Sleepy Classes IAS
Awakening Toppers



TWO MINUTE SERIES

AUGUST 2025

This Compilation Facilitates Revision of Crucial UPSC Prelims 2026 Topics within Minutes



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Polity & Governance

Supreme Court Judgement on Stray Dogs

Context

- The Supreme Court directed the Delhi Government, civic bodies, and authorities in Noida, Gurgaon, and Ghaziabad to remove all stray dogs from residential localities and shift them to dedicated shelters within eight weeks.
- The suo motu proceedings stemmed from increasing incidents of dog bites and rabies deaths in Delhi-NCR.
- *Later in the day, Rajasthan High Court directed municipal bodies to remove stray dogs and other animals from city roads while ensuring minimum physical harm is caused to them.*
- *Court further said that if anyone obstructs municipal bodies from removing stray animals from roads/colonies/public baths, then employees* are at liberty to take action against such persons which includes lodging FIRs for obstructing public servants from performing their duties.

Key Directives by the Supreme Court

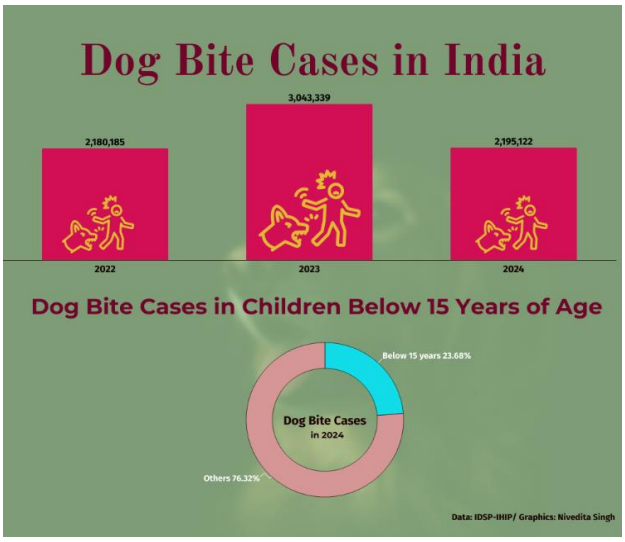
- **Immediate Relocation:** All stray dogs to be moved from streets to shelters; no release back into public areas after relocation.
- **Shelter Infrastructure:** Authorities to construct shelters for **5,000–6,000 dogs within six weeks**, equipped with personnel for sterilisation and immunisation.
- **Monitoring:** Mandatory CCTV surveillance in shelters to prevent removal of dogs.
- **Rapid Response Mechanism:** Helpline to be created within one week to report dog bites/rabies; authorities must pick up dogs within **four hours** of a complaint.
- **Enforcement:** Strict action against individuals/organisations obstructing relocation.
- **Children's Safety Priority:** SC emphasised ensuring that **infants and young children are safe from rabies risk**.
- **Status Report:** Implementation update to be submitted in six weeks.

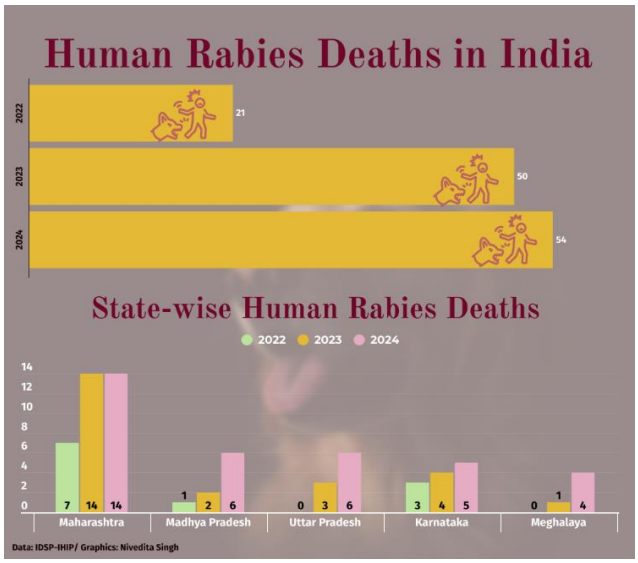
Judicial Reasoning

- The court described the **situation as "grim"**, requiring immediate measures to make streets "absolutely free" of stray dogs.
- Questioned the **Animal Birth Control (ABC) Rules, 2023** provision mandating return of sterilised and vaccinated dogs to their original locality.
- Justice Pardiwala noted: *"Animal activists cannot bring back lives lost to rabies."*

Understanding the numbers

- A overall of 49 **Rabies Cases** had been reported in the national capital this year.
- There are more than 65,000 stray dogs sterilised and vaccinated over a six-month duration.
- **India Saw Over 2.5 Times Jump In Rabies Deaths Since 2022, More Than 4 Deaths Per Month In 2024**
- There are more than 60 million stray dogs in India.
- In 2019, the government told Lok Sabha that stray dogs numbered 1.53 crore; it repeated this data in 2022.
- Also, someone is bitten by a dog in India every 10 seconds.
- This works out to more than 3 million bites a year, of which around 5,000 turn out to be fatal.





Underlying Issue

- In 2001, the Animal Birth Control (Dogs) Rules were notified under the Prevention of Cruelty to Animals Act, 1960.
- However, unless at least two-thirds of a canine population is sterilised within a small (typically 6-12 months) window, ABC drives fail to have any stabilising effect.
- Since owners are not accountable for their dogs or their dogs' pups, hundreds of unwanted pet dogs and pups are abandoned on the street daily.
- Thousands of pet dogs are allowed to roam or break free and breed with street strays.
- According to the World Health Organization (WHO), India is endemic for rabies and accounts for 36 per cent of the world's rabies deaths.
- It also said that about 30-60 per cent of reported rabies cases and deaths in India occur in children under the age of 15 years as bites that occur in children often go unrecognized and unreported.
- In India, human rabies is classified as a notifiable disease in 26 states/UTs following an advisory by the ministry of health and family welfare which is aiming to make India rabies-free by 2030.

Legal Aspect

- **Conflict with Existing Animal Welfare Guidelines**
  - **Animal Welfare Board of India (AWBI) Advisory – 7 December 2022**
  - Prohibited relocation of stray dogs; mandated ABC and anti-rabies programmes.
  - Called on RWAs/citizens to avoid any adverse action against feeders or relocation.
- The Prevention of Cruelty to Animals Act, 1960, which aims to prevent "the infliction of unnecessary pain or suffering on animals", is the primary animal rights legislation in India.
- Under the Act, the Centre in 2001 promulgated the ABC (Dogs) Rules.
- These rules mandated the sterilisation and immunisation of strays by local authorities supported by animal welfare organisations and private individuals.
- Humane methods were specified for capturing dogs.
- **ABC Rules, 2023**
  - Aligned with WHO recommendations.

- Sterilised and vaccinated community dogs must be returned to their home territories.
- Designed to stabilise populations and reduce rabies in situ.
- Euthanisation was only permitted if dogs were critically ill, fatally injured, or rabid.

Reactions

Opposition from Animal Rights Groups

- **FIAPO (Federation of Indian Animal Protection Organisations) Response**
- Termed the order **illegal and impractical**.
- Stated forced removal **contravenes ABC Rules, 2023** and global best practices.
- Highlighted that overcrowded shelters cause stress, injuries, and disease outbreaks, diverting resources from rabies prevention.
- Cited successful in-situ rabies control examples from Jaipur, Goa, and countries like the Netherlands.
- WHO guidelines recommend sheltering only sick, injured, or non-survivable dogs, allowing healthy dogs to remain in their territories.

Implementation Challenges

- **Infrastructure Gap:** Large-scale shelters with proper facilities yet to be built.
- **Manpower Needs:** Recruitment of trained staff for sterilisation, vaccination, and shelter management.
- **Resource Allocation:** Balancing between shelter maintenance and community-based rabies control.
- **Legal Hurdles:** Likely challenges in court citing conflict with existing ABC Rules and AWBI advisories.

Conficting orders

- In 2011, the Kerala HC held that local authorities "cannot kill the stray dogs" and "are bound to follow the 1960 Act and the 2001 (ABC) Rules"
- On the other hand, the Bombay, Himachal Pradesh, and Karnataka HCs have separately held that local authorities are not bound by the 2001 rules and have discretionary powers under municipal regulations to kill stray dogs.
- In 2022, a three-judge SC Bench comprising Justices U U Lalit, S Ravindra Bhat and Sudhanshu Dhulia upheld a stray dog-friendly judgment from the previous year in which Justice J R Midha of the Delhi HC had held that street dogs have a right to food and citizens have a right to feed them.
- "Animals are sentient creatures with an intrinsic value. Therefore, protection of such beings is the moral responsibility of each and every citizen…," Justice Midha had said.

Geography

Factors that Determine the Location of the Coffee Industry

Climate	• Coffee plants thrive in hot (15°C to 28°C) and humid climates (150 to 250 cm). It is **intolerant to frost, drought, high temperatures (>30°C), and strong sunshine**. • The **northern and eastern slopes of the Western Ghats** are preferred as they are less exposed to intense afternoon sun and southwest monsoon winds. • In the highlands of western **Yemen, western Saudi Arabia, and Ethiopia,** coffee **thrives despite low annual rainfall due to thick sea mist that provides moisture and shade for the coffee bush**.
Vegetation	• Like tea, it is **also generally grown under shady trees**.
Topography	• Coffee is grown on **hill slopes at elevations** from 600 to 1,600 m above sea level **to avoid stagnant water**. • **Sea-facing slopes are ideal as the sea breeze and mist provide continuous moisture.**
Soil	• Rich, well-drained loams with humus and minerals like iron and calcium are ideal for coffee cultivation.
Capital	• Coffee cultivation and processing is a capital-intensive industry. - Coffee bush takes about five years to mature. • Labour costs account for a significant part of the total cost of production.
Labour	• Except for bean roasting, all activities occur at the coffee estate itself. - Mechanisation isn't viable due to the sloping terrain. - This makes coffee cultivation a labour-intensive industry that requires abundant, cheap, and skilled labour.

Why coffee is sensitive to extreme conditions:

Frost:

- Coffee is a **tropical plant**; it evolved in **warm climates**.
- **Frost freezes the water inside plant cells**, causing them to **burst** and the leaves or buds to
- **short cold spell can damage or kill the plant.**

Drought:

- Coffee plants need **regular moisture** to grow flowers, fruits, and leaves.
- In drought, there's **not enough water in the soil**, so:
    - **Leaves dry up,**
    - **Beans don't develop,**
    - **The plant becomes weak or dies.**

High temperatures (>30°C):

- Too much heat causes the plant to **lose water quickly through its leaves** (a process called **transpiration**).
- **This stresses the plant, reduces growth, and can stop bean formation.**
- **Also, enzymes that control plant processes don't work well in extreme heat.**

Strong, direct sunlight:

- **Coffee naturally grows under the shade of taller trees in forests.**
- **Too much sunlight burns the leaves, dries the soil quickly, and reduces bean quality.**
- That's why coffee is often grown under **shade trees** — to recreate forest-like conditions.
- In, usually between **600 and 1,600 meters above sea level**.

