

Today's Prelims Topics

Tort of Alienation of Affection

Context

The Delhi High Court's ruling in Shelly Mahajan vs. Bhanushree Bahl marks a legal evolution in India by recognising Alienation of Affection as a potential civil tort.

What is Alienation of Affection (AoA)?

- AoA is a *common law* "heart-balm" tort that allows one spouse to sue a **third party** (usually a lover) for **intentionally and wrongfully interfering** in their marriage, leading to **loss of affection, companionship, or consortium**.
- **Legal Basis in India:**
 - **Not codified** or specifically prohibited in Indian law.
 - Hindu Marriage Act, 1955 (HMA) governs matrimonial remedies between spouses only, has no provision for action against a third party
 - However, in **Pinakin Mahipatray Rawal vs. State of Gujarat (2013)**, the Supreme Court recognised that "*alienation of affection by a stranger, if proved, is an intentional tort*."
 - In **Indra Sarma vs. V.K.V. Sarma**, the Court even noted that **children** might have a cause of action if a third party alienates the affection of a parent.

Joseph Shine vs. Union of India (2018)

- The case challenged **Section 497 of the IPC**, which criminalised adultery, punishing only men and exempting women, reflecting a patriarchal view of women as property.
- **Supreme Court Verdict:** A **five-judge Constitution Bench** led by **CJI Dipak Misra** struck down Section 497 as **unconstitutional**, holding that:
 - **Adultery is not a crime**, as it violates the **right to privacy and autonomy** under Article 21.
 - Marriage does not mean the **subjugation of women's sexual choices**.
 - Adultery remains, however, a **civil wrong** and a **valid ground for divorce** under matrimonial laws.

Delhi High Court Verdict

- The Court **overruled objections** to the maintainability of such a suit and **issued summons**, holding that **spouses may claim civil damages** from third parties who **maliciously interfere in a marriage and cause its breakdown**.
- The HC held that civil courts can hear AoA cases since Family Courts only have jurisdiction over disputes *between spouses* (divorce, custody, maintenance, etc.).
- AoA, being a **tort claim against a third party**, lies within **civil court jurisdiction**.
- **Conditions for Claim (Three-fold Test):**

U.S. Courts' View on Alienation of Affection

Origin

- Originated in 19th-century Anglo-American law as a "heart-balm" tort allowing wronged spouses to seek damages for loss of affection due to a third party's interference.

Current Status

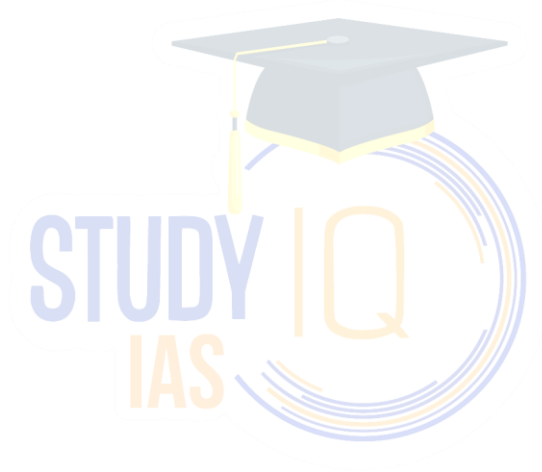
- Most U.S. states have abolished AoA suits, viewing them as outdated, prone to misuse, or incompatible with modern notions of marital privacy and autonomy.
- However, a few states still retain the tort – notably Hawaii, Mississippi, New Mexico, North Carolina, South Dakota, and Utah

Elements of Proof (in states where AoA exists)

- ① Existence of genuine love and affection in the marriage
- ② Loss of that affection due to interference
- ③ Malicious or intentional conduct by the third party causing that loss

- **Intentional & wrongful conduct** by the third party directed at disrupting the marriage.
- **Causation:** A clear link between the third party's conduct and the **marital breakdown**.
- **Measurable loss:** The aggrieved spouse must prove a **recognisable injury**, such as mental distress, humiliation, or loss of companionship.

Source: [The Hindu](#)



2025 Nobel Prize

Context

- Mary E Brunkow, Fred Ramsdell, and Shimon Sakaguchi have been honoured with the Nobel prize for Physiology or Medicine for their work on the human immune system.

