

## Today's Prelims Topics

### Three warships join Navy

#### Context

The Indian Navy has commissioned Three frontline naval combatants—**INS Nilgiri**, **INS Surat** and **INS Vaghsheer** at Mumbai's Naval Dockyard.

#### About INS Nilgiri (Project 17A Stealth Frigate)

- Built under **Project 17A** by Mazagon Dock Shipbuilders Limited (MDL) and Garden Reach Shipbuilders and Engineers (GRSE).
- It is capable of countering conventional and non-conventional threats.
- **Weapons:**
  - Supersonic surface-to-surface missile system.
  - Medium Range Surface-to-Air Missiles (MRSAM).
  - Upgraded **76 mm gun** and rapid-fire **close-in weapon systems**.
- **Construction Method:** Utilizes **integrated construction**, involving pre-outfitting during block stages to shorten build time.
- **Fleet Status:** INS Nilgiri is the first of **7 ships** in this class. Other ships under construction include: **Himgiri, Taragiri, Udaygiri, Dunagiri, Vindhyagiri**.

**Stealth frigates** are warships that use stealth technology to make them harder to detect by radar, sonar, infrared, and visual methods.

#### INS Surat (Project 15B Stealth Guided Missile Destroyer)

- It is the **4th and final ship of the Project 15B Visakhapatnam-class destroyers**.
  - **Predecessors:** INS Visakhapatnam, INS Mormugao and INS Imphal.
- **AI Capability:** First Indian warship equipped with **Artificial Intelligence** solutions for enhanced operational efficiency.
- **Designed by:** Warship Design Bureau, Indian Navy's in-house design unit.
- **Features:**
  - **Weapons:** Surface-to-air missiles, anti-ship missiles and torpedoes.
  - **Speed:** Achieved over **30 knots (56 km/h)** during trials.
  - **Propulsion:** Powered by a **Combined Gas and Gas (COGAG)** system with four gas turbines.

#### INS Vaghsheer (Project 75 Submarine)

- It is the **6th and final submarine of the Kalvari-class, part of Project 75**.
- **Design:** Based on the **Scorpene class** by French defense major Naval Group and Spain's Navantia.
- **Type:** **Diesel-electric attack submarine**, known for stealth and versatility.
- **Weapons:** Wire-guided torpedoes and anti-ship missiles along with Advanced sonar systems for detection and targeting.
- **Capabilities:**
  - Anti-surface and anti-submarine warfare.
  - Intelligence gathering, surveillance, and special operations.
- **Future Upgrade:** Air Independent Propulsion (AIP) systems to be installed from **2026**, enhancing submerged endurance.

#### Source:

- [The Hindu - Submarine, 2 warships commissioned](#)

## Blood Money

### Context

The death sentence awarded by a Yemen court to a nurse from Kerala for murdering her business partner, and the subsequent debates and efforts surrounding her acquittal and repatriation, have brought the focus back on 'blood money' and its implications.

### What is 'Blood Money'?

- It is known as **diya in Islamic Sharia law**, it involves compensation paid by the perpetrator of a crime to the victim or their family.
- **Purpose:** To alleviate the suffering of the victim's family and potential loss of income rather than putting a monetary value on life.
- **Applicability:**
  - Common in cases of unintentional murder or culpable homicide.
  - Also used in intentional murder cases where the victim's family chooses reconciliation instead of **qisas (retribution)**.
- **State Involvement:** Even after reconciliation, the state or community retains the right to impose additional penalties.

### Contemporary Applications in Islamic Countries

- **Saudi Arabia:** Used in road accidents and workplace incidents. Sharia courts determine compensation, while police decide culpability.
- **Iran:** Compensation varies by gender and religion. Women's compensation is half of men's.
- **Yemen:** Consensus for compensation can be arrived at by parties and there can be a judicial oversight over the fairness of the compensation.