There are two main reasons for this:

- **Avoiding Stagnant Water:**
    - On flat land, water can **collect and stand still**, especially during heavy rains.
    - **But coffee roots do not like soggy soil — it can cause root rot and damage the plant.**
    - **So, growing coffee on slopes helps water drain away quickly, keeping the roots healthy.**

Benefits of Sea-Facing Slopes:

- When the slope faces the sea, it gets **cool sea breezes** and **mist**.
- **This sea mist brings in moisture and keeps the air humid, even if there's not a lot of rain.**
- It also provides **natural shade** by diffusing sunlight — which is perfect, because coffee plants don't like strong, direct sun.

Summary:

- So in simple words — **slopes prevent waterlogging**, and **sea breeze keeps the air moist** and cool, creating the perfect conditions for coffee."

Rich soil with humus:

- **'Rich' means the soil has plenty of nutrients.**
- **Humus** is the **dark, soft part of soil** made from **rotted leaves and plants**.
- It keeps the soil **moist** and **fertile**, and gives coffee plants the energy they need to grow.

Minerals like iron and calcium:

- **Iron helps plants make chlorophyll, which is needed for green leaves and photosynthesis.**
- **Calcium helps the plant grow strong roots and stems.**
- These minerals make the beans **healthier and better in quality**.

It takes 4 to 5 years just to get the first harvest:

- When a coffee bush is planted, it doesn't give beans right away.
- It takes about **five years to mature** and start producing good quality coffee beans.
- So, the farmer has to **spend money for many years** without earning anything from that plant.

High labour costs:

- Coffee farming and processing require a **lot of human work** — especially:
    - **Picking the beans by hand** (to avoid damaging them),
    - **Sorting**, **drying**, **roasting**, and **packing**.
- In fact, **labour is the biggest cost** in coffee farming — especially in countries like India, where manual harvesting is still common.
- Coffee beans grow **inside small red or purple fruits** called **coffee cherries**, which grow on bushes. These cherries must be picked **only when fully ripe** for the best flavor.

Hand-Picking (like tea, but more selective):

- In **high-quality coffee farms**, especially in hilly areas like the **Western Ghats**, workers **pick each ripe cherry by hand**.
- It's **very labour-intensive**, but it ensures **only the best, ripest cherries** are selected.
- Workers may visit the **same bush multiple times** in a season — because all cherries don't ripen at once.
- This is called **selective picking**, and it's similar to tea plucking in care — but tea leaves are picked from the top shoots, while coffee requires picking **individual fruits**.

Summary:

- Coffee is capital-intensive because:
- It takes **years to produce**,
- Needs **constant care and labour**,
- Involves **multiple expensive processing steps**,
- And depends on **special soil, climate, and terrain**.
- That's why **big investment** is needed even before the first cup of coffee is brewed!
- Let me know if you want a flowchart or diagram to show this step-by-step in class.

Rubber Industry (UPSC Repeated theme)

UPSC PYQ

Q. Describing the distribution of rubber producing countries, indicate the major environmental issues faced by them.

Challenges Faced by the Rubber Sector

- Rubber-producing countries struggle with **unsuitable agricultural climates** worsened by the adverse effects of **climate change**.
- **Traditional rubber-growing regions** face the challenge of **limited available land for new plantations** due to extensive prior cultivation.
- Non-traditional rubber-growing areas face obstacles, such as **unsuitable agricultural and topographic conditions**, **social and cultural barriers, institutional limitations, and inadequate infrastructure**.
- **Fluctuations in global rubber prices** often result in prolonged periods of low prices, which impact revenue and investment in the sector.
- **Rubber-producing nations struggle to compete with other producers** due to **high production costs**, inefficiencies, and **slow technology adoption**, impacting market share and profitability.
- The **non-tyre rubber manufacturing segment** faces **stagnant growth** due to **limited innovation, outdated production methods, and inadequate investment in research and development.**

UPSC 2022: Describing the distribution of rubber producing countries, indicate the major environmental issues faced by them.

Major Environmental Issues in Rubber-Producing Regions

- **Deforestation and Biodiversity Loss:**
  - Large tracts of **tropical forests are cleared** for monoculture plantations, especially in Southeast Asia (e.g., Thailand, Indonesia, Vietnam)
- **Monoculture and Soil Degradation:**
  - Continuous **monoculture reduces soil fertility, affects microbial diversity**, and increases dependency on chemical inputs.
- **Water Resource Stress**
  - **Rubber plants require more water, that reduces ground water** and also take away from the share of other plants.
  - Soil and ground water contaminating in many rubber processing centre and the latex processing industries **discharging partly treated or untreated waste water in the surrounding places which contaminate environment**.
- **Biodiversity loss:**
  - Conversion of natural forests to rubber monocultures leads to substantial biodiversity loss, including the decline of endemic and threatened species
- **Climate Change Contribution and Vulnerability:**
  - Forest clearance releases stored carbon; rubber plantations sequester less carbon than natural forests.

5 Factors contributing to the growth of Food Processing Industries in India

Diverse Agro-Climatic Conditions	India's **diverse agro-climatic conditions** enable the cultivation of **various crops, fruits, and vegetables, benefiting the industry.**
Proximity to Agricultural Production Centres	Many **food processing units are strategically located near major agricultural production centres to ensure a consistent supply of fresh raw materials, minimise transportation costs, and reduce post-harvest losses.** For e.g., **Amul in Anand is in proximity to the milk-producing regions of Gujarat.**
Transportation Infrastructure	India's **extensive transportation network** enables the movement of **raw materials** and **finished products** across **India and for exports.** For e.g., the **Mother Dairy plant (Delhi)** benefits from the city's extensive road and rail network.
Availability of Labour	It is labour- intensive, and it benefits from India's abundant skilled and semi-skilled labour pool, especially in rural or semi-urban areas.
Growing Domestic and International Markets	The rising demand for processed foods in India, driven by lifestyle changes, urbanization, and higher incomes, fuels this industry's growth. Additionally, increasing demand in international markets for Indian processed foods creates export opportunities, further expanding the sector.

The food processing industry is the sector that converts raw agricultural products (like crops, milk, meat, fish, fruits, vegetables) into consumable, storable, and value-added food products through physical, chemical, or mechanical processes.

- **Coastal Regions:** Abundant fish and seafood → processed into frozen fish, prawns, canned tuna.
- Mangoes, grapes, pomegranates → processed into juices, wines, raisins, jams.
    - **Rice Mills:** Concentrated in Andhra Pradesh, West Bengal, and Punjab—major rice-producing states.
    - **Fruit Processing (Mango Pulp Units in Andhra & Maharashtra):** Located near mango orchards for juice, pulp, and pickle production.
- **Marine Processing Units:** Along coastal states like Kerala, Tamil Nadu, and Gujarat, where seafood is processed into frozen or canned products for export.
- **National Highways & Expressways** – connect Punjab's wheat and rice belt to major food processing hubs in Delhi-NCR.

Tea Plantations

- **Lifestyle Changes & Urbanisation** → More people prefer **ready-to-eat, packaged, and convenience foods**.
    - Example: Instant noodles (Maggi), ready-to-cook dosa batter (iD Fresh), frozen parathas and snacks.

- **Higher Incomes** → Growing demand for premium products like juices, chocolates, bakery items.
    - Example: ITC, Britannia, Haldiram's expanding into packaged snacks, biscuits, and frozen foods.
- **Health Consciousness** → Rise in demand for fortified foods, organic juices, low-fat dairy.
    - Example: Amul's probiotic curd, Patanjali's health-based food products.

Growing International Demand (Exports)

- **Spices & Condiments** → Indian spices (MDH, Everest) are exported globally.
- **Marine Products** → India is the largest exporter of frozen shrimp to the USA and China.
- **Fruits & Processed Items** → Mango pulp, guava nectar, and processed pickles exported to the Middle East and Europe.
- **Basmati Rice** → Processed and packaged in Haryana, Punjab, UP and exported to West Asia, Europe, and North America.
- **Tea & Coffee** → Darjeeling Tea and Coorg Coffee are famous worldwide.

Locational Factors Influencing the Horticulture Industry

Factors	Explanation
Climate	• Different crops thrive in specific temperature ranges. For e.g., **Mediterranean climates** favour **citrus fruits**, **tropical regions support mangoes, bananas, coconuts, and spices, and temperate climate** supports **apples, pears, peaches, and cherries.** • Water availability is crucial; **consistent rainfall** or **access to irrigation** supports diverse fruit and vegetable production. For e.g., **California's Central Valley.** • **Sunlight, on which photosynthesis depends, influences crop selection.** For e.g., **Australia's Barossa Valley**, with long sunshine hours, produces rich **grapes.**
Topography and Soil	• **Flat, fertile lands are ideal for large-scale crop production.** For e.g., the American Midwest for corn and soybeans. • Different crops require **specific soil types. For e.g., volcanic soils in the Canary Islands nourish banana plantations.**
Market Proximity and Accessibility	• **Proximity to large markets** and **efficient transportation facilitate rapid distribution.** • Reduces transportation costs and ensures **fresh produce reaches consumers quickly.**

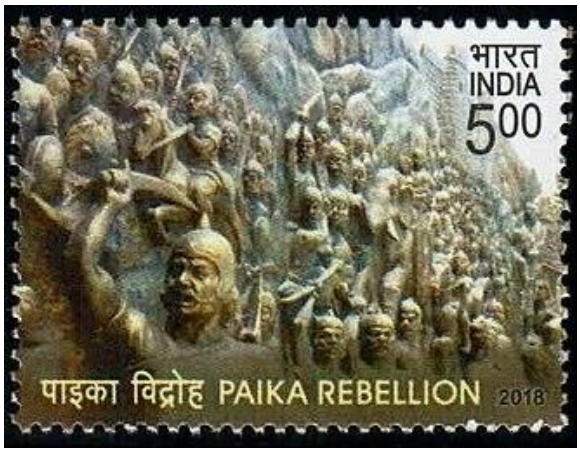
Economic and Policy Factors	• **Affordable labour and supportive government policies promote cost-effective horticulture production.** • **For e.g., India's National Horticulture Mission provides subsidies and promotes the adoption of technology like drip irrigation.**
Global Trade and Regional Specialisation	• **Open trade agreements allow countries to specialise in crops suited to local conditions and export them globally. For e.g., avocado production in Chile.** • **Clusters of horticulture-focused businesses in specific regions create a supportive ecosystem. For e.g., wine making in Loire Valley in France.**

History

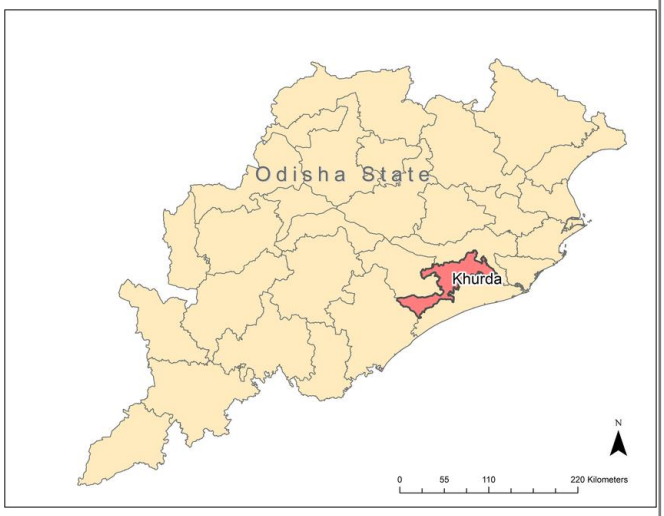
Paika Rebellion, 1817

Context:

- Former Odisha Chief Minister Naveen Patnaik has expressed concern over the "omission" of the Paika Rebellion from the latest Class VIII history textbook of the National Council of Educational Research and Training (NCERT), calling it a "huge dishonour" to the brave Paikas.
- The NCERT has clarified that the 1817 rebellion will be included in the second volume of the textbook, set to be released in September-October.