More in News

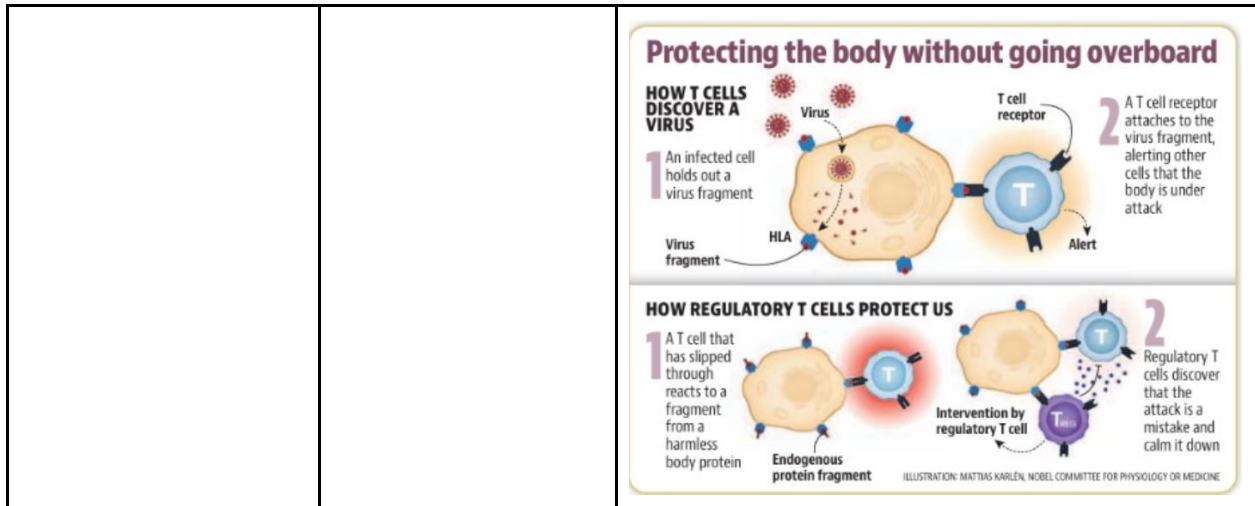
- Also, 3 US-based scientists — John Clarke, Michel Devoret, and John Martinis — have been awarded the 2025 Nobel Prize in Physics for their discovery of macroscopic quantum mechanical tunnelling and energy quantisation in an electric circuit.

About Nobel Prize

- The Nobel Prizes, founded in 1901 in the will of Alfred Nobel, have honoured excellence in science, literature, and peace with economics added later.
- Physics — the first category listed in Nobel’s will — remains among the most prestigious.

What is the Discovery Related to the Human Immune System?

Discovery	Scientist(s)	Significance
Existence of Regulatory T cells (Tregs)	Shimon Sakaguchi	● These cells, later called regulatory T cells (Tregs), prevent autoimmune reactions by keeping other immune cells in check. ● Without these “peacekeeping” cells, the immune system can mistakenly attack healthy tissues, leading to autoimmune diseases.
FOXP3 gene	Mary Brunkow & Fred Ramsdell	● They traced the cause to a mutation in the FOXP3 gene, which was also responsible for a rare human autoimmune disease called IPEX (Immune dysregulation, Polyendocrinopathy, Enteropathy, X-linked syndrome). ● They discovered that FOXP3 is the master gene that controls the development and function of regulatory T cells.
Integration of both findings	All three jointly	Established how the immune system maintains balance — attacking invaders but tolerating self-cells.



Source: [Indian Express](https://www.indianexpress.com)



START Treaty

Context

Russia has offered to voluntarily maintain limits on deployed strategic nuclear weapons under the New START Treaty.

