids. These “mini-brains” (with a size of up to 4 mm) are built using human stem cells and capture many structural and functional features of a developing human brain. Researchers are now using them to study human brain development and test drugs to see how they respond.
- However, the human brain also requires various sensory inputs (touch, smell, vision, etc.) to develop into the complex organ it is, and brain organoids developed in the lab aren't sophisticated enough.
- The organoids currently also don't have blood circulation, which limits how they can grow.



➤ **Aren't there other ways to study the human brain?**

- Recently, scientists transplanted these human brain organoid cultures into rat brains, where they formed connections with the rat brain, which in turn provided circulating blood. Since the organoids had been transplanted to the visual system, when the scientists showed the experimental rats a light flash, the human neurons were activated, too, indicating that the human brain organoids were also functionally active.
- Scientists have touted such a system as a way to study brain diseases in a human context. However, human brain organoids are still nested in the rat-brain microenvironment, including the non-neuronal cells that we know play a critical role in some neurological diseases. The effects of drugs in this model will also have to be interpreted through various behavioural tests in rats, which could be insufficiently representative. So we need to address the limitations of lab-grown organoids and develop a more human-relevant system.

➤ **What is the new 'bio-computer'?**

- The JHU researchers' scheme will combine brain organoids with modern computing methods to create “bio-computers”. They have announced plans to couple the organoids with machine learning by growing

the organoids inside flexible structures affixed with multiple electrodes (similar to the ones used to take EEG readings from the brain).

- These structures will be able to record the firing patterns of the neurons and also deliver electrical stimuli, to mimic sensory stimuli. The response pattern of the neurons and their effect on human behaviour or biology will then be analysed by machine-learning techniques.
- Recently, scientists were able to grow human neurons on top of a microelectrode array that could both record and stimulate these neurons. Using positive or negative electric feedback from the sensors, they were able to train the neurons to generate a pattern of electrical activity that would be generated if the neurons were playing table tennis.
- **What are the opportunities for 'bio-computers'?**
- While human brains are slower than computers at, say, simple arithmetic, they outshine machines at processing complex information.
- Brain organoids can also be developed using stem cells from individuals with neurodegenerative diseases or cognitive disorders. Comparing the data on brain structure, connections, and signalling between 'healthy' and 'patient-derived' organoids can reveal the biological basis of human cognition, learning, and memory.
- They could also help decode the pathology of and drug development for devastating neurodevelopmental and degenerative diseases such as Parkinson's disease and microcephaly.
- **Are 'bio-computers' ready for commercial use?**
- Currently, brain organoids have a diameter of less than 1 mm and have fewer than 100,000 cells (both on average), which make it roughly three-millionth the size of an actual human brain. So scaling up the brain organoid is key to improving its computing capacity – as will incorporating non-neuronal cells involved in biological learning.
- Second, researchers will also have to develop microfluidic systems to transport oxygen and nutrients, and remove waste products. These hybrid systems will generate very large amounts of data (i.e. of neural recordings from each neuron and connection), which researchers will need to store and analyse using 'Big Data' infrastructure. They will also need to develop and use advanced analytical techniques (with help from machines) to correlate the structural and functional changes in the brain organoids to the various output variables.
- "The first, very-primitive forms of learning are already around, like the pong-playing brain cultures. "The challenge is now to establish long-term memory. Scientists hope to achieve this within 1-2 years. Applying this to patient cell-derived brain organoids, like autism and Alzheimer donors, is already on the way. It might see benefits for drug development in this decade."
- There is also a proposal to have an ethics team to parallelly identify, discuss, and analyse ethical issues as they arise in the course of this work.

## **POLITY AND GOVERNANCE**

### ❖ **Conflict between tribal panel and Environment Ministry over forest rights**

➤ **CONTEXT:** After the National Commission for Scheduled Tribes (NCST) invoked its constitutional power to requisition detailed Forest Rights Act implementation reports from the Supreme Court, the Registrar has ordered the release of documents to the NCST.

