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ANTIVENOM & SNAKEBITES

Context

- Scientists from IISc Bengaluru's Centre for Ecological Sciences (CES) and the Technical University of Denmark (DTU) have created an **antivenom** that could be used to **treat snakebites from the diverse cobra species of India.**

Snakebite Envenoming

- The snakebite envenoming (poisoning from snake bites) was classified by the **World Health Organisation (WHO)** as a high-priority neglected tropical disease.
  - An estimated **1.8 – 2.7 million** people worldwide are envenomed annually.
- **Snake Bites in India:** In India, around 50,000 deaths occur of an estimated 3-4 million snakebites annually which accounts for **half of all snakebite deaths globally.**
  - Around **90% of snake bites** are caused by the **'big four'** among the crawlers - **common krait, Indian cobra, Russell's viper and saw scaled viper.**
  - **High burden states include** Bihar, Jharkhand, West Bengal, Madhya Pradesh, Odisha, Uttar Pradesh, Andhra Pradesh, Telangana, Rajasthan, and Gujarat.
- India launched a **National Action Plan for Prevention and Control of Snakebite Envenoming (NAP-SE) in 2024** with a vision to **reduce snakebite deaths by halve by 2030.**

Antivenoms

- **Antivenoms:** Antivenoms are **purified antibodies** against venoms or venom components. Antivenoms are produced from antibodies made by animals to injected venoms.
  - They are included in the **WHO Essential Medicines List.**
- **Antivenoms making process:** To make life-saving antivenoms, scientists enlist the help of **horses** that live on specialized ranches.
  - The animals are injected with a tiny, harmless dose of venom, which causes their immune systems to produce antibody proteins that attack and disable the venom toxins.
  - Then the antibodies are collected and used to treat people who have been bitten or stung.

Irular Community

- The Irulars are a Dravidian ethnic group, spread over the states of **Tamilnadu, Karnataka, and Kerala.**
- They are classified as a **particularly vulnerable tribal group in Tamil Nadu.**
- The Irular people are **skilled snake-catchers** and can safely extract venom from snakes in controlled environments, they play a critical role in producing India's life-saving snake antivenom.

Challenges in Accessing Antivenoms

- **Geographical Barriers:** The healthcare facilities in remote areas often lack antivenom supplies, leading to rise in casualties.
- **Limited Venom Coverage:** Indian antivenoms primarily target the "**big four"** snakes **(cobra, krait, Russell's viper, and saw-scaled viper).**
  - Other venomous species, such as the king cobra and pit vipers, remain uncovered, leading to ineffective treatment.
- **Cultural and Social Factors:** Due to widespread beliefs in superstitions and cultural practices, there is often delay in timely medical intervention in rural areas.

Significance of Newly Created Antivenom

- **Lower dosage:** Carefully selected and engineered antibodies may neutralise venom using smaller quantities, potentially reducing treatment costs and safety concerns associated with large antibody doses.
- **Broader protection:** The approach could help develop antivenoms tailored to different snake species and regional venom compositions.
- **Improved treatment:** Recombinant antivenoms may offer a more targeted and effective alternative to conventional antivenoms.

Source: IE

MEDIA ASSOCIATION CHALLENGES DIGITAL PRIVACY LAW

Context

- The Digital News Publishers Association (DNPA) has challenged the constitutional validity of the **Digital Personal Data Protection (DPDP) Act, 2023**, and the **DPDP Rules, 2025**, as a violation of journalistic freedom.

Concerns Raised by the Petition

- **Absence of journalistic exemption:** The law does not provide a distinct exemption for journalistic activities, potentially subjecting publishers and reporters to notice, consent and data-erasure requirements.
- **Government access to personal data: Section 36 of the DPDP Act**, read with **Rule 23 and the Seventh Schedule of the DPDP Rules,** is challenged for allegedly granting the central government broad powers to requisition information without adequate judicial oversight or safeguards.
- **Impact on the RTI Act: Section 44(3) of the DPDP Act** amends **Section 8(1)(j)** of the **Right to Information (RTI) Act, 2005**, concerning the disclosure of personal information.
  - The DNPA argues that the amendment could excessively restrict access to information held by public authorities.
- **Protection of journalistic sources:** The petition argues that these powers could expose confidential sources, including whistleblowers and RTI activists, thereby discouraging investigative journalism.