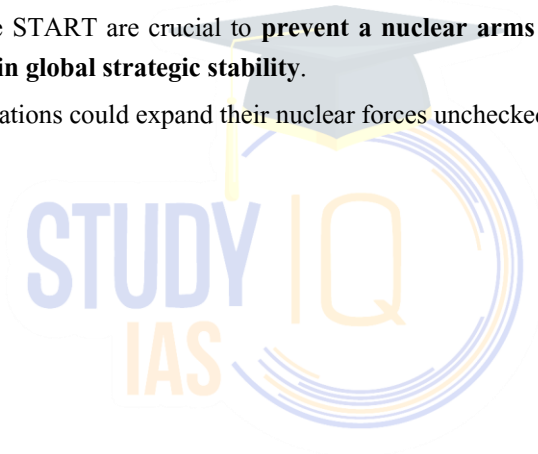
What is the START Treaty?

- The **New Strategic Arms Reduction Treaty (New START)** was **signed in 2010** by then U.S. President **Barack Obama** and Russian President **Dmitry Medvedev** in **Prague**, and **came into force in 2011**.
- It limits both nations to **1,550 deployed strategic nuclear warheads** and **700 deployed launchers** (missiles, bombers, submarines).
- It also includes **verification and inspection mechanisms** to ensure compliance.
- The treaty was **extended for five years in 2021**, making it valid **until February 5, 2026**.

Why Does It Matter?

- The **U.S. and Russia together possess about 87% of the world's nuclear weapons** — around **5,177 (U.S.)** and **5,459 (Russia)**, according to the Federation of American Scientists.
- Arms control treaties like START are crucial to **prevent a nuclear arms race** similar to that during the **Cold War** and to **maintain global strategic stability**.
- Without the treaty, both nations could expand their nuclear forces unchecked, escalating global tensions.

Source: [Indian Express](#)



NAKSHA Programme

Context

The Lal Bahadur Shastri National Academy of Administration (LBSNAA), in collaboration with the Department of Land Resources (DoLR), Ministry of Rural Development, inaugurated a two-day National Training-cum-Workshop on the NAKSHA Programme.

What is the NAKSHA Programme?

- It is a one-year pilot initiative.
- It aims to bring **transparency, efficiency, and accessibility** to **urban land governance** through the use of **advanced geospatial mapping, GNSS (Global Navigation Satellite System), and Web-GIS tools**.
- The programme seeks to **digitally map and authenticate every parcel of urban land**, eliminate **ambiguities in land ownership**, streamline **property taxation**, and strengthen the foundation for **urban planning and governance** — moving India closer to the vision of “**One Nation, One Land Record.**”

Source: [PIB](#)



Mar Del Plata Canyon

Context

A first-of-its-kind deep-sea exploration of the Mar del Plata Canyon has uncovered over 40 potential new marine species.

What is the Mar del Plata Canyon?

- The **Mar del Plata Canyon** is a **deep underwater gorge** located about **190 miles (≈305 km)** off **Argentina's northeastern coast** in the South Atlantic Ocean.
- It plunges to depths of around **3,500 metres (≈11,500 feet)** — nearly **twice as deep as the Grand Canyon**.
- It lies in the zone influenced by the **Brazil–Malvinas Confluence**, where **warm tropical waters** meet **cold Antarctic waters**.
- This confluence creates **nutrient-rich upwellings**, making the canyon a **biodiversity hotspot** that supports coral formations, invertebrates, and fish communities.
- The region acts as a **natural laboratory** to study how marine species adapt to **changing temperatures, nutrient flows, and human pressures**.

What is a Submarine Canyon?

- A **submarine canyon** is a **deep, steep-sided valley cut into the seabed of the continental slope or continental rise**, often extending from the mouth of a river into the deep ocean.
- These canyons are formed by **erosion caused by underwater currents (turbidity currents), sediment flows, and tectonic activity**.
- They play a vital ecological role by:
 - **Transporting sediments and nutrients** from coastal areas to the deep sea.
 - **Creating diverse habitats** for marine organisms due to variable light, temperature, and pressure conditions.
 - Acting as **pathways for organic matter**, supporting unique deep-sea ecosystems.

Source: [TOI](#)

Securities Transaction Tax

Context

The Supreme Court of India has agreed to examine a plea challenging the constitutional validity of the Securities Transaction Tax (STT).