- The **Paikas** (pronounced "*paiko*", literally "foot soldiers") were a **class of military retainers who had been recruited from various social groups by the Gajapati rulers** of Odisha since the **16th century.**
- They would **render martial services to the king in return for hereditary rent-free land** (*nish-kar jagirs*) which they would cultivate during peacetime.
- **Paik Rebellion/Khurda Uprising** was a significant armed uprising **against British colonial rule** that erupted in **1817** in the **eastern province of Khurda (present-day Odisha).**



Khurda Uprising, 1817

Background:

- In 1803, Colonel Harcourt marched virtually unchallenged from Madras to Puri, and faced only feeble Maratha opposition onward to Cuttack.
- Harcourt had made an agreement with Mukunda Deva II, for free passage through Khurda in return for compensation of Rs 1 lakh and four *parganas* — Lembai, Rahanga, Surai and Chabiskud — which had been under Maratha control since 1760.
- When the Company did not fulfil these conditions, Jayee Rajguru, the custodian of the king marched to Cuttack with around 2,000 armed Paikas in order to pressurise the British.
- Although Harcourt paid a sum of Rs 40,000, he refused to give Khurda the four *parganas*.
- Rajguru subsequently conspired to

overthrow the British, but was caught before the revolt could materialise.

- The Company subsequently took away the king's lands, dethroned him, razed the fort at Barunei, and arrested Rajguru, who was convicted for waging war against the British government and executed on December 6, 1806.
- The king was banished to Puri.

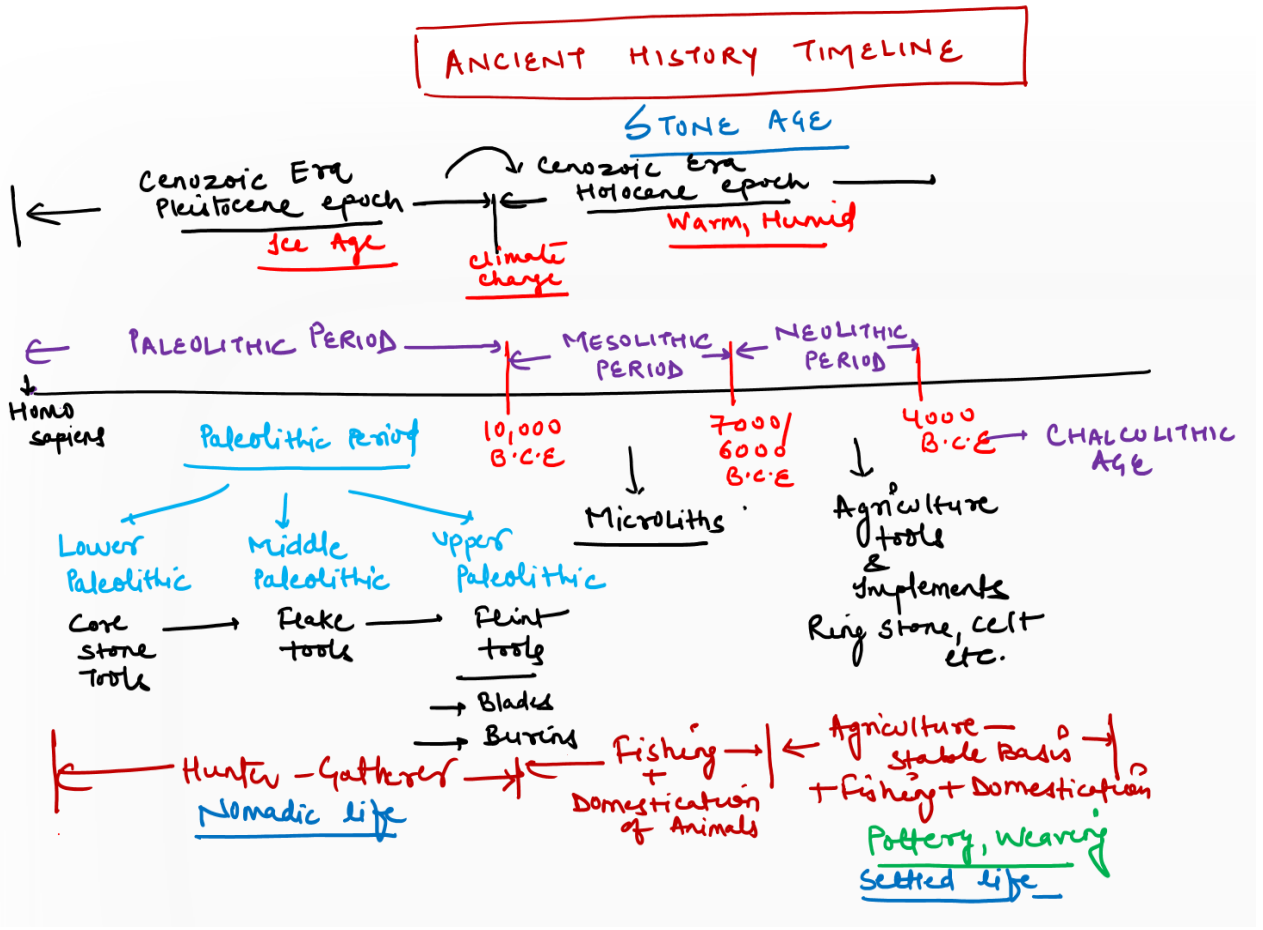
British Policies Leading to Discontent:

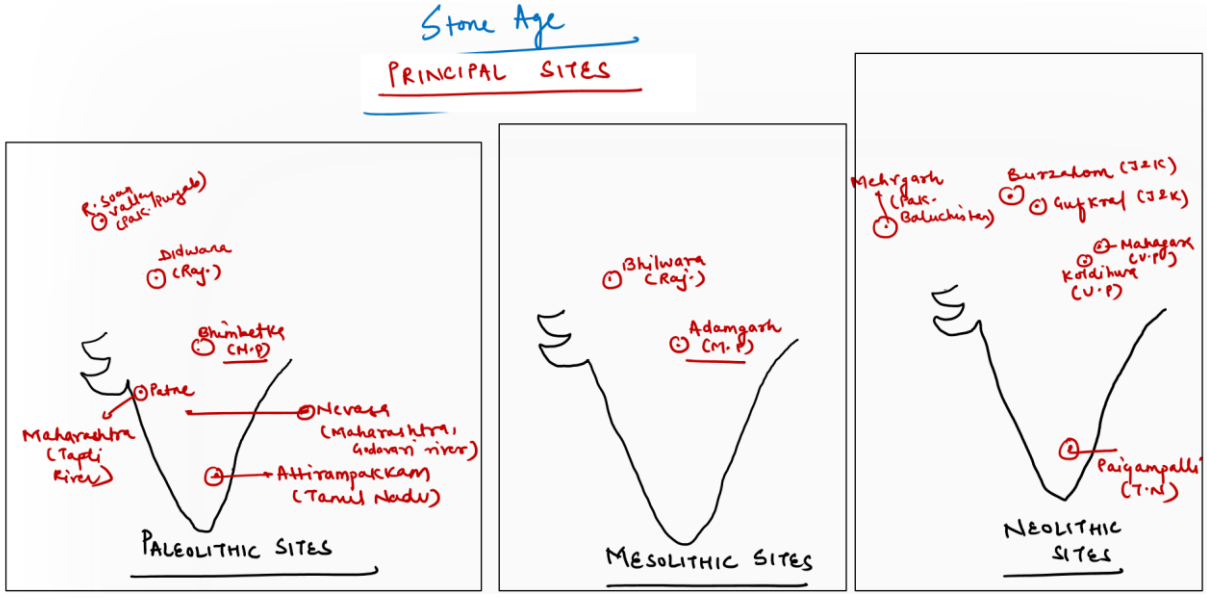
- **Disbandment of Paika Force:** Removal of their traditional military role left them unemployed and resentful.
- **Confiscation of Nishkar Jagirs:** Paikas lost their rent-free land grants, stripping them of economic status and prestige.
- **Land Revenue System:** Introduction of harsh, inflexible revenue demands replacing the traditional system. At least 5,000 to 6,000 families of ryots had deserted between 1805 – 06 to 1815 – 1817.
- **Currency Devaluation:** Introduction of the new silver "Sicca Rupee" replaced the existing copper currency ("Kaudi"), drastically reducing the value of people's savings and increasing hardship.
- **Salt Monopoly:** Imposition of high taxes and monopoly on salt production, a vital commodity, severely impacting livelihoods.
- **Disrespect to Royalty:** Humiliating treatment of the deposed king and his family.
- **Economic Exploitation:** General increase in taxes and exploitation by Company officials and their intermediaries (Dala Beheras & Sauris).
- **Corrupt and insensitive police system** further worsened conditions, intensifying the armed uprising.
- Buxi Jagabandhu Bidyadhar Mohapatra Bhramarbar Ray **(Buxi Jagabandhu),** the king's Military Commander, was dispossessed and reduced to **beggary**. He survived on public support for two years before leading a **rebellion**.
- **Date of Uprising**: Began on **29 March 1817**.
- Both **zamindars** and **ryots** joined enthusiastically.
- Buxi Jagabandhu led **5,000–10,000 Paiks** and **Kondh/ Kandha tribesmen**; seized **Puri**, reinstated **Mukunda Dev II** as king.
- **Martial Law** was declared by the British; King Mukunda Dev II was arrested and imprisoned with his son.
- Buxi and associate **Krushna Chandra Bhramarabar Rai** tried to isolate Cuttack from Khurda.
- **Major-General Martindell** deployed; large number of Paiks killed or fled.
- **By May 1817**: Uprising largely contained in Khurda.
- Buxi Jagabandhu led a **guerilla struggle** until his surrender in **May 1825**.
- **British Policy Shift**:

- Adopted **leniency and reforms**.
- **Salt prices reduced**.
- **Corrupt officials dismissed**.
- **Dispossessed landowners restored**.