Constitutional Frameworks

- **Article 14:** Guarantees equality before the law and equal protection of the laws.
- **Article 19(1)(a):** Protects freedom of speech and expression, providing the constitutional basis for press freedom and investigative journalism.
- **Article 19(2):** It contains reasonable restrictions that can be imposed on the freedom of speech and expression.

Judicial and Committee Precedents

- **Justice K. S. Puttaswamy (Retd.) vs Union of India (2017):** Declared **privacy a fundamental right** under the Constitution.
  - Restrictions on privacy must satisfy constitutional standards, including legality, legitimate state purpose and proportionality.
- **R. Rajagopal v. State of Tamil Nadu (1994) — Auto Shankar Case:** The Supreme Court declared that the media could publish material that is in the public record, including court documents, without the consent of the individual, subject to established exceptions.
  - However, publishing private details beyond public records could violate the right to privacy.
- **Group of Experts on Privacy (2012), chaired by Justice A. P. Shah was** constituted under the Planning Commission.
  - The report recommended that any legislation on privacy should **not dilute or circumscribe the RTI Act**. It emphasised that transparency and privacy must be complementary to each other.

Way Ahead

- **Address inaccurate reporting** through proportionate legal remedies rather than blanket requirements that obstruct publication before verification and disclosure.
- **Provide narrowly defined exemptions** for bona fide journalism undertaken in the public interest, subject to safeguards against privacy violations.
- **Establish criteria to protect legitimate reporting** on corruption, public officials and corporate wrongdoing while preventing unnecessary disclosure of personal data.

Source: TH

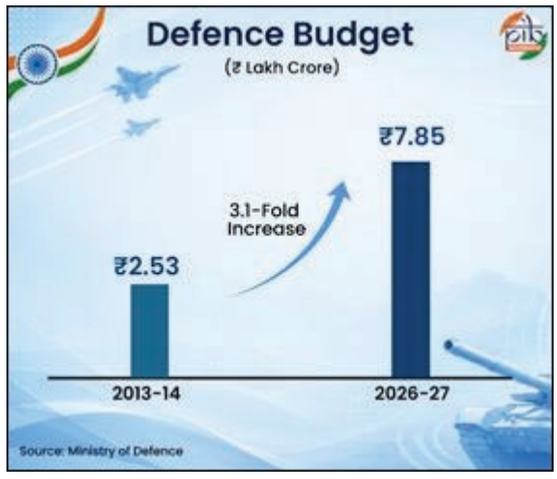
DEFENCE MINISTER CALLED FOR 'AATMANIRBHARTA 2.0' IN THE DEFENCE SECTOR

Context

- The Defence Minister has called for **'Aatmanirbharta 2.0' in the defence sector,** with a focus on developing advanced technologies, strengthening research and development (R&D) and building resilient domestic supply chains.

Overview of India's Defence Sector

- **India's annual defence production** has surged to an **all-time high of Rs 1.78 lakh crore in the Financial Year (FY) 2025-26.** The milestone represents a **15.6% growth over the previous fiscal year.**
- **Sectoral Contribution:** Defence Public Sector Undertakings and other PSUs accounted for approximately **76%** of total production, while the **private sector contributed 24%.**
- **Defence Budget Growth:**The defence budget rose from 2.53 lakh crore in 2013–14 to 7.85 lakh crore in 2026–27.



- India is **exporting defence equipment to more than 80 countries** as of FY 2025-26.
- **Defence R&D allocation** rose from 13,716.14 crore in 2014–15 to 29,100.25 crore in 2026–27, an increase of over **112%.**
- **Surge in Indigenous Defence Production:** 65% of defence equipment is now manufactured domestically, a significant shift from the earlier 65-70% import dependency.
- India targets **₹3 lakh crore** in defence production by **2029**, reinforcing its position as a global defence manufacturing hub.