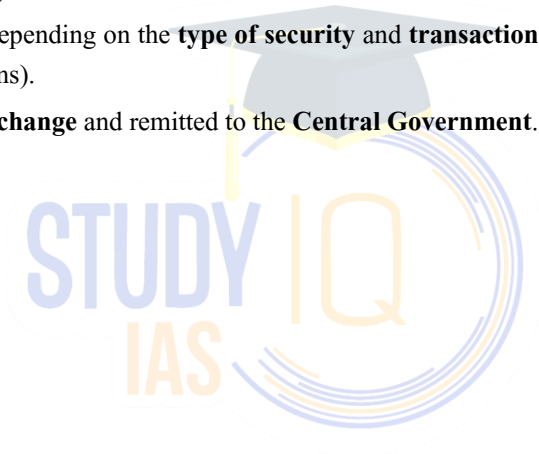
What is the Securities Transaction Tax (STT)?

- **Introduced:** In **2004** under the **Finance Act, 2004**.
- A **direct tax** levied on **transactions in securities** (such as shares, derivatives, and equity-oriented mutual funds) conducted through a **recognized stock exchange**.
- **Objective:**
 - To **curb tax evasion** in capital market transactions.
 - To ensure **transparency** and **ease of tax collection** at the source (collected by the stock exchange).

How STT Works

- It is **imposed on both buyers and sellers** of securities at the time of transaction.
- The **rate of STT** varies depending on the **type of security** and **transaction nature** (delivery-based equity, intraday, futures, or options).
- Collected by the **stock exchange** and remitted to the **Central Government**.

Source: [Business Line](#)



Namchik Namphuk Coal Block

Context

Arunachal Pradesh launched its first commercial coal mine at the Namchik-Namphuk coal block in Changlang district.

About Namchik–Namphuk Coal Block

- **Location:** Located in **Changlang district**, southeastern **Arunachal Pradesh**, within the **Upper Assam coal belt region**.
- **Reserves:** Contains around **1.5 crore tonnes of coal**, supporting **long-term production potential**.
- **Key Features:**
 - Expected to generate **₹100 crore annual revenue** for the state.
 - Will **create local employment** and help **control illegal mining**.
 - Promotes **eco-friendly extraction** under *Mission Green Coal Regions*, focusing on **land reclamation and afforestation**.
 - Aligns with the **PM-EAST Vision** (*Empower, Act, Strengthen, Transform*) to ensure **balanced development in the Northeast**.

About Commercial Coal Mining in India

- Concept introduced under the **Coal Mines (Special Provisions) Act, 2015**.
- **Operationalised in 2020** as part of the **AatmaNirbhar Bharat reforms** to boost competition and efficiency.
- **Governed by:**
 - **Mines and Minerals (Development and Regulation) Act, 1957**,
 - **Coal Mines (Special Provisions) Act, 2015**, and
 - **Environmental and land laws** applicable to mining operations.
 - **Auction process** overseen by the **Ministry of Coal** to ensure **transparency and accountability**.

Source: [PIB](#)

Mains Topics

Organic Farming in India

Context

To promote chemical-free, sustainable farming and reduce the ecological imbalance from input-intensive agriculture, the Union Government launched PKVY in 2015 under the National Mission for Sustainable Agriculture (NMSA). It has since become a flagship programme for mainstreaming organic farming and empowering rural communities.

Current Status of Organic Farming

Global Scenario

- According to **FiBL-IFOAM 2023 report**, about **76 million hectares** are under organic cultivation worldwide.
- **Top countries by area:** Australia (35.7 million ha), Argentina (4.4 million ha), and India (2.9 million ha).
- **Global organic market:** valued at over **USD 135 billion**, led by the U.S. and European Union.

India's Scenario

- India ranks **5th in terms of area** and **1st in the number of organic producers** globally.
- As of **2025**, about **15 lakh hectares** are under organic certification, involving **25.3 lakh farmers** (under PKVY).
- States like **Sikkim, Uttarakhand, Madhya Pradesh, Chhattisgarh, and Maharashtra** lead in certified area.
- **Sikkim** became the **world's first fully organic state** in 2016.
- India's organic exports (2023–24): worth **₹8,000 crore**, major products being oilseeds, cereals, pulses, tea, spices, and cotton.