- The ST Commission is caught in a row with the Union Environment Ministry over the latest Forest Conservation Rules (FCR), 2022. The row is over the potential violation of provisions enshrined in the Scheduled Tribes and Other Forest Dwellers (Recognition of Forest Rights) Act, 2006 dubbed the Forest Rights Act (FRA).
- **What are the rules, the Act and how is NCST involved?**
- The Ministry of Environment, Forests and Climate Change in June 2022, notified the Forest (Conservation) Rules, 2022, which prescribed the mechanism for the diversion of forest land for non-forest purposes.
- These amended rules have omitted a clause (present in 2014 and 2017 Rules) that explicitly required any proposal to mandatorily have the consent of local tribespeople and other traditional forest dwellers (OTFDs) of the area, before proceeding for Stage 1 clearance. The FCR, 2022 has allowed applying entities to go for the consent of locals, represented by the Gram Sabha, after Stage 1 or even after Stage 2 clearance.
- Within two months of the FCR, 2022 coming into force, the NCST constituted a "Working Group on the Forest Rights Act 2006 & other issues related to the Forest and Scheduled Tribes" to monitor the implementation of the FRA and "make recommendations to the Union government and State governments". The NCST concluded that the new FCR infringing on the rights of STs and other traditional forest dwellers (OTFDs) by violating the FRA.
- According to the FRA, 2006, in case of a dispute over forest land, precedence has to be given to the rights of STs and OTFDs, who live in and off the forest and its resources, over any other party.

➤ **What is the NCST demanding?**

- In September, 2022, NCST Chairperson shot off a letter to Environment Ministry, highlighting the potential consequences of FCR, 2022, recommending that they be put on hold and the previous Rules, which provided for the consent clause, be strengthened. The ST panel argued that the previous versions of the Rules provided a legal space for “ensuring completion of the processes for recognition and vesting of rights under the FRA in areas where forests are being diverted.
- The ST Commission noted that it made little sense to take the consent of tribals and forest dwellers after an applicant had got Stage 1 clearance. By then, the applicant would be invested in the project and would then have the incentive to “pursue the State Governments or Union Territories” to divert the land at the earliest. The NCST added that the FCR, 2022 provided for Compensatory Afforestation, but nowhere did it prescribe safeguards or a mechanism for compliance with FRA.
- Further, the NCST’s Working Group found that even under the old rules, FRA compliance was in trouble. It said currently, nearly 25,000- 30,000 hectares of forest land was being diverted every year.
  - ✓ It cited a study by the Centre for Environment and Development, ATREE to note: “Out of 128 applications for forest diversion for mining, over 100 had been processed between 2009 and 2018.” It added that 74 proposals had Stage 2 approval, 46 had Stage 1 approval (in-principle), with just five rejected and four closed for other reasons. None of the rejections was for non-compliance of FRA. The study also found that 14 of these cases (all-post 2014) had been cleared with an FRA compliance report, despite this being far from the “ground reality”.
- Environment Minister wrote back to the NCST chief insisting that FCR, 2022 does not violate any provisions granting land rights to STs and OTFDs. The FCR has been issued in accordance with the Forest (Conservation) Act, 1980, which was for a procedure which will run “parallel” to the provisions of the FRA, 2006, and that there was “no legal basis” for the ST Commission’s concerns about the FCR’s impact on the FRA.
- After this, the NCST’s letter to the Supreme Court requisitioning detailed reports related to FRA implementation by all States and UTs, is its the ST panel’s latest move. The Court is yet to notify the next date for hearing the FRA case.

➤ **What is the SC case in which the NCST sought documents from?**

- In order to access “authentic FRA reports”, the NCST approached the Supreme Court with a letter, invoking powers under Clause 8(d) of Article 338A of the Constitution, seeking all documents filed in Writ Petition.
- The petition was filed initially by a Trustee of Wildlife First, a Bengaluru-based advocacy organisation that believes in the “ideology of strictly protected wildlife reserves” and “voluntary resettlement solutions” for local tribespeople and OTFDs living in forest reserves. The plea essentially challenged the constitutionality of the FRA and was placed for hearing before a three-judge Constitution Bench.
- In the course of the hearings, the Supreme Court requisitioned data of all claims under the FRA, which showed that nearly 50% of claims had been rejected. Subsequently, the top Court remarked that despite such a rate of rejections, evictions were seemingly not at the same scale. The Court in 2019 went on to order that all encroachments be cleared from forest land and anyone found occupying land despite having their FRA claim rejected, be evicted.
- However, the Court was alerted that the order would adversely affect thousands of tribespeople and OTFDs, whose claims process under the FRA could be questionable. The Court noted that in many FRA rejections, rejection notices might not have been served to the locals and there was no clarity on whether they were given a chance to provide evidence. It added, the question of “mighty people, industrialists” sitting on forest land by occupying it in the guise of OTFDs was of significance and cannot be ignored.
- The eviction order was stayed and the court called for more detailed reports on number of rejections, reasons for rejection, procedure followed for processing a claim, whether each claimant had the opportunity to provide evidence. The States filed their reports. These are the reports that the Supreme Court released to the NCST on February 20 2023.