### Historical practices similar to Blood Money

- **Ireland:** System of *Éraic* (body price) and *Log nEnech* (honor price) under Brehon law of the 7th century AD.
- **Wales:** *Galanas* - Determined compensation based on the victim's status.
- **Germany:** *Wergeld* - Formalized in early medieval Germany.

### India's Stand on 'Blood Money'

- No direct provision for 'blood money' in India's legal system.
- **Comparable Concept:**
  - **Plea bargaining**, introduced via the Criminal Law (Amendment) Act, 2005.
  - Allows defendants to plead guilty for lesser charges or reduced sentences in return for concessions.
  - **Limitations of Plea Bargaining:**
    - Applies only to offenses with imprisonment less than **7** years.
    - Not applicable for crimes against women, children, heinous crimes or socio-economic offenses.
    - Victims may receive compensation under **Section 265E**.

### Source:

- [The Hindu - does blood money have legal standing](#)

## SC pulls up ED for saying rigours of bail apply to women

### Context

The Supreme Court criticized the Enforcement Directorate for its argument that stringent bail conditions under the Prevention of Money Laundering Act (PMLA) apply equally to women, despite statutory exceptions.

### About Section 45 of PMLA and Its Exception

- **Twin Conditions for Bail:** Section 45 provides that a court may grant bail to an accused if it is satisfied with two essential conditions:
  - **Reasonable Grounds for Innocence:** The court must believe that there are reasonable grounds for believing that the accused is not guilty of the offence.
  - **No Likelihood of Committing Offence on Bail:** Additionally, the court must be convinced that the accused is not likely to commit any offence while on bail.
  - The **burden of proof is on the accused** to prove no prima facie case against them.
- **Exception:**
  - Women, minors (below 16 years), sick or infirm individuals may be granted bail if the Special Court so directs.

### Enforcement Directorate (ED)

- It is India's specialized agency for **enforcing economic laws and combating financial crimes** under the Ministry of Finance (Department of Revenue).
- **Establishment:** May 1956 as an 'Enforcement Unit' within the Department of Economic Affairs.
  - In 1957, it was renamed as the Enforcement Directorate
  - In 1960, its administrative control shifted to the Department of Revenue.
- **Mandate:** Under various acts;
  - Prevention of Money Laundering Act, 2002 (PMLA)
  - Foreign Exchange Management Act, 1999 (FEMA)
  - Fugitive Economic Offenders Act, 2018 (FEOA)
  - Foreign Exchange Regulation Act, 1973 (FERA)
- **ED Director:**
  - **Tenure:** Initial tenure of **ED Director 2 Years. (Can be extended to 3 more years)**
  - Appointed under **Section 25 of the CVC Act, 2003** by the Central Government on the recommendation of a selection committee headed by **CVC (central vigilance Commissioner)**.

### Source:

- [Indian Express - SC pulls up ED](#)

## New System for Wearable Devices to Detect Stress

### Context

Scientists have developed a novel device using a **silver wire network embedded in a stretchable material** that senses strain, mimics pain perception, and adapts its electrical response over time. Developed by scientists at the **Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR)** in Bengaluru.

### What are Neuromorphic Devices?

- These are systems inspired by the **human brain** that emulate how the body senses and adapts to stimuli.
- **Human Pain Perception: Nociceptors**, special sensors in the body that detect pain and help us respond to harmful situations.
  - Over time, these sensors adapt to repeated stimuli, reducing the perception of pain.

### How Does It Work?

- **Stretchable Material with Silver Wires:**
  - The material has a network of silver wires running through it.
  - When stretched, small gaps form in the wires, breaking the electrical path.
- **Memory and Repair:**
  - An electric signal is sent, which "heals" the gaps by reconnecting the wires.
  - Each time this happens, the material **remembers and adapts**, just like how we feel less pain after getting used to it.
- **Acts Like Human Pain Sensors**
  - In our body **nociceptors** detect pain and help us react to danger.
  - Over time, they adapt to repeated pain, making it feel less intense.
  - This material works in a similar way, adjusting its response to repeated stress.