About Organic Farming

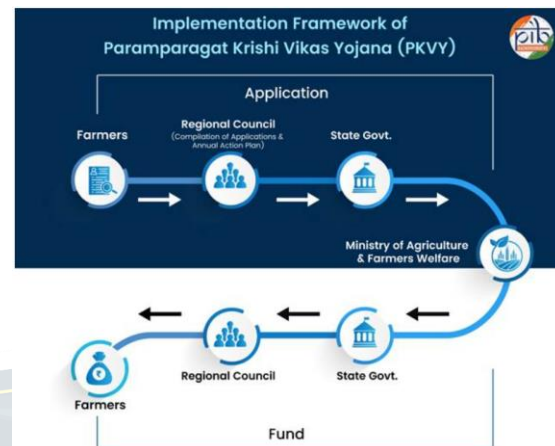
Definition

- According to FAO, "Organic agriculture is a holistic production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles, and soil biological activity."
- It avoids synthetic fertilizers, pesticides, GMOs, and growth regulators, relying instead on natural inputs and biological processes.
- **Core Principles:**
 - **Health:** Sustain and enhance the health of soil, plants, animals, and humans.
 - **Ecology:** Work with natural ecosystems rather than dominating them.
 - **Fairness:** Build equitable relationships among producers and consumers.
 - **Care:** Manage agriculture responsibly for future generations.
- **Types of Organic Farming:**
 - **Pure Organic Farming:** No use of synthetic inputs; only bio-fertilizers, green manures, compost, and natural pest control methods.

- **Integrated Organic Farming:** Combines crops, livestock, aquaculture, and agroforestry in a sustainable nutrient cycle.
- **Natural Farming:** Minimal human intervention; relies on natural processes (e.g., Zero Budget Natural Farming, Subhash Palekar's model).
- **Biodynamic Farming:** Follows holistic methods using lunar cycles and natural compost preparations.

Paramparagat Krishi Vikas Yojana (PKVY)

- It was launched in **2015** under the National Mission for Sustainable Agriculture (NMSA) to revive traditional, chemical-free farming and restore ecological balance.
- Over a decade, PKVY has become a key driver of India's organic farming revolution, blending traditional wisdom with modern systems to promote sustainability, empower farmers, and strengthen rural economies.
- **Objectives:**
 - Promote **cluster-based organic farming** using traditional knowledge.
 - Reduce dependence on chemical fertilizers and pesticides.
 - Improve **soil health**, biodiversity, and productivity.
 - Support **certification, branding, and marketing** of organic products.
 - Empower **farmer collectives** and ensure sustainable livelihoods.
- **Cluster-Based Approach:** The PKVY model is built on cluster-based organic farming
 - Farmers are grouped into **clusters of 20 hectares** to adopt organic practices collectively.
 - This encourages **resource sharing, peer learning, and uniform organic standards**.
 - So far, India has formed **52,289 clusters**, covering around **15 lakh hectares**, benefitting **over 25.30 lakh farmers** across states like Chhattisgarh, Odisha, Sikkim, Maharashtra, and Assam.



Certification Framework

Certification is the backbone of PKVY, ensuring trust and market access:

- **Third-Party Certification (NPOP):**
 - Managed under the **National Programme for Organic Production (Ministry of Commerce)**.
 - Enables farmers to meet **international organic standards** for export markets.
 - Covers the entire value chain - production, processing, and trade.
- **Participatory Guarantee System (PGS-India):**
 - **Community-based certification** under the Ministry of Agriculture.
 - Farmers collectively conduct **peer verification** of organic practices.
 - Focused on **domestic markets**, low-cost and inclusive.
- **Large Area Certification (LAC) (Introduced 2020-21):**

- Targets regions with **no history of chemical farming** (tribal belts, islands).
- Reduces certification time from 2–3 years to a few months.
- Boosts export readiness and income generation in remote areas.

Impacts of PKVY

- Increased awareness and adoption of organic practices.
- Improved soil health and reduced chemical contamination.
- Enhanced market access through certification and branding.
- Boosted incomes via reduced input costs and organic premiums.
- Created eco-friendly employment opportunities in rural areas.

Limitations

- Limited market penetration and branding support.
- Certification delays and high costs for smallholders.
- Inadequate post-harvest and cold-chain infrastructure.
- Low productivity in the transition period.
- Weak consumer awareness in domestic markets.