**PRELIMS**

**1. SWAMIH investment fund**

- **CONTEXT: The Special Window for Affordable and Mid-Income Housing (SWAMIH) Investment Fund I has raised Rs 15,530 crore so far to provide priority debt financing for the completion of stressed, brownfield and Real Estate Regulatory Authority (RERA)-registered residential projects that fall in the affordable, mid-income housing category. SWAMIH has so far provided final approval to about 130 projects with sanctions worth over Rs 12,000 crore.**
- **What is the SWAMIH investment fund?**
- The Special Window for Affordable and Mid-Income Housing (SWAMIH) Investment Fund I is a social impact fund specifically formed for completing stressed and stalled residential projects.

- Since the Fund considers first-time developers, established developers with troubled projects, developers with a poor track record of stalled projects, customer complaints and NPA accounts, and even projects where there are litigation issues, it is considered as the lender of last resort for distressed projects.
- The Fund's presence in a project often acts as a catalyst for better collections and sales primarily in projects that were delayed for years.
- According to the Finance Ministry, SWAMIH Fund has one of the largest domestic real estate private equity teams focused only on funding and monitoring the completion of stressed housing projects.

➤ **How many projects so far have been financed by the Fund?**

- SWAMIH has so far provided final approval to about 130 projects with sanctions worth over Rs 12,000 crore. The Fund has completed 20,557 homes and aims to complete over 81,000 homes in the next three years across 30 tier 1 and 2 cities.
- The Fund has been able to complete construction in 26 projects and generate returns for its investors. The Fund has also played a critical role in the growth of many ancillary industries in real estate and infrastructure sector having successfully unlocked liquidity of more than Rs. 35,000 crore.
- Launched in November 2019, it has raised Rs 15,530 crore so far with an aim to provide priority debt financing for the completion of stressed, brownfield and RERA-registered residential projects that fall in the affordable, mid-income housing category.

**2. One Nation, One Challan initiative**

➤ **CONTEXT: The Gujarat government recently told the High Court, which was hearing a public interest litigation seeking the setting up of virtual traffic courts in the state, that it was already in the process of doing so under the 'One Nation One Challan' initiative.**

➤ **What is the One Nation, One Challan initiative?**

- One Nation, One Challan is an initiative of the Ministry of Road Transport and Highways to bring all related agencies, such as the traffic police and the Regional Transport Office (RTO), on one platform, to enable seamless collection of challans as well as data transfer.
- The integrated system involves detection of traffic violations through the CCTV network and getting the registration number of the erring vehicle from applications like VAHAN (detecting the vehicle's ownership details) and SARATHI (compilation of driving licenses). An e-challan is then generated with the relevant penalty amount, and sent to the mobile number linked with the vehicle.
- In Gujarat, the initiative is operational in three commissionerate areas of Ahmedabad, Rajkot and Surat since January 16, and implementation at Vadodara is underway.

➤ **How does the integration help?**

- So far, if police had to penalise someone from a different state using the CCTV network, they were unable to find details of the vehicle ownership, as the database was not integrated.
- Now with the integration of all the states' RTO data and traffic police data with the support of National Informatics Centre (NIC) servers, "for example if someone coming from Chhattisgarh is captured violating traffic regulations on CCTV, the vehicle's registration number and its related data can be accessed by the Ahmedabad police, and the challan will be sent directly to the mobile number mentioned at the time of the vehicle's registration. Also, e-challans so far are delivered through mobile phone SMSes, or through post when the phone number is not available.

➤ **How do virtual traffic courts work?**

- If someone doesn't pay the challan amount within 90 days, the challan will be automatically forwarded to a virtual court and proceedings will be initiated. Summons will be sent on the mobile phone of the offender. If the fine is still not paid, further legal proceedings will follow.
- Virtual courts are aimed at eliminating the presence of litigants in the court. An accused can search their case on the virtual court's website. Upon successful payment of fine, the case will be shown as disposed of.
- The court will deal dedicatedly with the 'One Nation, One Challan' cases.