### Potential Applications

- **Healthcare:** Doctors can use it in **wearable devices** to track stress and health in real time.
- **Robotics:** Robots can use it to sense stress or pressure, making them safer and more responsive when working with humans.
- **Smart Wearables:** Can be used in smartwatches, fitness trackers or clothing that monitors stress levels.

### Source:

- [PIB - wearable devices that can detect stress](#)

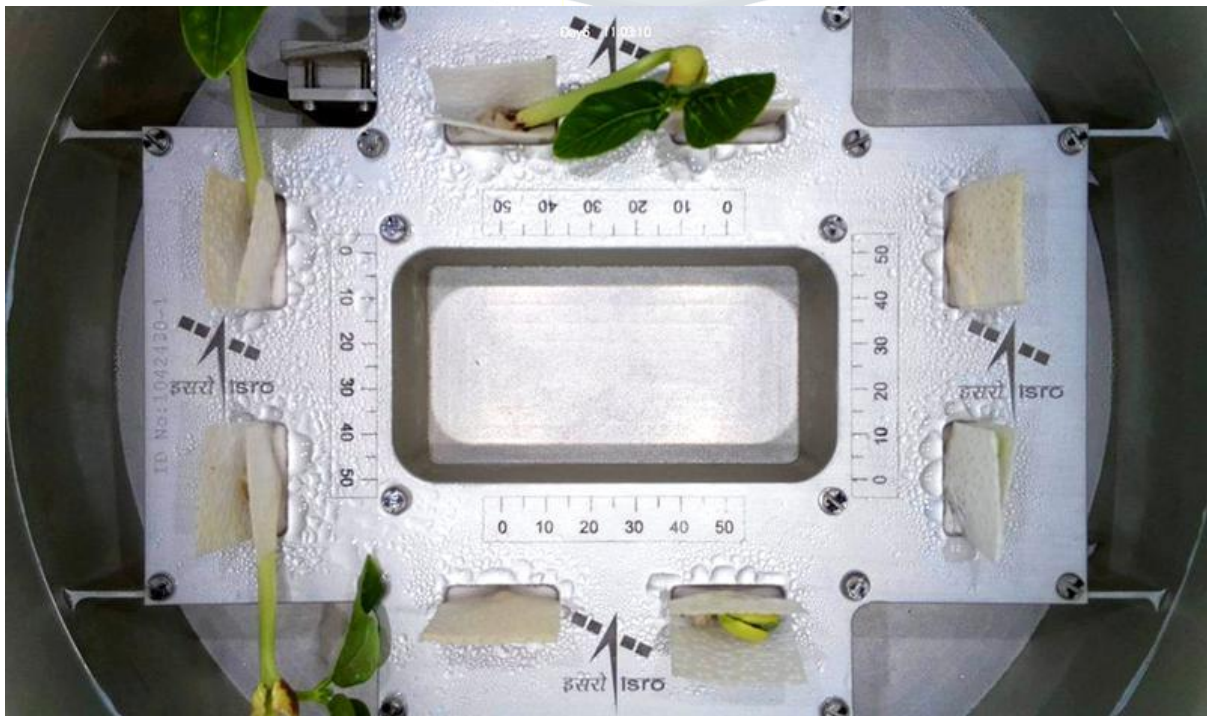
## How and Why are plants grown in Space

### Context

Recently ISRO launched lobia (black-eyed pea) seeds to space as part of its **Compact Research Module for Orbital Plant Studies (CROPS)** project. The seeds successfully germinated, marking a significant step in advancing space farming technologies.

### Why Grow Plants in Space?

- **Sustainable Food Supply:**
  - Long-duration missions to the Moon, Mars and beyond require sustainable food sources.
  - Pre-packaged vitamins degrade over time, reducing their nutritional value. This makes space-grown plants essential.
- **Life Support System**
  - Plants release oxygen through photosynthesis, helping maintain breathable air in spacecraft.
  - They recycle carbon dioxide and organic waste, creating a closed-loop life support system.
- **Mental Well-Being**
  - Tending to plants has been shown to reduce stress and improve mental health for astronauts during extended missions.