Other Government Initiatives for Organic Farming

- **Mission Organic Value Chain Development for North Eastern Region (MOVCDNER)** – Focuses on organic clusters, value addition, and export infrastructure.
- **National Mission on Natural Farming (NMNF)** – Encourages natural and regenerative farming models.
- **Bharatiya Prakritik Krishi Padhati (BPKP)** – A sub-scheme of PKVY promoting traditional inputs like cow dung, jeevamrut, and mulching.
- **Rashtriya Krishi Vikas Yojana (RKVY)** – Provides support for organic value chain development.
- **National Centre of Organic Farming (NCOF)** – Coordinates organic input production and training.
- **Organic e-Marketplace: Jaivik Kheti Portal** – Digital platform linking organic farmers directly with buyers.

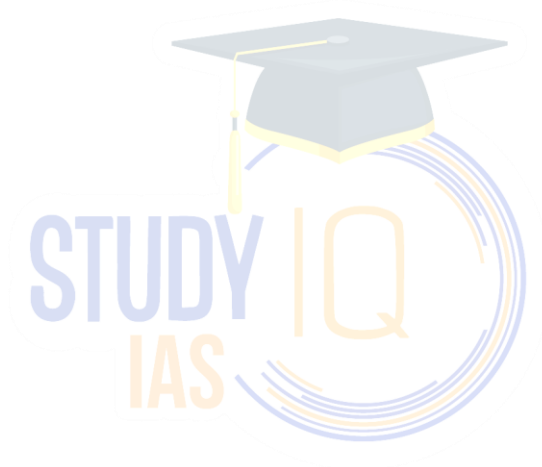
Challenges in Organic Farming in India

- **Low Productivity:** Organic yields are often 15–25% lower during transition periods.
- **Lack of Market Infrastructure:** Absence of dedicated organic markets and procurement agencies.
- **Certification Complexity:** Time-consuming and costly process for small farmers.
- **Limited Awareness:** Both farmers and consumers lack knowledge about organic standards.
- **Input Constraints:** Shortage of bio-fertilizers, compost, and organic seeds.
- **Price Premium Uncertainty:** Inconsistent market demand affects profitability.
- **Logistics and Cold Chain Gaps:** Poor storage and transport reduce shelf life.
- **Policy Fragmentation:** Overlap between schemes and lack of state coordination.
- **Research Deficit:** Limited R&D on organic pest management and region-specific crop systems.
- **Export Bottlenecks:** Complicated export certification and lack of branding in international markets.

Way Forward

- **Integrated Policy Framework:** Align PKVY, NMNF, MOVCDNER, and state missions under one coordinated policy.
- **Market Development:** Establish organic mandis, branding hubs, and MSP-like mechanisms for certified organic produce.
- **Digital Certification:** Simplify PGS and NPOP systems using blockchain and digital traceability.
- **R&D Investment:** Strengthen ICAR and SAUs to research bio-inputs, pest control, and productivity enhancement.
- **Public Procurement:** Include organic food in mid-day meals, hospitals, and public institutions.
- **Capacity Building:** Expand training for FPOs, SHGs, and local entrepreneurs in value addition and e-commerce.
- **Consumer Awareness:** Promote national organic branding and awareness campaigns.

Source: [PIB](#)



Judicial Efficiency in India

Context

Recent remarks by a Member of the Prime Minister's Economic Advisory Council, branding India's judiciary as the "single biggest hurdle" to achieving *Viksit Bharat*, have reignited debate on the judiciary's efficiency and role in India's development.

Judicial Efficiency: The Reality Check

India's judicial system is one of the most overburdened in the world. Yet, judges continue to work under severe constraints of manpower, infrastructure, and administrative support.

- **Scale of Pendency:**
 - Over **5 crore cases** are pending across all courts in India (as of 2025).
 - Around **90% of these cases** are concentrated in **district and subordinate courts**.
 - The judge-to-population ratio is only 21 per million, compared to 50+ in developed countries.
- **High Caseload and Limited Capacity:**
 - Each Supreme Court judge hears **50–100 cases a day** on average.
 - Judges prepare for hearings, study briefs, and draft judgments beyond court hours.
 - Despite this, they function in a **severely under-resourced environment** - inadequate staff, weak technology, and administrative inefficiencies.
- **Vacations and Misconceptions:** Judicial vacations are often misconstrued as leisure.
 - In reality, judges use these periods to **write pending judgments** and **dispose of reserved cases**.
 - Vacation benches of the Supreme Court and High Courts remain active for urgent matters.
- **Financial and Structural Constraints:**
 - The judiciary receives **less than 0.1% of GDP** as budget allocation.
 - Court infrastructure, especially in lower judiciary, is outdated, lacking basic digital and physical facilities.