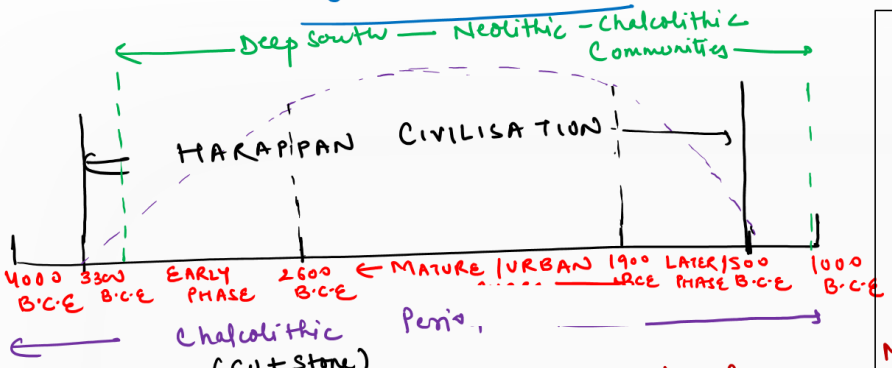
- **Ram Chandra Dev III** (son of the King) allowed to move to Puri with a **₹24,000 grant** and manage **Jagannath Temple**

Ancient History Timeline

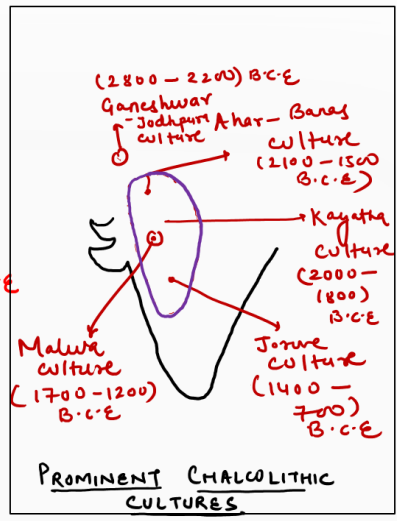




CHALCOLITHIC AGE



- Begining of Metallic Age — Technological advancement
- Planned Rural settlements
- Advancements in material life — Subsistence Agriculture
- No Art of writing
- No city/Urban life



PROMINENT CHALCOLITHIC CULTURES

HARAPPAN CIVILISATION (3300 – 1500) B.C.E

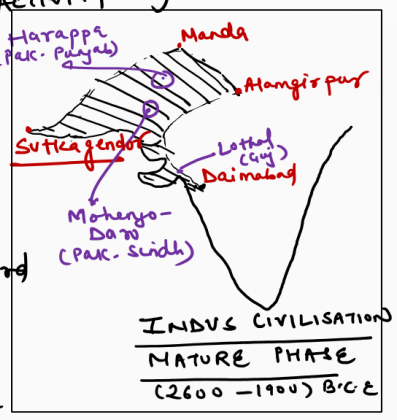
ECOLOGICAL DEGRADATION
CHANGE IN COURSE of INDUS
TECTONIC PLATE ACTIVITY



Early/Proto-Urban Phase
- Agricultural Productivity ↑
- Specialization in Crafts ↑
- Trade Volume Expanded
  - ↓ Proto-Urban Sites
- Art of Bronze Making

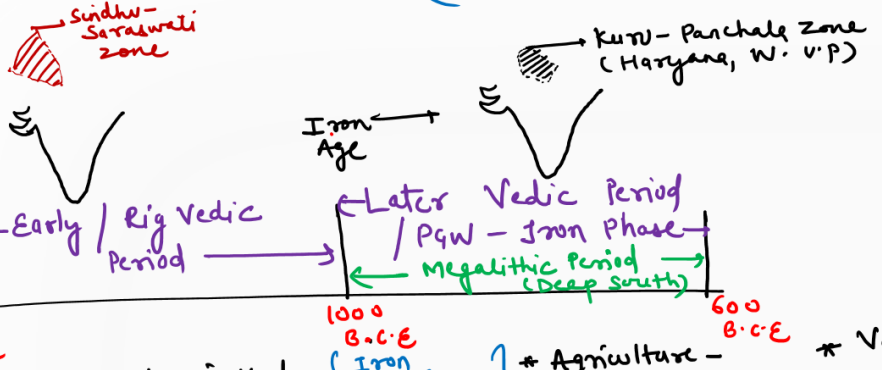
Mature/Urban Phase
- Towns and city life – I Urbanization
- Town planning
  - ↳ Burnt Bricks – 4:2:1
  - ↳ Drainage system
  - ↳ Grand structures: Great Bath, Granaries
- Internal and overseas trade.
- Script — Pictographic, logo & syllabic
- Elite Urban Culture

Late/Post-Urban phase
- Towns and city life disappeared
- Rural, haphazard settlements
- Subsistence Agriculture
- All signs of mature urban culture gradually vanished.



INDUS CIVILISATION
MATURE PHASE
(2600 – 1900) B.C.E

Vedic Period
(1500 – 600) B.C.E



Economy:
* Pastoral, Limited Agriculture (Yava)
* Diverse crafts, Little specialisation
* Limited, Barter trade
* Grama – temporary settlements
* No compulsory tax

Iron tools & implements
Iron weapons

* Agriculture – Mainstay of Economy
* Settled life
* Specialisation in crafts
* Trade volume expanded
* Compulsory tax – Bali
* Territorial State – Janapada

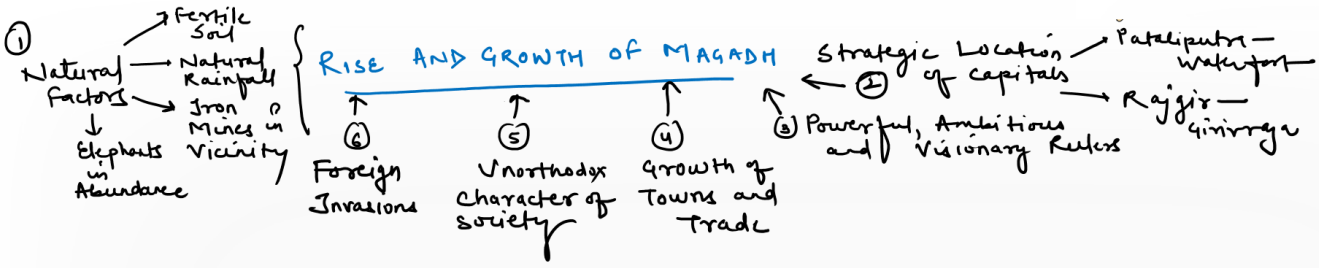
* Varna System – Rigid + Hierarchial
* Decline in status of women
* complex rituals, cattle sacrifice, monopoly of Brahmanical class in religion.
* Upanishad – philosophical text – core of Vedas

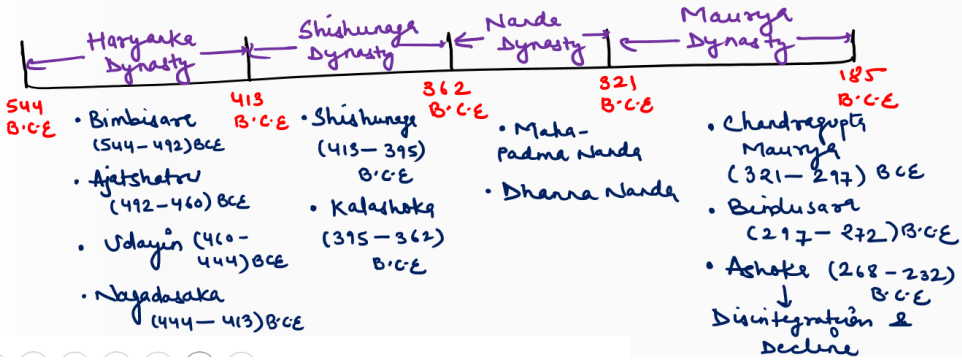
Post-Vedic Period
600 – 400 B.C.E

Mahajanapada Period — 16 Mahajanapadas
II Urbanisation
Age of Buddha
NBPW Phase – Northern Black Polished Ware

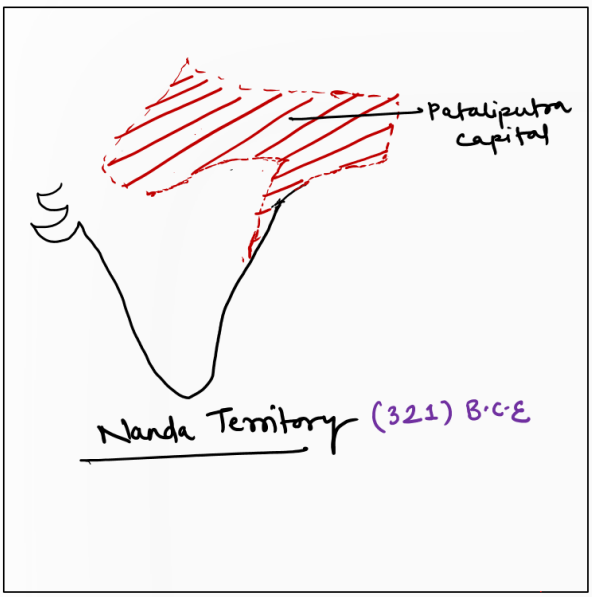
Fertile Soil + Good Amount of Rainfall + Natural + Iron plough
↓
Agricultural surplus
↓
Population growth
Specialisation in crafts
Trade Volume Expansion
↓
Surplus Food Producing Economy
→ Rise of Towns / cities — Historical Urbanism
→ Art of Writing
→ Beginning of money Economy.
↓
increased Revenue Base
↓
State → Administrative needs → Bureaucracy
State → military needs → Permanent standing army
↓
Rise of Mahajanapadas

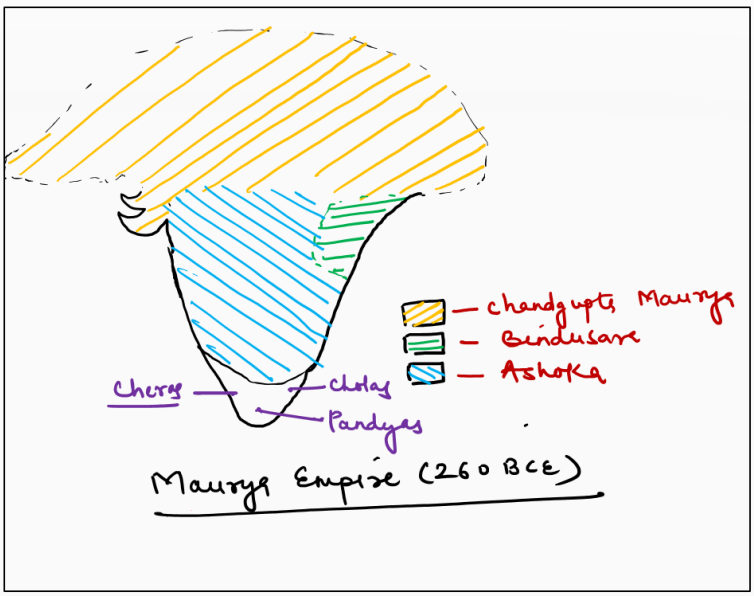
Resistance against Ritual centric, cattle sacrifice oriented vedic Religion, Monopoly of Brahmanical class — Heterodox sects.