### Challenges of Growing Plants in Space

- **Microgravity:** Roots struggle to grow downward without gravity. Water clings to surfaces instead of flowing to roots, complicating nutrient delivery.
- **Radiation:** Space radiation can damage plant DNA and affect growth.
- **Temperature Fluctuations:** Extreme temperature changes, often hundreds of degrees.
- **Light Conditions:** In areas with limited sunlight, photosynthesis stops and plants consume more oxygen than they produce.

### Methods of Growing Plants in Space

- **Hydroponics:** Nutrients and water are delivered via liquid solutions rather than soil.
- **Aeroponics:** Plants grow without soil or any medium, reducing water usage by **98% and eliminating the need for pesticides by 60%**. Plants absorb more minerals and vitamins, making them more nutritious.
- **Soil-Like Media:** Mimics Earth's soil to provide a familiar environment for plant growth.

### How Did ISRO Grow Lobia in Space?

- **The CROPS Module:** Designed as a mini-greenhouse with Earth-like conditions.
- **Components Used**
  - **Soil-Like Medium:** ISRO used highly porous clay comprising tiny pellets. The porosity helped absorb and retain water. Pellets consisted of a water-activated slow-release fertiliser.
  - **Lighting:** Eight LEDs (four warm, four cool) simulated sunlight. Lights operated for 16 hours (day) and were off for 8 hours (night).
  - **Temperature Control:** Maintained between 20–30°C.
  - **Watering:** Water injected into the medium via an electric valve controlled from Earth.
- **Results:**
  - Seeds sprouted on the 4th day of the experiment.
  - By the 5th day, two leaves had emerged.

### Ideal Plants for Space Cultivation

- **Selection Criteria:**
  - Rapid growth, high nutrient content and compatibility with space farming systems.
- **Examples of Ideal Plants**
  - **Leafy Greens:** Lettuce, spinach and kale grow quickly and require little space.
  - **Legumes:** Beans and peas provide protein and fix nitrogen in the soil-like medium.
  - **Root Vegetables:** Radishes and carrots thrive in compact spaces.
  - **Cereals:** Wheat and rice are grown for long-term sustenance.
  - **Fruits:** Tomatoes and strawberries are viable options.

### Source:

- [Indian Express - plants grown in space](#)

## Discovery of a Strange New Particle: Semi-Dirac Fermion

### Context

Physicists have identified a new type of particle, the semi-Dirac fermion, which behaves unusually.

### About Subatomic Particles

- Subatomic particles are the building blocks of matter, smaller than atoms. They can be broadly categorized into two groups based on their properties and functions:
  - **Fermions (Matter Particles):** Particles that make up matter. **E.g.** Electrons, protons, neutrons. They are of 2 Types:
    - **Dirac Fermions:** Have mass and are distinct from their antiparticles. **E.g.** electrons.
    - **Majorana Fermions:** Are their own antiparticles. **E.g.** neutrinos.
  - **Bosons (Force-Carrying Particles):** Particles that mediate forces between fermions.
    - **E.g.** Photons (light), gluons (bind quarks), W and Z bosons (mediate weak force) and Higgs boson (gives mass to particles).

### What is a Semi-Dirac Fermion?

- A newly discovered type of **quasiparticle**, which exhibits unique behavior compared to standard fermions.
- **Unique Properties:**
  - **Directional Mass Behavior:** Has **mass** when moving in one direction & Acts **massless** when moving in the perpendicular direction.
  - **Exotic Nature:** Found in specific materials under precise conditions. It behaves differently from ordinary particles due to its interaction with electric and magnetic forces.

### What is a Quasiparticle?

- A **quasiparticle** is a group of particles or energy packets that collectively behave like a single particle.
- **E.g.** Protons are quasiparticles made of three quarks bound by gluons.

### Source:

- [The Hindu - 'Strange' particle](#)

## News in Shorts

### Students detained in Tripura over Roman script for Kokborok

- Several members of the Twipra Students Federation (TSF) were detained for staging a protest for the use of the Roman script for Kokborok in textbooks and for official work.