Achievement in India's Defence Self-Reliance: FY 2025–26

- **Self- sufficiency:** The Indian Army achieved roughly **91% self-sufficiency** by indigenising **159 out of 175 ammunition variants in its inventory.**
- **Missiles:** India has successfully tested the **Agni-4 Intermediate Range Ballistic Missile and Agni-5 Long Range Surface-to-Surface Ballistic Missile**.
  - **The TARA Glide Weapon and RudraM-II air-to-surface missile** have also demonstrated indigenous precision-strike capabilities.
- **Air-Defence Systems:** The DRDO has advanced multiple indigenous systems, including the **Kusha Long Range Air Defence Missile and Very Short-Range Air Defence System (VSHORADS).**
  - **An integrated air-defence system** combining missile interceptors, short-range weapons and laser technologies has also been successfully tested.
- **Warships and Submarines:** The Indian Navy commissioned **12 warships and submarines,** including INS Surat, INS Nilgiri and INS Vaghsheer.
  - INS Mahendragiri, stealth frigate, also entered service with over 75% indigenous content.
- **Maritime Surveillance:** SHACHI, the first of 11 Next Generation Offshore Patrol Vessels, launched. INS Dunagiri, INS Sanshodhak and INS Agray also commissioned, completing the indigenous Sandhayak-class survey fleet, expanding maritime surveillance.

Need for Defence Indigenisation Reforms

- **Strategic Autonomy & National Security:** It reduces dependence on foreign suppliers, especially during crises and geopolitical tensions.
- **Addressing Capability Gaps:** India faces complex security challenges across borders and in the Indian Ocean Region (IOR). Modernisation is required to replace ageing platforms in the Army, Navy, and Air Force.
- **Reducing Import Bill & Promoting Economic Efficiency:** India is among the world's largest arms importers, indigenous production lowers costs in the long run, reduces foreign exchange outflow, and strengthens the domestic defence economy.
- **Boosting Domestic Defence Industrial Base:** Indigenisation stimulates innovation and growth of Defence Public Sector Undertakings (DPSUs), MSMEs, and private industry.
- **Faster Procurement & Operational Readiness:** Domestic manufacturing shortens procurement cycles and ensures timely delivery.
- **Improved Customisation & Adaptability:** Indigenous platforms can be tailored to Indian terrain (Himalayan high-altitudes, deserts, maritime zones) which allows continuous upgrades to meet evolving threat environments.
- **Technology Sovereignty:** Developing indigenous technologies ensures freedom in design, production, and future upgrades. It also prevents vulnerability due to sanctions, supply chain disruptions, or technology denials.

What are the Challenges?

- India continues to **depend on imports** for several **advanced defence technologies** and critical components.

- **Research and development expenditure** in the defence sector remains comparatively limited.
- **Technological gaps** exist in areas such as jet engines, semiconductors, cyber warfare, and advanced sensors.
- **Private sector participation** still faces regulatory and procurement-related challenges.
- Achieving global competitiveness in defence exports requires **sustained investment and quality assurance mechanisms.**