Thus, while delays exist, it is incorrect to equate them with inefficiency or lack of diligence - the problem lies in **institutional design, not judicial intent**.

The Root Causes of Delay

Judicial delays in India stem from **multi-layered causes** - legal, administrative, and behavioral - many of which are **beyond the judiciary's control**.

- **Massive Judicial Vacancies:**
 - Over **5,000 judicial posts** remain vacant across levels, leading to mounting pendency.
 - The appointment process is often delayed due to tussles between the **executive and the collegium**.
- **Poor Legislative Drafting:** Many laws are **vague, overlapping, or poorly worded**, leading to frequent litigation.
 - Eg: The new Income-tax Bill replaces the term "notwithstanding" with "irrespective of anything," a linguistic change intended to simplify drafting but likely to cause fresh confusion and litigation.
- **Government as the Largest Litigant:**
 - The **Union and State Governments account for 50% of all pending cases**.

- Ministries and PSUs file repetitive appeals, even on settled matters.
- Pensioners, teachers, and public servants are forced to litigate for basic dues.
- **Outdated Procedures:**
 - Civil and criminal procedure codes are slow, cumbersome, and paperwork-heavy.
 - Frequent adjournments and lack of case management systems compound pendency.
- **Infrastructure Deficiency:**
 - Inadequate courtroom space, staff shortages, and limited access to e-courts impede swift justice.
 - Only a fraction of courts have **digital filing, video hearings, or automated tracking**.
- **Socioeconomic and Administrative Factors:**
 - Police investigations are often **delayed or poorly conducted**, weakening cases.
 - High cost of litigation deters settlements and prolongs disputes.

Way Forward

- **Structural Reforms:**
 - Establish a National Judicial Infrastructure Authority (NJIA) to modernize court facilities and standardize digital systems.
 - Fill all judicial vacancies within a fixed timeline through coordination between the executive and judiciary.
- **Reduce Government Litigation:**
 - Implement a National Litigation Policy to discourage routine appeals.
 - Mandate pre-litigation mediation for government disputes.
- **Strengthen Lower Judiciary:**
 - Improve pay, training, and technological support for subordinate courts.
 - Expand Gram Nyayalayas, Fast-Track Courts, and Family Courts for targeted dispute resolution.
- **Process and Procedural Reforms:**
 - Introduce case management systems and time-bound hearings.
 - Encourage summary trials for minor cases.
 - Expand video hearings and e-filing nationwide.
- **Legislative Clarity and Quality:**
 - Undertake **pre-legislative scrutiny** of laws for clarity and enforceability.
 - Avoid cosmetic legal reforms that merely rename or repackage old laws.
- **Judicial Accountability and Capacity Building:**
 - Institutionalize judicial performance audits while maintaining independence.
 - Strengthen judicial academies for continuous professional development.

Source: [The Hindu](#)

Time to Prioritise Energy Storage in India

Context

India's shift to renewable energy is gaining pace, but managing intermittency and peak demand remains a challenge. Recent developments in Andhra Pradesh and debates on power swapping have renewed focus on energy banking and storage as key to India's clean energy strategy.

Understanding Power Swapping

- Power swapping refers to an agreement between two States or utilities to exchange electricity to manage fluctuations in supply and demand.
 - A **State with surplus electricity** during a particular season or time of day supplies power to another **State facing a shortage**.
 - Later, the process is reversed when the first State faces high demand.
 - This mechanism allows both to **save on high-cost short-term purchases** and ensure supply stability.
- **Advantages:**
 - Helps States avoid purchasing expensive electricity from spot markets.
 - Improves utilization of idle power generation capacity.
 - Enables short-term balancing of demand and supply.
- **Limitations:**
 - **Transmission Costs and Losses:** Inter-State power transfers attract transmission charges and energy losses, reducing cost efficiency.
 - **Short-Term Fix:** It addresses temporary supply gaps but does not solve long-term grid stability or renewable intermittency.
 - **Dependence on Other States:** Swapping relies on another State's surplus availability, which may not always coincide.
 - **No Support for Renewable Storage:** It doesn't address the **surplus solar or wind energy** that goes unutilized during off-peak hours.