#### About Kokborok Language

- It is spoken by the **Borok people** belonging to the State of **Tripura**.
- It is a **Sino-Tibetan language** and can be traced back to 1st century AD when the historical record of Tripuri kings started to be written down in a book called the **Raj Ratnakar**.
- Rajratnakar was originally written in Kokborok using the Koloma script by **Durlobendra Chontai**.
- It is one of the official languages of Tripura, along with Bengali.

#### Source:

- [The Hindu - Roman script for Kokborok](#)

#### UPSC PYQ

Q. With reference to India, the terms 'Halbi, Ho and Kui' pertain to **(2021)**

- (a) Dance forms of Northwest India
- (b) Musical instruments
- (c) Prehistoric cave paintings
- (d) Tribal languages

Answer: D

### Nautor Land

- The Union Home Ministry is considering a proposal to regularise vast areas of government land in the UT of Ladakh in the names of residents who have been using it over the years.
- **Nautor** refers to barren or wasteland owned by the government that can be allotted to individuals for cultivation or other productive use.
- The practice of cultivating wasteland has its origin in a rule framed by **Hari Singh ( former king of J&K) in 1932**.
- **Himachal Pradesh** also has this type of land.

#### Source:

- [The Hindu - Centre, Ladakh leaders discuss new land policy](#)

### Kashi Tamil Sangamam 3.0

- It is an annual month-long programme started in 2022 to celebrate, reaffirm and rediscover the **age-old links between Tamil Nadu and Varanasi**.
- **Organised by:** Union Ministry of Education.
- The theme for this year is **legacy and philosophy of Maharishi Agasthyar**.

#### About Maharishi Agasthyar

- Also known as **Agastya**, he is one of the most revered sages in Indian mythology and spiritual traditions.
- He is regarded as the **father of Tamil grammar**.
- He authored **Agastya Samhita**, a text focusing on herbal medicines, treatments, and health.

#### Source:

- [The Hindu - Agasthyar's legacy](#)

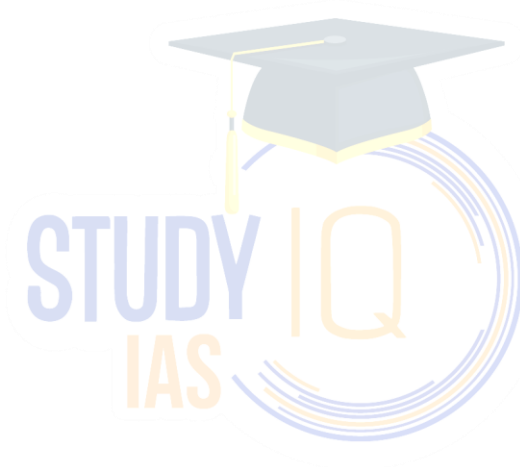


### Three Indian nuclear entities removed from U.S. restrictions list

- **Entities removed from the US entity list are:**
  - Bhabha Atomic Research Centre (BARC)
  - Indira Gandhi Atomic Research Centre (IGCAR)
  - Indian Rare Earths (IRE)
- **US Entity List:** It is a list of foreign individuals, businesses and organisations that are subject to export restrictions and licensing requirements for certain goods and technologies.
  - The **Bureau of Industry and Security (BIS)** of the US Department of Commerce publishes the Entity List.
- The removal of Indian entities will aid in implementation of the landmark **India-U.S. Civil Nuclear agreement 2008.**

**Source:**

- [The Hindu - U.S. restrictions list](#)