Defence Acquisition & Indigenisation Reforms

- **Defence Procurement Procedure (DPP) 2016** streamlined defence acquisitions while advancing Make in India. It laid the foundation for subsequent reforms in defence procurement.
- **Defence Acquisition Procedure (DAP) 2020** strengthened indigenous procurement and domestic manufacturing. It also expanded opportunities for Indian companies in defence design, development and production.
  - **DAP 2026** proposes simpler acquisition categories and stronger support for indigenous design and development. It also proposes indigenous content **requirements of up to 60%.**
  - Till May 2026, **10 Positive Indigenisation lists,** five each of DMA & DDP, covering 5,521 items were notified.
- **Major indigenous acquisitions:** Approvals include 97 Tejas Mk-1A fighter jets worth 62,000 crore and 156 LCH Prachand helicopters worth 62,700 crore.
  - These procurements expand India's domestic aerospace and defence manufacturing capabilities.
- **Defence Procurement Manual (DPM) 2025** streamlined nearly ₹1 lakh crore in revenue procurement. It enabled faster approvals, relaxed penalties for indigenous projects and assured long-term orders.
- **Srijan Defence Equipment Empowerment Platform (DEEP)** is a digital repository promoting indigenous defence sourcing. As of May 2026, it listed over 41,000 vendors and 2.7 lakh products, strengthening domestic supply chains.
- **Defence Industrial Corridors:** Two corridors, **Uttar Pradesh Defence Industrial Corridor (UPDIC) and Tamil Nadu Defence Industrial Corridor (TNDIC),** are the lifelines of this transformation.
  - By April 2026, the **UPDIC** had attracted ₹42,057 crore in investment commitments and the TNDIC attracted ₹32,699 crore of investment.
    - **The BrahMos Integration & Testing Facility** in Lucknow has begun manufacturing missiles.
- **Defence Testing Infrastructure Scheme (DTIS):** DTIS aims to boost indigenisation by providing financial assistance for setting up **eight Greenfield testing and certification facilities** in the aerospace and defence sector.
  - **Seven test facilities** are already approved in areas like unmanned aerial systems, electronic warfare, electro-optics, and communications.
- **Boosting Innovation: iDEX & TDF Innovations for Defence Excellence (iDEX), launched in 2018,** supports startups, MSMEs, academia, and innovators with grants and funding to develop technologies for defence and aerospace.
  - **Technology Development Fund (TDF) Scheme** also funds industries, especially Start-ups and MSMEs upto an amount of Rs. 10 Crore, for innovation, research and development of defence technologies.
- **Ease of Doing Business in Defence:** Industrial licence validity has been extended from 3 years to 15 years, with a possible 3-year extension, making investment planning easier.
  - The FDI limit in the defence sector was increased to **74% under the Automatic Route and up to 100% via the Government Route.**

Way Ahead

- India should **strengthen indigenous research and development capabilities** in emerging defence technologies.
- Greater collaboration **between DRDO, private industries, startups, and academic** institutions is required.
- **Defence industrial corridors and manufacturing clusters** should be expanded further.
- **Specialised skill development and training programmes** should be launched to create a skilled workforce for emerging defence technologies.

Source: DD

CYCLONE ARNAB

Context

- India's east coast is bracing for the year's first cyclone, Cyclone Arnab, which has intensified into a **Very Severe Cyclonic Storm** over the Bay of Bengal.

About

- The name Arnab was contributed by **Bangladesh** to the list of names used for tropical cyclones over the North Indian Ocean. It is pronounced "Ornab". In Bengali, the word Arnab means "ocean" or "sea."

What are Cyclones?

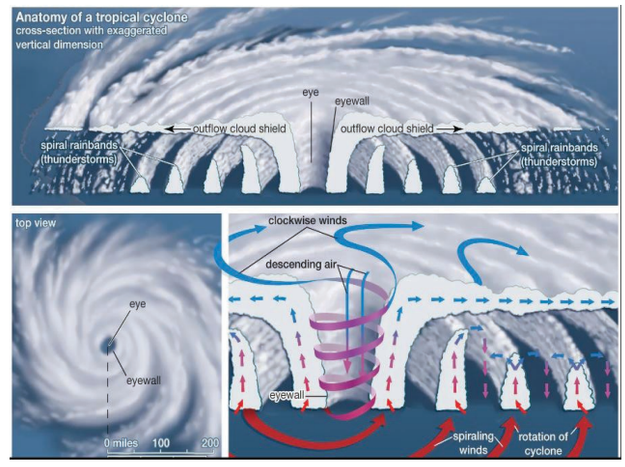
- The word Cyclone is derived from the **Greek word Cyclos,** meaning the **coils of a snake.**
  - It was coined by **Henry Peddington** because the tropical storms in the Bay of Bengal and the Arabian Sea appear like coiled serpents of the sea.
- Cyclones are **powerful, rotating storms** that form over warm ocean waters, characterized by low pressure at the center and high winds.