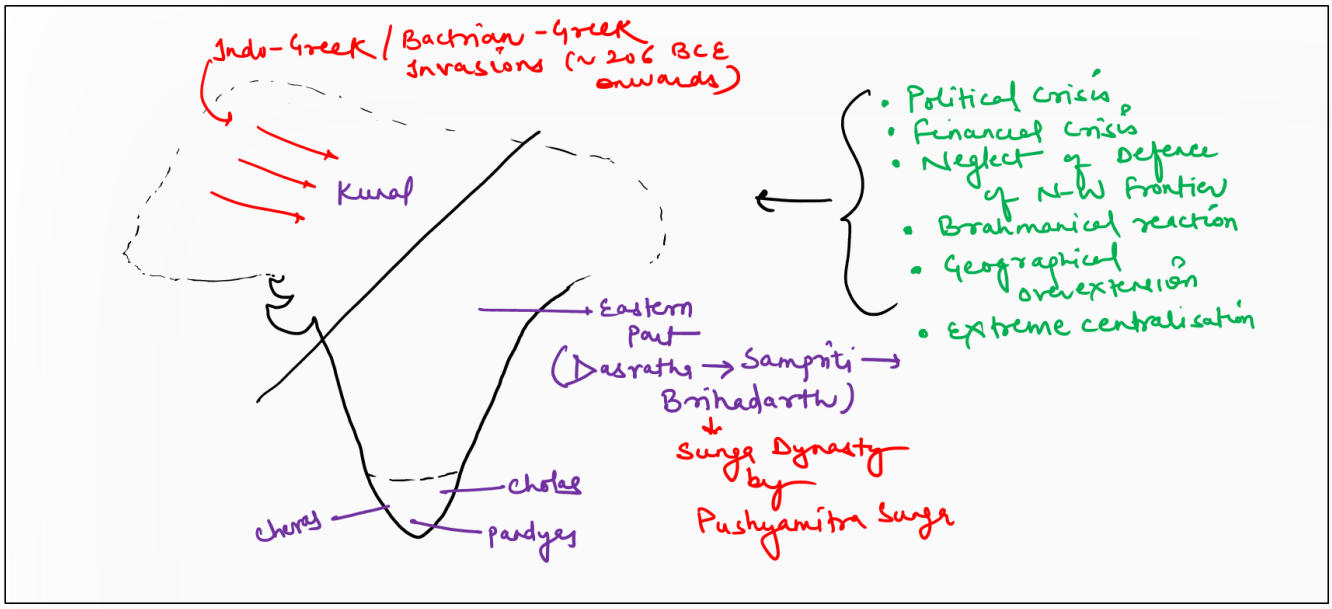


Rise and Growth of Magadh





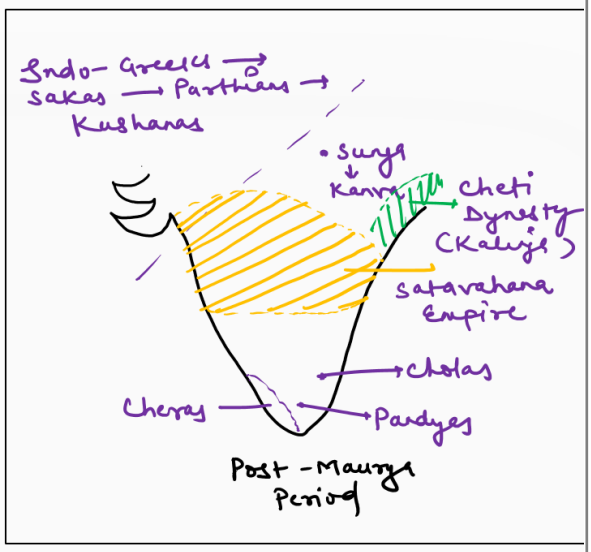
DISINTEGRATION AND DECLINE OF MAURYA EMPIRE :



Post-Maurya Period
(185 B.C.E — 320 C.E)

Foreign Powers :
- Indo-Greeks (190 BCE – 10 CE), Sakala
- Sakas (150 BCE — 400 CE)
- Parthians (20 BCE – 240 CE)
- Kushanas (30 CE — 375 CE)
  - Capitals: Purushpura, Mathura

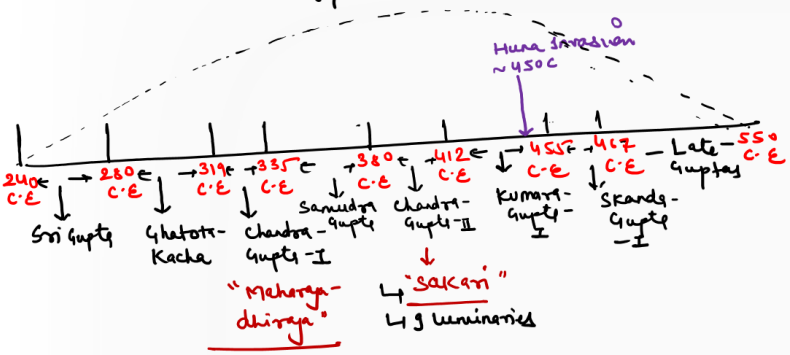
Native Powers :
- Surgas (185 BCE — 73 BCE)
- Kanvas (73 BCE — 28 BCE)
- Cheti Dynasty (Kharavela)
- Satavahanas (100 BCE — 250 CE)

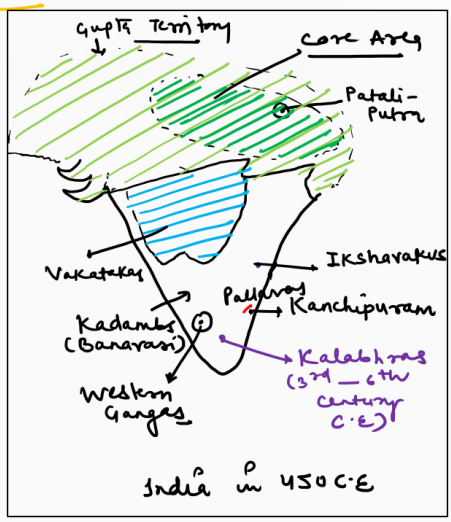


Deep South :
Sangam Age (300 BCE – 300 CE)
- Chera, Chola and Pandya Chiefdoms

Gupta Age
(320 CE – 550 CE)

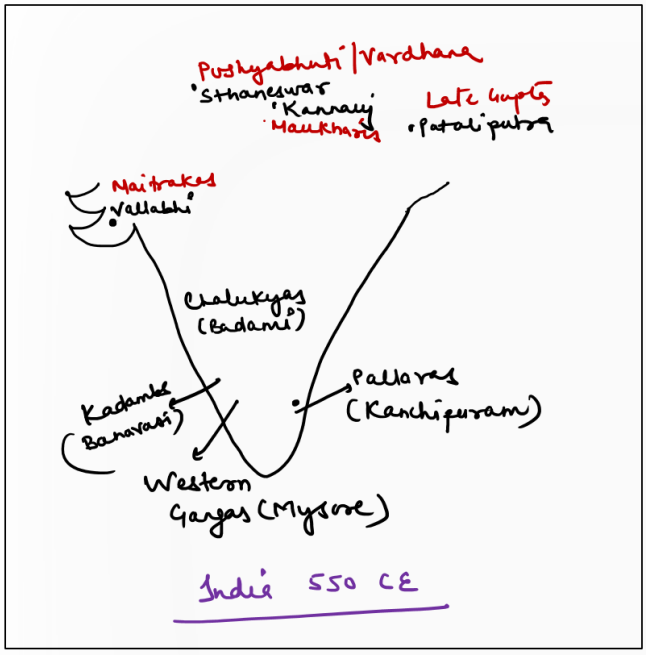
Art, Literature, Science & technology ← GOLDEN AGE of ANCIENT INDIA

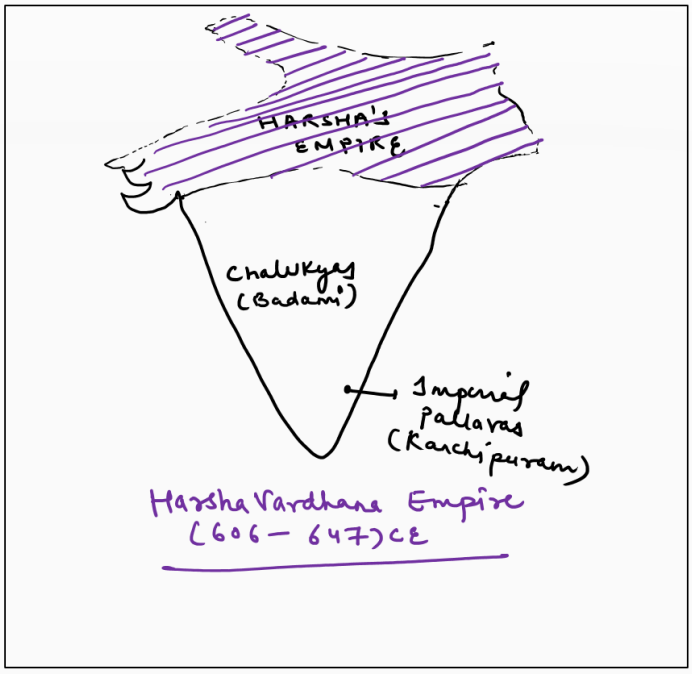




Main Reason Behind Decline of Gupta Power — Decline of Trade and commerce

Post-Gupta Period
(550 – 750) C.E





International Relations

Intermediate-Range Nuclear Forces Treaty

Background

- Amid escalating tensions with the United States, Russia declared that it would no longer abide by the self-imposed restrictions under the Intermediate-Range Nuclear Forces Treaty, and renew the deployment of short and intermediate range nuclear missiles.
- Russian Foreign Ministry, over a statement, said that Moscow "no longer considers itself bound" by its "previously adopted self restrictions" under the treaty, while highlighting that US has already moved to deploy intermediate-range missiles in Europe and Asia.

China–Russia Naval Drills Underway

- China and Russia have been holding a series of **joint naval exercises** in the **Sea of Japan**, running from **August 1 to August 5, 2025**, under the name **"Joint Sea-2025"** or **"Maritime Interaction-2025"**. These drills have included:
    - Anti-submarine warfare
    - Artillery fire
    - Air-defense and missile operations
    - Submarine rescue training

Drills By USA- Cause of Russia's Exit?

- U.S. President **Donald Trump** stated on **August 3, 2025**, that he had ordered two nuclear submarines to be positioned in the region to counter Russia. However:
- He did **not claim they were conducting exercises** in the Sea of Japan.
- Independent reports confirm **no U.S. submarine drills** were part of the scheduled Joint Sea-2025 exercise.

Background

- This move comes after Trump, over the past week, continued to push India and China to halt their oil purchases from Russia, which he alleged, were helping fund the Kremlin's war against Ukraine, as he plans to pressure Russian President Vladimir Putin to agree to a ceasefire.

What is IRNFT?

- The Intermediate-Range Nuclear Forces Treaty was signed between the United States and the then USSR during the Cold War era (1987).
- The treaty led to the elimination of an entire class of weapons, ground-launched missiles with a range of 500 to 5,500 kilometres, before US withdrew from it, citing violations by Russia.
- Moreover, in 2019, Moscow had said it would not deploy missiles as long as Washington did not do so.
- In 1987, former US President Ronald Reagan and the Soviet leader of that time, Mikhail Gorbachev, agreed upon a treaty - the INF Treaty.
- It was a deal to ban ground-launched missiles with a range of 500 to 5,500 kilometres (311 to 3,418 miles).
- As per the Arms Control Association, the INF treaty was the first time that both Russia and the United States agreed to bring down their nuclear arsenals.
- As a result of the deal, both nations destroyed around 2,692 short-, medium-, and intermediate-range missiles by the treaty's implementation deadline of June 1, 1991.