## Editorial Summary

### The Red Flag As China's Expansionist Strategy Rolls On

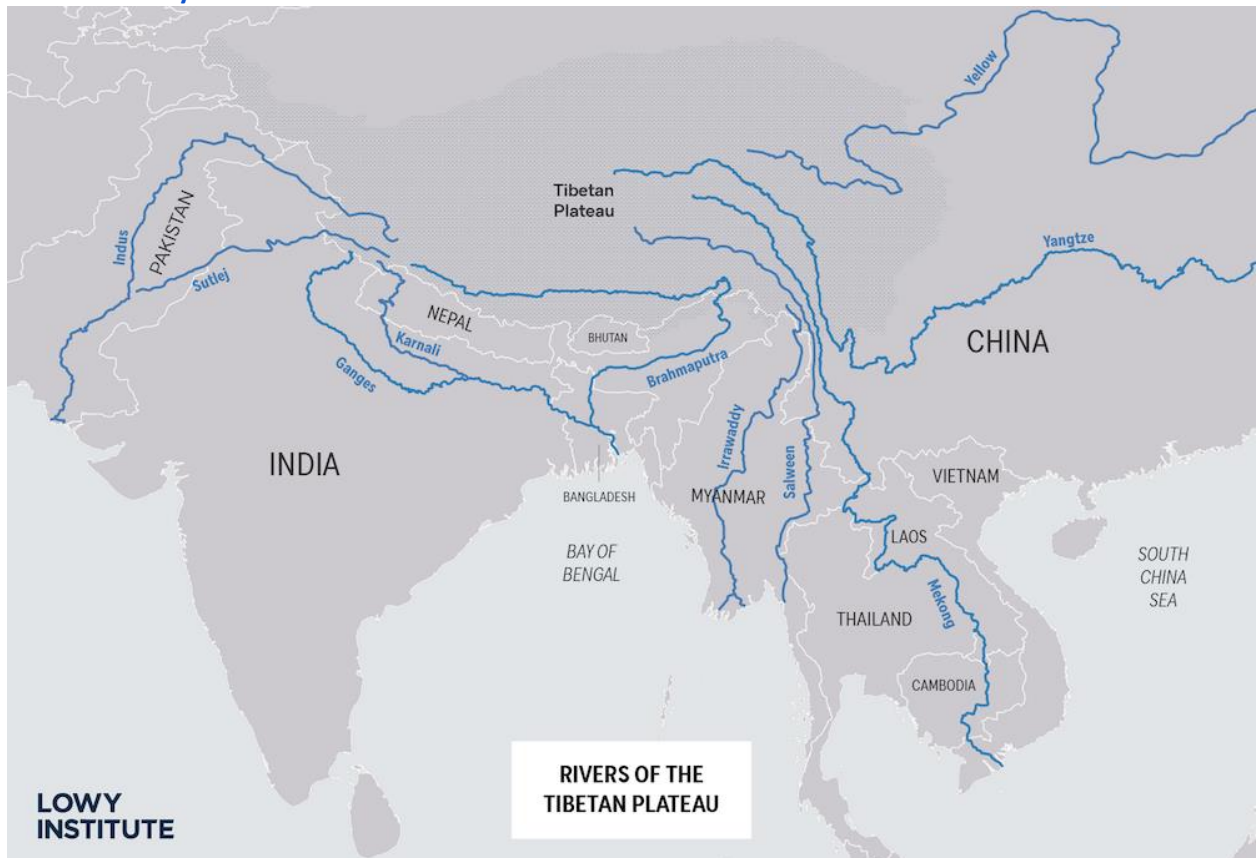
#### Context

Recently, India has experienced two notable instances of Chinese aggression along the China-India border, exposing vulnerabilities that pose a threat to India's territorial integrity and sovereignty.

#### More in News

- **What are the Recent Developments?**
  - Announcement of the construction of a dam on the Yarlung Zangbo river (which is the Brahmaputra river.)
  - Creation of two new counties in north-eastern Ladakh (Hotan Prefecture.)
- These developments are particularly disturbing given the recent consensus on troop disengagement along the Line of Actual Control (LAC).
- These new moves further underscore the unpredictability of China's approach in the region.