Thus, while power swapping can help States manage seasonal electricity fluctuations, it cannot be the foundation of India's clean energy strategy.

Energy Banking: The Sustainable Alternative

- Energy banking allows renewable energy producers to store surplus electricity in the grid or in a storage system for withdrawal during deficit periods.
- It acts as a financial and operational mechanism that:
 - Stabilizes the grid against renewable fluctuations,
 - Enables producers to earn better returns by selling power during peak demand, and
 - Reduces wastage of green energy.
- **Mechanism:**
 - During high generation (e.g., daytime solar surplus), electricity is "banked" with the grid.
 - It is then withdrawn at night or during peak hours when renewable generation drops.
 - States or Discoms can monetize this by trading banked energy under **capacity trading models**.

● **Key Technologies:**

- **Battery Energy Storage Systems (BESS)** – lithium-ion and emerging sodium-ion batteries.
- **Pumped Hydro Energy Storage (PHES)** – uses surplus energy to pump water uphill, releasing it to generate power later.
- **Thermal Storage Systems** – store heat energy for use in power or industrial processes.
- **Compressed Air Energy Storage (CAES)** – stores energy by compressing air in underground reservoirs.

● **Why Energy Storage is Crucial:**

- Renewable sources like solar and wind are **intermittent** - they generate power when sunlight or wind is available, not necessarily when demand peaks.
- Storage allows this power to be **captured and released when required**.
- Without storage, surplus renewable power gets **curtailed or wasted**, undermining economic and environmental goals.

Current Status of Energy Storage in India

- India currently has **about 4.8 GW of operational pumped hydro capacity**, with several projects under construction (Maharashtra, Andhra Pradesh, MP).
- **Battery storage capacity** remains limited - around **400–500 MW installed**, mostly in pilot projects.
- The government's **National Electricity Plan (2023)** projects the need for **47 GW/236 GWh** of battery storage by 2032.
- Renewable-rich States like **Gujarat, Rajasthan, and Tamil Nadu** have initiated tenders for hybrid projects combining solar, wind, and storage.

Challenges in Energy Storage and Banking

- **High Capital Costs:** Battery storage costs remain high (~₹8–10 crore/MWh), limiting large-scale adoption.
- **Policy and Regulatory Gaps:** No uniform national policy governing inter-State energy banking.
- **Limited Indigenous Manufacturing:** Dependence on imported lithium, cobalt, and nickel increases costs and vulnerability to global supply disruptions.
- **Technological Uncertainty:** Rapid evolution of battery chemistries creates investment risks for developers.
- **Financial Health of Discoms:** Many Discoms are unable to invest in storage infrastructure due to poor financial conditions.
- **Land and Environmental Clearances:** Pumped hydro projects face long gestation periods and ecological concerns.

Way Forward

- **National Energy Banking Policy:** Establish a unified framework for inter-State renewable energy banking and capacity trading to efficiently utilize surplus power.
- **Accelerate Storage Deployment:** Integrate energy storage obligations with Renewable Purchase Obligations (RPOs) and provide **Viability Gap Funding (VGF)** for grid-scale projects.

- **Boost Domestic Manufacturing:** Expand **PLI schemes** and incentivize R&D in next-generation battery technologies (sodium-ion, flow, solid-state).
- **Promote Hybrid Projects:** Encourage **solar–wind–storage hybrids** for 24×7 renewable power through streamlined approvals and tariffs.
- **Strengthen Pumped Hydro Capacity:** Fast-track sustainable **Pumped Hydro Energy Storage (PHES)** projects using existing reservoirs to minimize environmental impact.
- **Improve Discom Finances:** Enhance payment discipline and financial health of Discoms to enable investment in modern storage infrastructure.

Source: [The Hindu Business Line](#)