Type of Disturbances	Wind Speed in Km/h	Wind Speed in Knots
Low Pressure	Less than 31	Less than 17
Depression	31-49	17-27
Deep Depression	49-61	27-33
Cyclonic Storm	61-88	33-47
Severe Cyclonic Storm	88-117	47-63
Super Cyclone	More than 221	More than 120

- **Worldwide terminology:** Cyclones are given many names in different regions of the world:
  - They are known as **typhoons** in the China Sea and Pacific Ocean; **hurricanes** in the Caribbean Sea, West Indian islands, and the Atlantic Ocean; **tornados** in the Guinea lands of West Africa and southern USA; **willy-willies** in north-western Australia and **tropical cyclones** in the Indian Ocean.

How is a cyclone formed?

- **Conditions:** Cyclones typically form over **warm ocean waters**, the warmth provides the necessary **heat and moisture** to fuel the cyclone.
- **Formation of a Low-Pressure System:** When the air rises up and away from the ocean surface, it creates an **area of lower air pressure below.**
  - It causes the air from surrounding areas with higher pressure to move towards the low-pressure area which further leads to **warming up of the air and causes it to rise above.**
- **Cyclonic Circulation:** The rotation of the Earth (Coriolis effect) causes the rising air to start spinning around the low-pressure center. This spinning motion leads to the development of cyclonic circulation.



- **As the wind system rotates with increasing speed, an eye gets formed in the middle.**
  - The centre of a cyclone is very calm and clear with very low air pressure. The difference of temperature between the warm, rising and the cooler environment causes the air to rise and become buoyant.
- **Dissipation:** A cyclone will eventually weaken and dissipate when it moves over cooler waters, encounters dry air, or interacts with land, which disrupts the system's supply of warm, moist air.

Source: IE

NEWS IN BRIEF

SPECIAL EXECUTIVE MAGISTRATES

Context

- A **Special Executive Magistrate (SEM) court** in Delhi accepted the sureties and granted bail to Cockroach Janta Party (CJP) activists Saurav Das and Ashutosh Ranka.

About Special Executive Magistrate (SEM)

- **Legal Basis:** State governments appoint SEMs for **specific areas or purposes** and give them the powers exercised by the **Executive Magistrates** under the Bharatiya Nagarik Suraksha Sanhita (BNSS), 2023.
- **Functions:** They are appointed for a specified period, area or function, such as particular situations that require preventive action or maintenance of public order.

- Their powers also depend on the authority conferred on them by the State government.

- **Nature of Powers:** The powers of SEMs are intended to allow authorities to intervene when there is a likelihood of disturbance rather than responding after the offence has occurred.
  - They maintain public order and prevent breaches of peace by performing preventive and administrative functions.
- **SEMs are limited to administrative functions** and cannot conduct criminal trials or convict people through these proceedings.
- **Judicial Review:** SEMs' actions are subject to judicial review and administrative oversight to ensure legality and that the rights of citizens are protected.

What is a Peace Bond?

- **Section 126 of the BNSS** allows an Executive Magistrate to require a person to execute a **peace bond for up to one year** to prevent breach of peace.
- In case of a **breach of a peace bond,** the Magistrate may order that the person be arrested or detained for the remaining period of the bond.

Source: TH

ANAEMIA

In News

- Anaemia continues to be one of India's most pressing public health challenges.

Anaemia

- **Meaning**: Anaemia is a condition in which the number of red blood cells or the haemoglobin concentration within them is lower than normal.
  - It mainly affects women and children.
- **Causes:** Anaemia can be caused by poor nutrition, infections, chronic diseases, heavy menstruation, pregnancy issues and family history.
  - It is often caused by a lack of iron in the blood.
  - It occurs when there isn't enough haemoglobin in the body to carry oxygen to the organs and tissues.
- **Affects:** In severe cases, anaemia can cause poor cognitive and motor development in children.
  - It can also cause problems for pregnant women and their babies.
- **Treatment**: Treatment and prevention of anaemia varies depending on aetiology.
  - A well-rounded diet rich in iron, folate, vitamin B12, vitamin A and other important nutrients, plus supplements when advised by a skilled healthcare provider, can treat it.
  - Prevention also includes controlling infections such as malaria and parasitic worms, excellent hygiene, vaccinations and management of chronic disorders.
- **India's Steps:** The Government of India's 7X7X7 Anaemia Mukt Bharat (AMB) strategy, which was launched recently, rightly recognises the multifactorial nature of anaemia through a comprehensive approach spanning prevention, screening, treatment, dietary diversification and behaviour change.