#### Transboundary Water Issues with China



- **Unilateral River Projects:** China's dam-building projects on transboundary rivers, like the Brahmaputra (Yarlung Zangbo in China) and Indus river systems, have raised concerns about water flow, sediment transport, and ecological impact in downstream countries such as India, Bangladesh, Bhutan, Nepal, and Pakistan.
  - **Example:** The proposed Chinese dam on the lower reaches of the Yarlung Zangbo is expected to generate 300 billion kilowatt-hours of electricity annually but could reduce water and silt flow to downstream regions, affecting agriculture and biodiversity.

- **Flood Risk:** China's ability to release water from its dams during the monsoon season or geopolitical tensions creates flood risks for downstream countries, particularly India and Bangladesh.
- **Lack of Transparency:** China has been reluctant to share hydrological data consistently with downstream countries, exacerbating concerns about water security and disaster preparedness.
- **Impact on Agriculture and Fisheries:** Reduced water flow and silt due to upstream infrastructure in China threaten agricultural productivity, fisheries, and biodiversity in South Asia.
- **Absence of Regional Mechanisms:** Unlike Southeast Asia's Mekong River Commission, South Asia lacks a multilateral framework to manage transboundary water issues with China, leaving countries to address concerns bilaterally.

### Territorial Issues with China

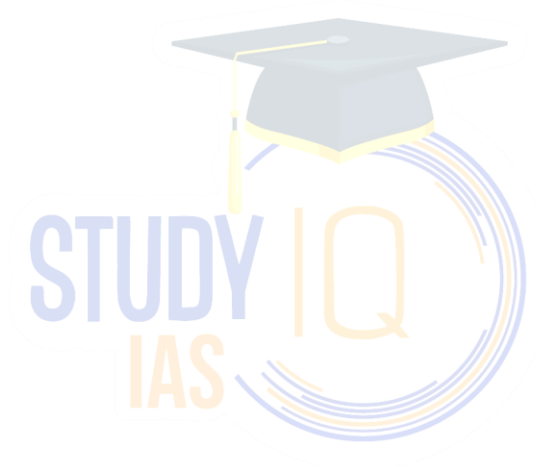
- **India-China Border Dispute:** The unresolved border spans 3,488 km across the Line of Actual Control (LAC), with disputes over Ladakh in the west and Arunachal Pradesh in the east.
  - **Example:** China claims Arunachal Pradesh as "South Tibet" and has renamed locations in the region to assert its claims.
- **Cartographic Aggression:** China uses tactics such as renaming areas, creating new administrative divisions, and publishing maps to assert territorial claims.
  - **Example:** In 2023, China standardized names for 11 locations in Arunachal Pradesh, following similar actions in 2021 and 2017.
- **Encroachments in Bhutan and Nepal:**
  - **Bhutan:** China claims regions like the Doklam plateau, creating strategic implications for India.
  - **Nepal:** China has been accused of encroaching on Nepalese territory, particularly along their northern border.
- **Settlements in Disputed Areas:** China has been building infrastructure, including villages, in contested areas to strengthen its claims and establish a physical presence.
  - **Example:** "Model villages" near the India-China border in Arunachal Pradesh.
- **Power Asymmetry:** The smaller South Asian nations face difficulty countering China's territorial assertions due to its economic and military dominance.
- **Violation of International Law:** Despite provocative tactics, international law does not recognize territorial claims based solely on maps or unilateral declarations.
  - **Example:** The ICJ precedent emphasizes sovereignty through administrative control over cartographic assertions.

### Way Forward

- **Economic Engagement Amid Disputes:** While China has pursued economic partnerships with South Asian nations, its territorial and water-related disputes continue to strain relations in the region.
- **Absence of Collective Action:** Unlike Southeast Asia, which employs multilateral mechanisms like the Mekong River Commission (MRC) and ASEAN to address regional issues, South Asian countries engage with China on a bilateral basis.
- **Impact of Power Asymmetry:** The significant disparity in economic and military power between China and its smaller South Asian neighbors has limited these countries' ability to form a unified front against China's assertive policies.
- **India's Role as a Regional Leader:** As the dominant power in South Asia, India has the potential to spearhead a coordinated regional response to counter China's territorial and water-related actions.
- **Need for a Unified Strategy:** Establishing regional forums, multilateral institutions, or mechanisms for enhanced diplomatic coordination could strengthen South Asia's position in addressing China's growing influence and assertiveness.