Why Did Russia Leave The Treaty?

- Russia cited US action, specifically the deployment of Typhoon missile launchers with Tomahawk cruise missiles in the Philippines and Dark Eagle hypersonic systems used in Australia during the Talisman Sabre drills.
- Notably, Russia has already withdrawn from the New START (2010) treaty in February 2023, and the Comprehensive Nuclear-Test-Ban Treaty (CTBT) in November 2023.
- The cancellation of the treaty marks a pivotal moment and the restart of a Cold War-style arms race.

Utility of IRNFT

- **Eliminated an Entire Class of Weapons**
  - **Scope**: Banned all **land-based** ballistic and cruise missiles with ranges between **500–5,500 km**.
  - **Impact**: Led to the **destruction of nearly 2,700 missiles** by 1991 — the **first arms control treaty to eliminate existing weapons**, not just limit their numbers.
- **Reduced European Nuclear Risk**
  - **Context**: Europe was the main battleground for these missiles (e.g., US Pershing II and Soviet SS-20).
  - **Benefit**: Removed **highly destabilizing, quick-strike nuclear weapons** that could hit targets within minutes, thus **reducing the risk of nuclear war in Europe**.
- **Strengthened Global Arms Control Norms**
  - Set a precedent for **verifiable disarmament** with **on-site inspections** — a breakthrough in Cold War-era trust-building.
  - Paved the way for future treaties like **START** and **New START**, enhancing the legitimacy of arms control diplomacy.
- **Eased Cold War Tensions**
  - Signified a **turning point in US–USSR relations**, helping to end the Cold War.
  - Boosted trust between superpowers and encouraged greater cooperation.
- **Prevented Arms Race in Intermediate Missiles**
  - Halted development and deployment of a **highly destabilizing class** of weapons.
  - Prevented costly competition in the **intermediate-range domain**.
- **Symbolic Value**
  - Seen as a **victory for diplomacy and peace**, boosting **public confidence** in nuclear arms control.
  - Helped strengthen anti-nuclear sentiment globally.

IRNFT Classification

Category	Range (Approx.)
Short-Range Missiles	< 500 km
Intermediate-Range Missiles	**500 – 5,500 km**
Shorter-range (SRINF)	500 – 1,000 km
Intermediate-range proper (IRBM)	1,000–5,500 km
Intercontinental Missiles (ICBMs)	> 5,500 km

Demographics in Decline in Japan

Context

- The year 2024 saw Japan's total population decline by more than 908,000 people to around 120.65 million (or 12 crore), according to recent official data.
- A DW report stated that while this was the largest population drop since 1968, it was also the 16th straight year in which the Japanese population shrank.
- One important trend in this context is the falling birth rate in Japan, or the number of births per 1,000 people in the population over a given period.
- Some 686,061 newborns were recorded in 2024, the lowest number since records began in 1899.

Is Japan an Outlier?

- Japanese Prime Minister Shigeru Ishiba termed the figures a "quiet emergency", but the country is not alone in witnessing declining birth rates and populations, especially not in its neighbourhood.
- China has also seen shrinking populations every year since 2022 and announced a subsidy to improve fertility rates.
- South Korea also has among the lowest birth rates globally, even as the figures have declined in other countries, from India to France.

Demography Transition Theory

- One popular explanation is the demographic transition theory, which says that as countries move from agrarian societies (that require a high number of workers) to industrialised economies, birth rates fall.
- Medical, educational and technological advancements improve the chances of survival of infants, and women's decision-making powers about the number of children they plan to have.

Reasons for This Shift

- First was social liberalism, in which individuals in modern societies re-examined social norms and increasingly focused on individual aspirations.
- Second was the withdrawal of the welfare state in major Western economies in the 1980s and 1990s, which led to "loss of trust in others… decline of community…and fear of failure or of being left behind"

Situation in Japan

- Japan often makes headlines in this area because of its particularly low TFRs and birth rates.
- For example, India's TFR is 1.98, South Africa's is 2.22, Brazil and the United States are both at 1.62, and France is at 1.66 (World Bank data as of 2023).
- Japan's TFR is at 1.2, South Korea's at 0.72, China's at 1 and Singapore's at 0.97.
- The world average was 2.2, just above 2.1 — the TFR needed to maintain the population levels.
- There are clear benefits to lower TFR, like women living healthier lives, gaining more education and financial freedom, and exercising autonomy about their bodies, as well as parents potentially providing a higher quality of life for each child.

Situation in Other Countries

- Demographers have noted some common patterns in many East Asian nations.
- Urbanization and modernization have meant high living costs, making it expensive to raise kids.
- Rigid traditional gender roles still prevail in these matters.

Double Burden

- Women who do decide to marry often find themselves carrying a 'double burden' of

working and managing the majority of household tasks (or 'unpaid work'), making the prospects of a large family both stressful and unmanageable.

Child Rearing

- making child-rearing a social project, so to speak, with governments and other institutions changing how they view the subject and becoming more accommodating.
- "While young people are aware that almost inevitably, they will reduce their material outcomes if they have children, most are willing to accept the loss so long as it is not overly destructive of their aspirations.
- In particular, they would like to have confidence that they will have adequate

TRIPP Corridor

Context

- Following numerous rounds of negotiations, the leaders of Azerbaijan and Armenia signed a historic peace accord mediated by the United States (US) at the White House.
- The agreement was signed in the presence of President Donald Trump on 13 March 2025, marking the culmination of decades of conflict and war.

TRIPP Corridor

- Trump Route for International Peace and Prosperity (TRIPP)—linking Nakhichevan, the Azerbaijani enclave bordering Türkiye, to Azerbaijan, via the Zangezur Corridor.
- The Zangezur Corridor is a direct overland multimodal route connecting mainland Azerbaijan to Nakhichevan through southern Armenia.



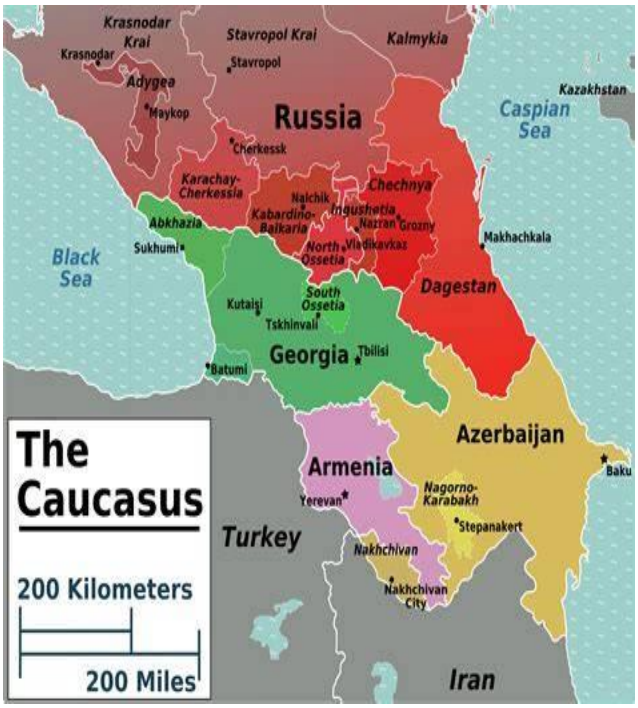
- Under the agreement, Armenia leases the land to the US for 99 years, allowing private consortia - including American, Turkish, and European companies - to build and operate railways, highways, energy pipelines, and telecommunications infrastructure.
- The project resembles the long-discussed Zangezur Corridor but crucially differs in its administration; instead of being overseen by Russia or subject to Iranian transit control, it is an American-backed, US-secured route embedded within Armenia's legal framework.
- Amid rising geopolitical tensions, the 43 km corridor in Armenia is expected to become a vital cross-Eurasia geostrategic and geoeconomic asset for the US, especially vis-à-vis Tehran, Moscow, and even Beijing.
- If developed, the corridor could fill the power vacuum in the historically Russian-dominated region and reshape regional geopolitics.

Impact on South Caucasus

- The TRIPP agreement, involving the

United States, Azerbaijan, and Armenia, marks a pivotal shift in South Caucasus geopolitics, fostering enhanced regional trade while redefining transit dynamics.

Caucasus Region



Impact on South Caucasus

- The TRIPP corridor's estimated costs of US$3-5 billion over the next 5 to 10 years could generate annual logistics savings of approximately US$20-30 billion.
- The corridor has the potential to unlock US$50-100 billion in annual trade by 2027 and reduce transit time between Asia and Europe.
- More importantly, it will meet the growing infrastructure needs of TITR, which connects Europe with Central Asia and beyond via Georgia.
- It will also enhance Europe's energy security and double the energy imports from Central Asia and Azerbaijan.

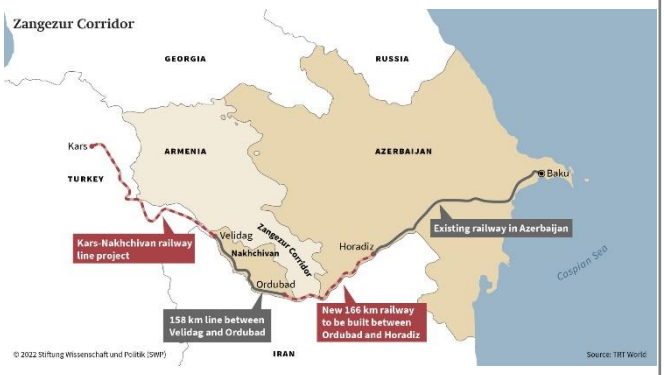
TITR



- The Middle Corridor, also called TITR (Trans-Caspian International Transport Route), is a trade route from SoutheastAsia and China to Europe via Kazakhstan, Caspian Sea (using train ferries to cross the Caspian), Azerbaijan, Georgia and Turkey.

Circumventing Iran

- For Iran, the TRIPP corridor represents the loss of a vital role in Azerbaijani transit.
- By cutting Tehran out of the most direct link between Baku and its western exclave, the project undermines a revenue stream and removes a bargaining chip Iran has long used in regional diplomacy.



Russia's INSTC in Danger?

- On the other hand, Russia, which has invested heavily in INSTC, will face enhanced strategic challenges in the South Caucasus.

- The peace agreement will increase the influence of the US and NATO in its southern periphery.
- However, Russia has yet to officially respond to this development, given Moscow's continued preoccupation with Ukraine.
- Given its strained relations with Tehran and Moscow, the TRIPP corridor could render Azerbaijan's western route of the International North-South Transport Corridor (INSTC) less relevant.

INSTC Corridor



Remember!

- The TRIPP corridor is thus much more than a transport conduit.
- It is a political bandwagon for Trump's legacy.

Transshipment Clause

Context

- The ongoing trade conflict between the United States and India has escalated.
- Washington's decision to levy a 25 per cent reciprocal tariff on Indian exports effective August 7, followed by an additional 25 per cent tariff linked to India's purchases of Russian oil, effective August 27.
- The tariffs directly threaten almost $50 billion of India's goods exports (out of a total $85 billion) to the US.