**3. Urban Infrastructure Development Fund (UIDF)**

➤ **CONTEXT: Guidelines for UIDF likely to be released soon**

- The UIDF will be created using priority sector lending shortfall and will be managed by the National Housing Bank.
- The fund will provide resources for public agencies to create urban infrastructure in tier-2 and tier-3 cities.
- The UIDF will be established on the lines of the Rural Infrastructure Development Fund (RIDF).
- States will be encouraged to access the UIDF by leveraging resources from the 15th Finance Commission grants and other existing schemes.

➤ **Classification of Cities:**

- Tier-2 cities: Cities with a population between 50,000 to 100,000
- Tier-3 cities: Cities with a population between 20,000 to 50,000

- **Rural Infrastructure Development Fund (RIDF)**
  - The RIDF was established by the government in 1995-96 for financing ongoing rural infrastructure projects.
  - The Fund is managed by the National Bank for Agriculture and Rural Development (NABARD).
  - Domestic commercial banks contribute to the Fund to fulfill their shortfall in priority sector lending to agriculture.
  - The main objective of the RIDF is to provide loans to state governments and state-owned corporations for completing ongoing rural infrastructure projects.
  - The loan must be repaid in equal annual installments within seven years from the date of withdrawal, with a grace period of two years.
- 4. **International Maritime Exercise/ Cutlass Express 2023 (IMX/CE-23)**
  - **Ins Trikand Participates in International Maritime Exercise/ Cutlass Express 23 (Imx/ Ce-23)**
    - The exercise is an annual maritime exercise conducted to promote national and regional maritime security in East Africa and the Western Indian Ocean.
    - The exercise is designed to assess and improve combined maritime law enforcement capacity, promote national and regional security and increase interoperability between the regional navies.
    - INS Trikand is participating in the International Maritime Exercise/ Cutlass Express 2023 (IMX/CE-23) being held in the Gulf region from 26 Feb to 16 Mar 23. She will exercise with participants from over 50 nations and international maritime agencies with the common aim of enhancing maritime security and keeping sea lanes in the region safe for maritime commerce.
    - IMX/CE-23 is one of the largest multinational maritime exercises in the world. While this is Indian Navy's maiden IMX participation, it also marks the second occasion where an Indian Naval ship is participating in an exercise conducted by the CMF. Earlier, in Nov 22, INS Trikand had participated in the CMF led Operation Sea Sword 2.
    - Participation in exercises like Sea Sword 2 and IMX/CE-23 enables the Indian Navy in strengthening relationships and enhancing interoperability and collective maritime capability with maritime partners in the IOR. It also enables the Navy contribute constructively to regional stability and security.

**ANSWER WRITING**

**Q. Recently the Supreme Court verdict directed changes in the appointment procedure of Chief Election Commissioner (CEC) and Election Commissioners (ECs). What are the changes ruled by the Supreme Court? Discuss how CEC and ECs are appointed and concerns raised with respect to the present appointment procedure.**

A Constitution Bench of the Supreme Court has ruled that Election Commissioners will be appointed by the President of India on the advice of a committee consisting of the Prime Minister, the leader of the Opposition in the Lok Sabha, and the Chief Justice of India. This practice will be enforced until a law in this regard is made by the Parliament. The bench noted that the making of law under Article 324 of the Constitution is an unavoidable necessity.

Article 324 of the Constitution has made the following provisions with regard to the composition and appointment procedure of the election commission:

- The Election Commission shall consist of the chief election commissioner and such number of other election commissioners as the president may from time-to-time fix.
- The appointment of the chief election commissioner and other election commissioners shall be made by the president.
- The president may also appoint after consultation with the election commission such regional commissioners as he may consider necessary to assist the election commission.
- The conditions of service and tenure of office of the election commissioners and the regional commissioners shall be determined by the president.

**Concerns raised with respect to the present appointment process:**

- **Lack of transparency:** The present system of appointment lacks transparency as they are appointed unilaterally as per the wish of the government of the day.
- **Absence of law for an appointment:** At present, there is no law to regulate the appointment of Election Commissioners. 255<sup>th</sup> law commission report recommended the constitution of a selection committee to ensure greater autonomy.
- **Lack of Independence:** The Constitution has not specified the term or qualifications of the members of the Election Commission. Further, the expenses incurred by the election commission are not charged to the consolidated fund of India and are sanctioned by the government.
- **No clarity on the elevation process:** Election Commissioners at present considers themselves as probationers and are conscious of how their conduct is viewed by the government. The 255<sup>th</sup> law

commission recommended that elevation of an Election Commissioner should be done on the basis of seniority.