- **Diplomatic Engagement and Regional Cooperation:** A comprehensive strategy that combines diplomatic efforts with regional collaboration is essential to safeguard India's sovereignty and ensure security for South Asia in the face of China's expansionist actions.

Source: [The Hindu: The red flag as China's expansionist strategy rolls on](#)



## How US curbs on Russia shadow fleet may impact India oil imports

### Context

The outgoing United States administration has implemented extensive new restrictions on Russia's oil trade, targeting 183 tankers—primarily comprising the "shadow fleet" that has facilitated the continued flow of Russian oil to major consumers like India and China.

### Impact on India

#### Oil Supply Dynamics

- **Reliance on Russian Oil:** Russia has become India's largest supplier of crude oil, accounting for nearly 38% of India's total imports in 2024.
  - This shift occurred as Russia began offering substantial discounts to attract buyers amid Western sanctions.
- **Higher Freight Costs:** Freight costs for Russian crude are expected to rise due to the reduced availability of tankers, eroding the discount advantage that Indian refiners enjoyed.
- **Shift to Other Suppliers:** Indian refiners may turn to traditional suppliers such as Iraq, Saudi Arabia, and the UAE, which were previously India's top sources before the war in Ukraine.
- **Shift in Supply Sources:** With fewer Russian tankers available, Indian refiners are expected to increase imports from traditional suppliers:
  - Iraq, Saudi Arabia, and the UAE were India's **top three crude suppliers** before the Russia-Ukraine war.
  - These suppliers, currently at numbers **2, 3, and 4**, could regain their earlier positions.

#### Consequences of US Sanctions

- **Economic Consequences:**
  - **Higher Energy Costs:** Increased freight rates and reduced discounts could lead to higher oil import bills for India, straining its economy and impacting inflation.
  - **Diversification Costs:** Shifting to alternative suppliers might involve logistical and contractual adjustments, leading to transitional costs.
- **Strategic Implications:**
  - **Pressure on India's Neutrality:** While India is not part of the sanctions regime, continued engagement with Russia could draw scrutiny from the US and its allies, challenging India's balanced foreign policy.
  - **Reduced Leverage on Russia:** Dependence on Russian crude discounts could limit India's ability to negotiate favorable terms in other areas of bilateral cooperation.
- **Geopolitical Repercussions:**
  - **US-India Relations:** Sustained oil trade with Russia might strain ties with the US, potentially affecting India's access to advanced technology and strategic partnerships.
  - **China's Role:** Sanctions could push Russia closer to China, altering the power dynamics in the region and complicating India's geopolitical strategy.
- **Market Resilience:**
  - **Short-Term Adjustments:** India's extensive refining capabilities and diversified import sources might mitigate the impact in the medium term.
  - **Long-Term Opportunities:** Sanctions could encourage India to invest in renewable energy and domestic oil exploration, reducing import dependency.
- **Russian Response:** Russia may offer deeper discounts to comply with the price cap, potentially benefiting India, but at the risk of secondary sanctions if volumes continue to rise.
- **Global Oil Dynamics:** Reduced Russian oil supply in global markets could increase prices, affecting India as a major energy importer, though the overall impact would depend on global supply-demand trends.

### Future Considerations

- **Pricing Strategies:** To comply with Western price caps, Russia may need to lower its prices below \$60 per barrel, which could lead to reduced revenues for Russia but still allow it to maintain some level of sales to India and China.
- **Political Implications:** The incoming administration under Donald Trump may influence U.S. sanctions policy towards Russia. While Trump aims for a peace deal between Moscow and Kyiv, it remains unclear how this will affect existing sanctions or if they will be relaxed

Source: [Indian Express: How US curbs on Russia shadow fleet may impact India oil imports](#)