Sectors Impacted

- Textiles
- Apparel
- Footwear
- Accessories
- Shrimps
- Gems and Jewellery

Competitive Advantage

- India's competitor countries in Southeast and South Asia face reciprocal tariffs in the 19-20 per cent range.
- While a 25 per cent tariff makes Indian goods uncompetitive in the US market.
- 50 per cent tariff would devastate market share, jeopardizing thousands of jobs and export earnings.

Transshipment Clause

- This measure imposes a much higher 40 per cent tariff on "transshipped" goods, with US Customs given the task of "determining" which goods have been "transhipped to evade applicable duties."

Transshipment

- "Transshipment" usually refers to a simple transfer of cargo, but in trade terms, it has come to denote a practice of obscuring the country of origin of a particular good.

- This is done to evade higher duties, typically when the country of manufacture is subject to a higher duty in the destination market than the country of export.
- Imagine **Country A** (China) makes goods.
- Instead of sending them directly to the **U.S.**, they ship them first to **Country B** (say Vietnam or Malaysia).
- Then Country B just **changes the label** or does very small processing and re-exports it to the **U.S.**.
- This way, the goods **avoid higher U.S. tariffs** meant for China.
- During Trump's trade war with China (2018–19), the U.S. put **big tariffs (extra taxes)** on Chinese imports.
- Example: A **Chinese steel product** costing $100 was taxed **25%** → so U.S. importer had to pay **$125**.
- But if that steel was first sent to Vietnam and then relabeled as "Made in Vietnam," the U.S. tariff for Vietnam (say **10%**) applied instead.
- So the same $100 steel cost **$110** to U.S. importer.
- This loophole is what the U.S. called **transshipment fraud**.
- If a product is **originally from a tariff-hit country (like China)** but is sent through another country **just to dodge tariffs**, the **full tariff will still apply**.
- In our example:
    - Even if the label says **Made in Vietnam**, if proven that the steel came from China, then the U.S. charges **25% tariff**, not 10%.
- Indeed, the significant jump in Southeast Asian exports to the US in the last decade, since the advent of the US-China trade war, started by Trump in his first term.
- This led to allegations that much of this expanded trade is actually Chinese goods that are being illegally routed through these countries to evade the higher US tariffs on China.
- For India, the transshipment clause could prove to be a hidden saviour.
- India's exposure to China in several key supply chains, such as textiles, apparel, footwear, and accessories, is significantly lower than many Southeast and South Asian competitors, which are all deeply dependent on Chinese materials and components.
- Consequently, if the transshipment threshold for Chinese content is set at 30 per cent, or maybe even 50 per cent, many of these countries' exports to the US could be subjected to the 40 per cent tariff.

Apparel Sector

- Bangladesh sources much of the fabric for its garment industry from China
- It remains to be seen how much of its apparel exports will be subject to the 40 per cent rate as opposed to the lower 20 per cent rate for Bangladeshi goods.
- Similarly, in footwear, China dominates global material production, and Vietnam's export success depends heavily on Chinese components.

How can India Gain from this Clause?

- The loss of US market share due to a 25 per cent reciprocal tariff may be less if a significant share of exports from Southeast and South Asian competitors are subject to the higher 40 per cent tariff rate.
- This will likely reduce the number of orders lost and preserve some amount of export earnings that would otherwise have been lost.
- The reciprocal tariff does pose challenges, but the overlooked transshipment clause alters the competitive landscape, blunting

some of the damage and might even create opportunities in some areas — so long as India's effective tariff burden remains capped at 40 per cent.

Q. With reference to the Transshipment Clause in international trade, consider the following statements:

1. It is a provision that prevents importers from evading tariffs by routing goods through a third country for relabeling or minimal processing.
2. Under this clause, the tariff applicable is determined solely by the **country of final shipment** rather than the country of origin.
3. The United States invoked such a clause during its tariff actions against China to ensure that goods shipped via countries like Vietnam or Malaysia did not bypass higher tariff barriers.
4. The World Trade Organization (WTO) mandates all member countries to enforce the Transshipment Clause uniformly.

Which of the statements given above is/are correct?

A. 1 and 3 only

B. 2 and 4 only

C. 1, 2 and 3 only

D. 1, 3 and 4 only

Answer: A

- **Statement 1 – Correct:** That's the core idea: stopping tariff evasion by "hiding" goods through third countries.
- **Statement 2 – Incorrect:** The tariff is decided by the **country of origin**, not just the last port of shipment. That's what the clause enforces.
- **Statement 3 – Correct:** Trump's trade war policies targeted this exact practice, especially with Chinese steel and aluminum.
- **Statement 4 – Incorrect:** WTO doesn't mandate it uniformly; this is a **unilateral U.S. trade enforcement measure**.

Science & Technology

Gravitational waves

Black hole merger

- **Context-Recently,** scientists reported massive black hole merger, named GW231123.
- **LIGO, Virgo, and KAGRA** had detected gravitational waves from the merger
- In this event, two black holes, about **137x and 103x the mass of the sun**, crashed together, forming an even bigger black hole. This was unusual because **black holes in this mass range are thought to be rare**.
- The discovery suggests large **black holes might form when smaller ones merge, not just from dying stars.**

LIGO, or Laser Interferometer Gravitational-Wave Observatory

- It is an **international network of laboratories** meant to detect **gravitational waves** – the ripples in space-time produced by the movement of large celestial bodies like stars and planets.
- **First discovered in 2015 by two LIGOs based in the United States**
- Two years later, in 2017, this experimental verification of the century-old theory received the Nobel Prize in Physics
- Besides the United States (in **Hanford and Livingston**), such gravitational wave observatories are currently operational in **Italy (Virgo) and Japan (Kagra).**
- **LIGO-India will be the fifth, and possibly the final, node of the planned network.**
- To be located in **Hingoli district of Maharashtra**, about 450 km east of Mumbai, LIGO-India is scheduled to begin its scientific runs from 2030

Gravitational Waves

- Gravitational waves are **'ripples' in space-time caused by some of the most violent and energetic processes in the Universe**.
- **Albert Einstein** predicted the existence of gravitational waves in 1916 in his general theory of relativity.
- Einstein's mathematics showed that **massive accelerating objects (such as neutron stars or black holes orbiting each other) would disrupt space-time in such a way that 'waves' of undulating space-time** would propagate in all directions away from the source. These cosmic ripples would travel at the speed of light, carrying with them information about their origins, as well as clues to the nature of gravity itself.
- The **strongest gravitational waves are produced by cataclysmic events** such as colliding black holes, supernovae (massive stars exploding at the end of their lifetimes), and colliding neutron stars.
- Other waves are predicted to be caused by the rotation of neutron stars that are not perfect spheres, and possibly even the remnants of gravitational radiation created by the Big Bang.

Sources and Types of Gravitational Waves

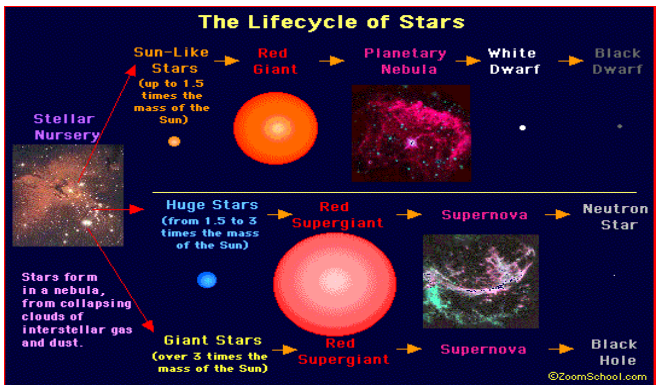
- **Every massive object that accelerates produces gravitational waves**. This includes **humans, cars, airplanes etc**., but the **masses and accelerations of objects on Earth are far too small** to make gravitational waves big enough to detect with our instruments. To find big enough gravitational waves, we have to look far outside of our own solar system.
- It turns out that the Universe is filled with incredibly massive objects that undergo rapid accelerations that by their nature,

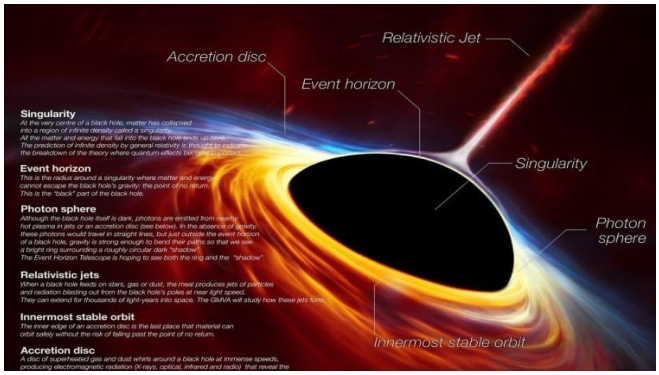
generate gravitational waves that we can actually detect.

- Examples of such things are orbiting pairs of **black holes and neutron stars, or massive stars blowing up at the ends of their lives**.

Black hole classification

- **Black hole**
    - A **black hole** is a region in space where gravity is so intense that **nothing—not even light—can escape from it.**
    - Black holes are typically classified into **four main types** based on their mass and formation:
- **Primordial Black Holes**
    - Could be as small as an asteroid or as massive as a planet
    - Hypothesized to have formed soon after the Big Bang due to extreme densities
- **Stellar-Mass Black Holes**
    - About 5 to 100 times the mass of the Sun
    - Formed when massive stars (typically >20 solar masses) collapse under their own gravity after exhausting nuclear fuel.
- **Intermediate-Mass Black Holes**
    - Between 100 to 100,000 solar masses
    - Hard to detect; evidence is growing but still limited
- **Supermassive Black Holes**
    - Millions to billions of times the mass of the Sun
    - Found at the centers of most galaxies, including the Milky Way
    - Exact origin is uncertain; possibly formed from merging smaller black holes or direct collapse of gas clouds





Satellite internet Vs Fibre optics

Signal Transmission-Within India



Satellite internet

- Satellite internet is a type of broadband connection that uses **communication satellites** orbiting the Earth to provide internet access.

Company	Inmarsat	Intelsat	One Web	Starlink	Iridium	SES	Globalstar	Orbcomm	Viasat	Hughes
Data speed	500 Kbps	2–5 Mbps	50–100 Mbps	50–200 Mbps	500–700 Kbps	2 Mbps	500 Kbps	N.A.	40 Mbps	15–50 Mbps
Orbit	GEO	GEO	LEO	LEO	LEO	GEO & MEO	LEO	LEO	GEO	GEO
No. of satellites	15	127	648	6426	66	70	25	51	20	3

GEO Vs LEO satellite internet

- Starlink offers speeds of up to 200 Mbps—comparable to OneWeb's 100 Mbps and far faster than most Geostationary Earth Orbit-based services such as Intelsat (2–5 Mbps) or Inmarsat (500 Kbps).
- However, LEO systems require far more satellites to maintain coverage, whereas GEO operators use fewer satellites but with higher latency and slower speeds.

Advantages

- Can reach **remote or rural areas** where fiber/cellular isn't available.
- Quick deployment (no need for laying cables).
- High-speed broadband with LEO constellations.

Disadvantages

- **Expensive** user terminals and subscription.
- Weather sensitive (rain fade at higher frequencies).
- GEO satellites → high latency.
- Spectrum coordination is complex to avoid interference with terrestrial 5G and aviation systems.