Source :TH

SAMHITA PROJECT

In News

- India and Sri Lanka have launched the **SAMHiTA Project** at Gangaramaya Temple, Colombo.

About the project

- **Full form:** South Asian Manuscript Histories and Textual Archive. "Samhita" is a Sanskrit word meaning compilation.
- **Who runs it:** The India International Centre (IIC), New Delhi, is carrying it out with grant assistance from the Government of India.
- **Origin:** It was launched in 2022 with Ministry of External Affairs support. Its original goal was to build a digital database of Indian manuscripts that went abroad over time.
  - It is steered by Dr Sudha Gopalakrishnan, who was the founding director of India's National Mission for Manuscripts.
- **Wider goal:** To create a relational database and digital archive of South Asian manuscripts held in libraries and archives outside India. It is the first attempt to bring repositories from outside India and South Asia onto one platform.

Why it matters?

- **Heritage protection:** Palm-leaf and other old manuscripts decay with time, climate and neglect. Digital copies keep their content safe and open to scholars.

- **Cultural diplomacy:** It builds on the old Buddhist and civilisational links between India and Sri Lanka. It also fits India's neighbourhood-first approach and soft power outreach.
- **Local partnership:** Sri Lankan experts do the digitisation, so the effort is shared and not one-sided.
- **Regional reach:** SAMHiTA also works with institutions in Bhutan, Cambodia, Nepal and Sri Lanka.

Source: PIB

'CLICK TO CANCEL' RULE

In News

- New York City Mayor Zohran Mamdani announced the enforcement of the city's 'Click to Cancel' rule, which allows residents to cancel subscriptions as easily as they sign up, ideally with a single click.

'Click to Cancel' Law

- The 'Click to Cancel' regulation was created to safeguard customers from unfair subscription practices by making it as easy to cancel a service as it was to sign up for it.
- Companies will commonly use digital "dark patterns", difficult menus, lengthy procedures, or obligatory calls and in-person visits to dissuade cancellation.

Features

- The law covers most subscriptions that include automatic renewals or continuing services, with few exclusions.
- It requires firms to give an easy cancellation procedure through the same medium used to sign up.
- Residents can file complaints to be mediated, and offenders can be subject to civil penalties starting at $525.
- The law is also anticipated to save New Yorkers up to $162.5 million per year by increasing openness, fairness, and customer convenience.

India's Stand

- India **doesn't have a complete 'Click to Cancel' policy** like the one outlined in New York City.
- However, the **RBI's Digital Payments – E-mandate Framework** requires customers to receive a **pre-transaction notification at least 24 hours before the recurring payment.**
- The notification should include details like the merchant's name, transaction amount, debit date, etc., and is followed by a **post-transaction notification.**
- This helps avoid silent deductions, but it doesn't fully address **deceptive cancellation methods or digital "dark patterns."**
- The Dark Patterns Consumer Perception Study by Datum Intelligence in June 2026 showed that e-commerce and quick-commerce platforms like Nykaa, Amazon, Flipkart, Zepto and Blinkit did not provide pre-renewal reminders on free-trial billing, and cancellation required more than four steps.
  - This means that even with the existing payment protections, Indian consumers are still left with the huge challenge of readily and transparently terminating undesirable subscriptions.

Source: TH

INDIA OPENS THE DOOR FOR E100 FLEX-FUEL VEHICLES

In News

- The Ministry of Road Transport and Highways (MoRTH) has amended the Central Motor Vehicles Rules (CMVR), 1989 by **legally allowing the testing, certification** and commercial rollout of flex-fuel vehicles that can run on **blends up to E100.**

About

- **E100:** Almost pure bio-ethanol. It is made by fermenting sugarcane juice, molasses, maize or damaged food grain, with small additives that denature the ethanol and prevent corrosion.
- **Flex-fuel vehicles (FFVs):** Petrol engines fitted with special fuel systems and sensors. They adjust engine settings automatically, so they can run on petrol, E100 or any blend in between (E20, E85).