The supreme court in its judgment observed that in a substantive democracy, the power to vote is “more potent than the most powerful gun” and people depend on an honest Election Commissioner to guard the purity of the electoral process. Therefore, the present verdict will bring independence and transparency to the appointment procedure and will strengthen the electoral process.

**MCQs**

1. With reference to the term “Organoids” consider the following
  1. They are tiny organ-like structures (group of cells) grown in laboratories, miniature structures that mimic the cell arrangement of a fully-grown organ.
  2. They are grown in the lab using stem cells that can develop into any specialised cells seen in the human body.
  3. They lack blood vessels to make them fully functional as they are artificially cultured in the labs.
  4. They are used to study the safety and efficacy of new drugs and also test the response of tissues to existing medicines.

Which of the above given statement/s is/are correct?

a) 1 and 4 only      b) 2 and 3 only      c) 1, 3 and 4 only      **d) 1,2,3 and 4**
2. With reference to Forest (Conservation) Act, 1980 consider the following
  1. It prohibits the felling of forests for any “non-forestry” use without prior clearance by the central government.
  2. The clearance process includes seeking consent from local forest rights-holders, from wildlife authorities and National Commission for Schedule Tribes
  3. The Centre is empowered to reject such requests or allow them with legally binding conditions.

Which of the given above statement/s is/are correct?

a) 1 and 2 only      b) 2 and 3 only      **c) 1 and 3 only**      d) 1,2 and 3
3. Consider the following statements with reference to SWAMIH Investment Fund
  1. It is a statutory fund established under Real Estate (Regulation and Development) Act (RERA) is an act passed by the Parliament in 2016.
  2. The Sponsor of the Fund is Real Estate Regulatory Authority (RERA) on behalf of the Government of India.

Which of the above statement/s is/are correct?

a) 1 only      b) 2 only      c) Both 1 and 2      **d) Neither 1 nor 2**
4. With reference to the Urban Infrastructure Development Fund (UIDF) recently seen in news, consider the following statements
  1. It will be established through the use of priority sector lending shortfall.
  2. It will be managed by the Industrial Development Bank of India (IDBI).

Which of the statements given above is/are not correct?

a) 1 only      **b) 2 only**      c) Both 1 and 2      d) Neither 1 nor 2
5. Recently Megha-Tropiques 1 satellite often mentioned in news, with reference to it consider the following
  1. It was a satellite mission to study the water cycle in the tropical atmosphere in the context of climate change
  2. It was a collaborative effort of India and France space agencies.

Choose the correct statement/s using the codes given below

a) 1 only      b) 2 only      **c) Both 1 and 2**      d) Neither 1 nor 2
6. Recently the term “Hindu rate of growth” seen in news, refers to the rate of growth of which of the following?
 

a) Population      b) Agricultural output      **c) GDP**      d) Per Capita Income
7. With reference to INS Trikand consider the following
  1. It is a state-of-the-art guided missile stealth frigate and is part of the Western Fleet of Indian Navy.
  2. It has been participated in exercises like Sea Sword 2, IMX/CE-23 and Operation Sankalp.

Which of the above statement/s is/are correct?

a) 1 only      b) 2 only      **c) Both 1 and 2**      d) Neither 1 nor 2
8. International Women's day celebrated every year on which of the following date?
 

a) 4<sup>th</sup> March      **b) 5<sup>th</sup> March**      c) 6<sup>th</sup> March      d) 7<sup>th</sup> March
9. With reference to exercise FRINJEX-23 consider the following
  1. It is the maiden joint military exercise between the Indian Army and French Army.
  2. It is for the first time that both countries are engaging in this format with each contingent comprising a Company Group.
  3. The theme for the exercise is based on “counter terrorism”.

Which of the above statement/s is/are correct?

**a) 1 and 2 only**      b) 2 and 3 only      c) 1 and 3 only      d) 1,2 and 3
10. Kalibr Cruise Missile often mentioned in news is associated with which of the following country?
 

a) USA      b) UK      c) Japan      **d) Russia**