Why the move?

- Cut crude oil imports and to reduce exposure to global price swings.
- Lower emissions from road transport.
- Create a steady market for farm produce like more demand for sugarcane, maize and grain, which helps farmers, distilleries and rural jobs.

How are FFVs different?

- **Ethanol-proof fuel system:** Stainless steel, special polymers and seals resist corrosion, since ethanol absorbs moisture.
- **Smart control unit:** It reads the ethanol share and adjusts the fuel-air mix and ignition timing.

- **High-octane advantage:** Ethanol resists engine knocking, so engines can be tuned for better efficiency.
- **Bigger injectors and pumps:** They deliver about 30% more fuel to make up for ethanol's lower energy content.
- **Cold-start help:** Fuel heating or a little petrol injection helps the engine start in cold weather, when ethanol vaporises poorly.

Challenges

- **Lower mileage:** Ethanol carries about 30% less energy, so savings depend on fuel pricing and tax support.
- **Water stress:** Sugarcane and paddy need a lot of water. More ethanol could pressure groundwater and divert land from food crops.
- **Old vehicles can't use it:** E10/E20 vehicles cannot safely run on E100 without modification. Corrosion, leaks and engine damage are risks.
- **Supporting systems:** Oil companies are expected to set up dedicated E100 pumps in key cities and farm regions, and carmakers must widen their flex-fuel range.

Source: IE

HYDROSEEDING

In News

- Tata Steel has introduced hydroseeding at its West Bokaro Division in Ramgarh district, Jharkhand.

What is hydroseeding?

- It is a mechanised way of planting. Seeds, mulch, fertilizer and a binding agent are mixed with water into a slurry. This slurry is then sprayed over bare ground using a high-pressure machine.
- It allows for quickly growing green cover on damaged land, holding slopes in place, stop soil erosion by wind and water, and restoring overburdened dumps without heavy manual planting.



Advantages

- **Controls erosion:** It binds soil particles at once, reducing rain washouts, rill erosion and dump-slope landslides.
- **Faster growth**: The nutrient-rich slurry gives seeds water and nutrients from day one, leading to even germination and dense roots.
- **Cost-effective:** It cuts labour and transport costs compared with sodding or hand planting on large industrial sites.

Source: IE

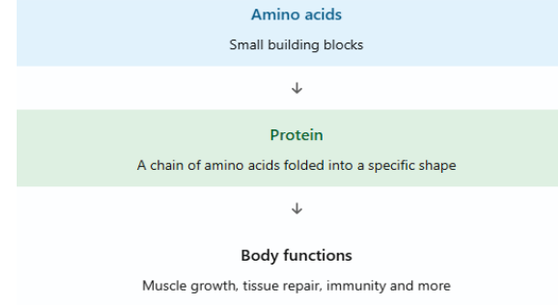
PROTEIN BIOAVAILABILITY

Context

- Scientists investigated whether **protein bioavailability (**meaning protein in a form that's nutritively useful to the body) of traditional meat was the same as that of **plant-based meat.**
  - The study showed **higher bioavailability of plant-based meat** than their meat counterparts,

About

- **Plant-based protein** is protein that comes from **plants rather than animal sources.**
- Proteins are **essential nutrients** that help the **body grow, repair itself, and function properly.**
- Proteins are made up of **hundreds or thousands of smaller units called amino acids,** which are attached to one another in long chains.
  - There are **20 different types of amino acids** that can be combined to make a protein.



- Amino acids are coded by **combinations of three DNA building blocks (nucleotides),** determined by the sequence of genes.
- **Essential amino acids** are organic compounds that **the human body can't produce on its own.**
  - **The nine essential amino acids**—histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan, and valine play vital roles in building proteins, hormones, and neurotransmitters.

Source: TH