INDIAN FTTH/FWA VS. STARLINK SATELLITE PLANS (US)

Provider	Monthly Charges ($)	High-End Charges ($)	Download Speed	Hardware Cost ($)
Jio FTTH	5	47	30–1000 Mbps	–
Bharti FTTH	6	47	40–1000 Mbps	–
Jio FWA	7	47	30–1000 Mbps	–
Bharti FWA	7	47	40–1000 Mbps	–
Starlink (US)	120	500	40–220+ Mbps	349
Viasat, Hughesnet	50	115	40–100 Mbps	–

- Setting up Satcom services can cost companies about $400 (₹35,086) per user. **In the US, Starlink charges** around $120 per month for speeds between 40–220+ Mbps compared to **Jio and Airtel's fibre-to-the-home (FTTH) and fixed wireless access (FWA) plans** which start from $5–7 for 30–40 Mbps and go up to $47 for 1 Gbps.

Significance

- The entry of several domestic and foreign players like Starlink (SpaceX), Eutelsat OneWeb (Bharti Airtel), Jio Space Technology (Jio-SES JV) and Amazon's Project Kuiper along with established players like Nelco and Hughes Communications India shows the significant potential of the Indian Satcom market.
- This competition will ultimately benefit users though the full impact will unfold over time.

Feature	**Satellite Internet**	**Fibre Optics**
Medium	Wireless (signals travel via satellites in space)	Wired (light pulses through glass fibre cables)
Speed	Lower	Higher
Latency	Higher	Lower
Coverage	Global – works in **remote, rural, ocean, deserts**	Limited to **areas where cables are deployed**
Reliability	Affected by **weather, obstacles** (rain fade, trees, storms)	Very reliable, not affected by weather
Scalability	Needs launching more satellites; limited by orbital slots	Scalable with more fibre deployment
Energy Efficiency	Less efficient (satellite launch + operation power needed)	Highly efficient (light transmission, very low power loss)
Best Use Cases	Rural areas, mountains, islands, disaster recovery, ships, airplanes, defense, military	Cities, towns, offices, high-demand homes, data centers

Bharatiya Antariksh Station

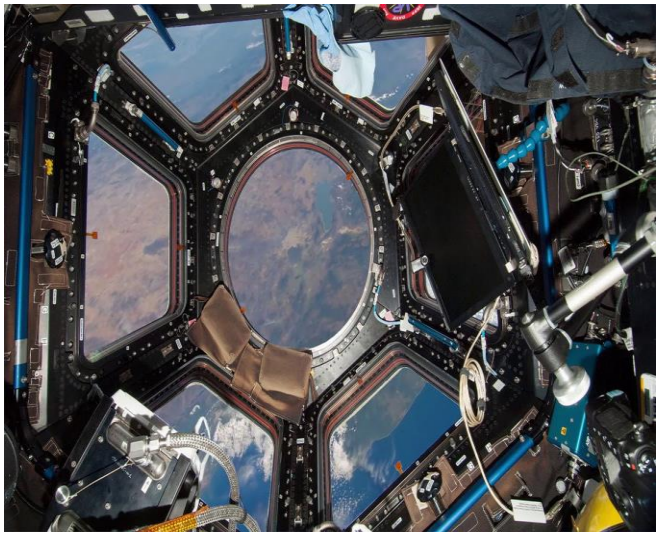
- The unveiling of the **Bharatiya Antariksh Station (BAS-01) model at Bharat Mandapam** marks India's most ambitious leap in space exploration.
- Planned as a **five-module orbital laboratory by 2035**, BAS represents a transition from sporadic human missions to **permanent human presence in space**.



- **BAS-01 module**: First launch planned by **2028**, a **10-tonne module** orbiting **450 km above Earth**.
- Features: **Environmental Control & Life Support System (ECLSS)**, **Bharat Docking System**, advanced **radiation shielding**.
- Expansion: 5 modules to be completed by **2035**, placing India in the exclusive group with the **ISS consortium** and **China's Tiangong**.
- Functions: Microgravity research, technology demonstrations for interplanetary missions, and even **space tourism**.

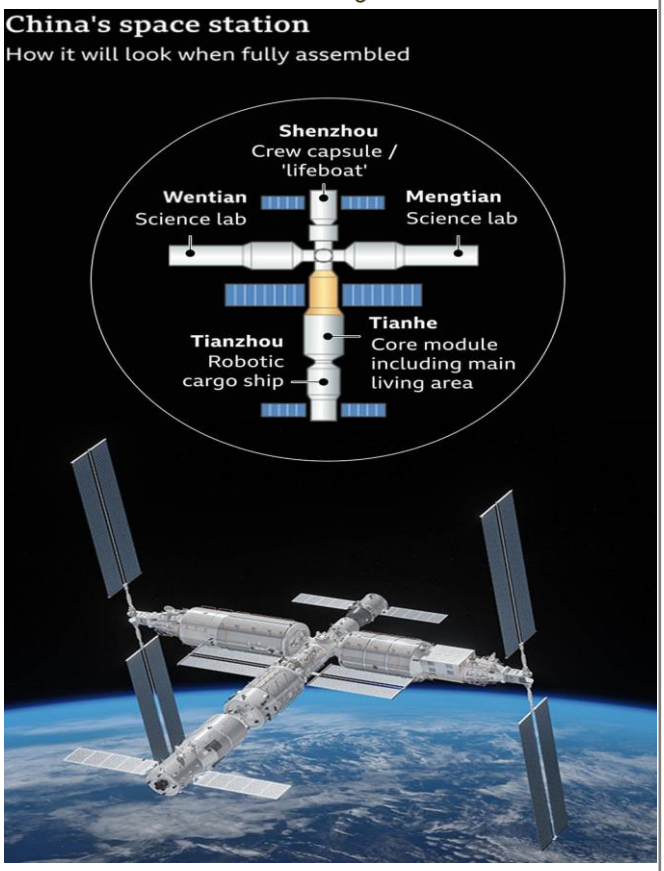
International Space Station (ISS)

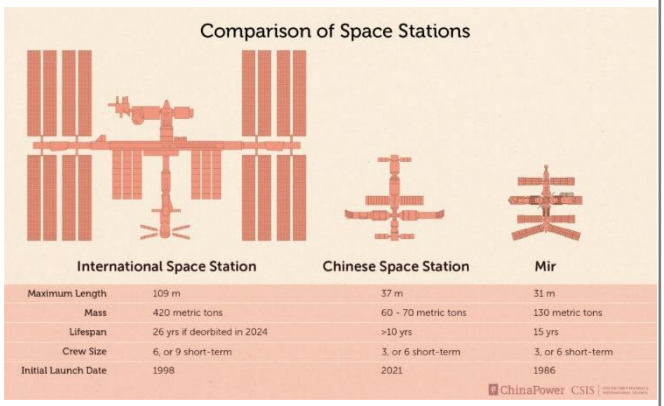
- **Main modules**
  - USA-Unity, Quest
  - Russia-Zaria,Zvedza
  - European-Columbus laboratory
  - Japanese-Kibo research
  - Canada-Canadian Canadarm
  - **Cupola** -one of the most iconic modules on the International Space Station – basically the ISS's "window to the world



Tiangong space station

- **Launched by:** China (by **China Manned Space Agency – CMSA**)
- **Meaning of Tiangong:** "Heavenly Palace"
- **Purpose:** Permanent modular space station in **Low Earth Orbit (LEO)** (~340–450 km altitude).
- **Construction Period:** 2021–2022 (fully operational by end of 2022).
- **Design Life:** ~10–15 years.
- Only operational space station besides the **International Space Station (ISS)** after Russia's Mir deorbited.
- China excluded from ISS (due to U.S. restrictions under Wolf Amendment).





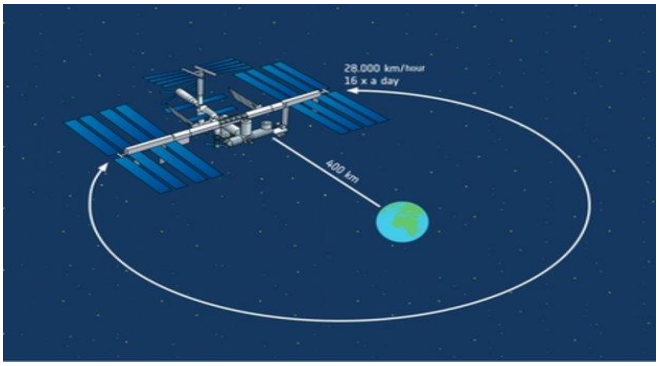
Microgravity

- Micro- very small
- condition where gravity seems to be very small
- Astronauts can float in their spacecraft - or outside, on a spacewalk.
- Heavy objects move around easily.
- Sometimes called "zero gravity," but this is misleading.

Is there Gravity in Space?

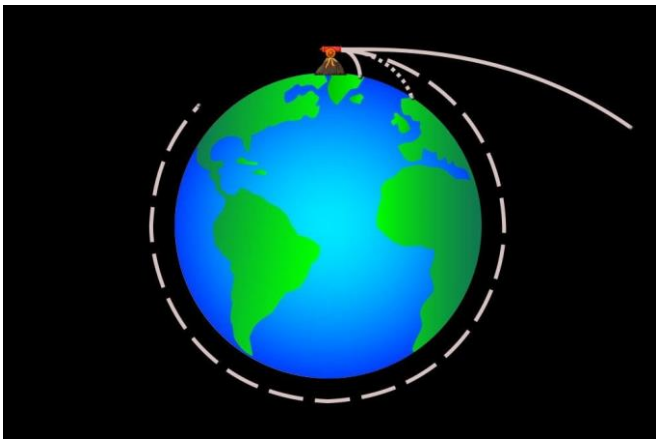
- Gravity causes every object to pull every other object toward it.

- In fact, a small amount of gravity can be found everywhere in space.
- Gravity is what holds the moon in orbit around Earth. Gravity causes Earth to orbit the sun.



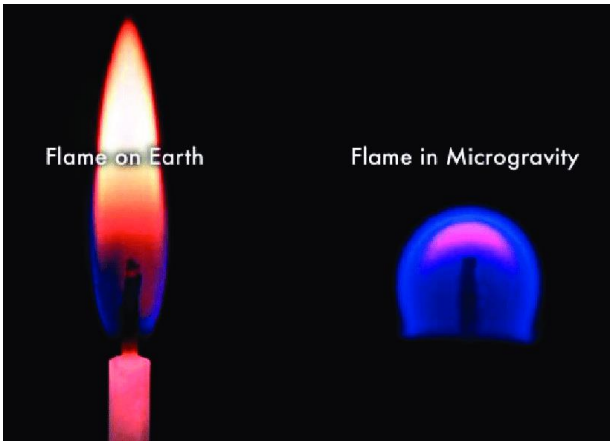
Why Do Objects Float in Orbit?

- If 90 percent of Earth's gravity reaches the space station, then why do astronauts float there?
- The answer is because they are in free fall



Microgravity-Significance

- To learn what happens to people and equipment in space
- Learn about the effects of microgravity to keep astronauts safe and healthy on other planets
- Impacts
    - Fire burns differently
    - Crystals grow better



How BAS will Benefit India's Space Programme

- **Scientific Advancement**:
    - The microgravity environment of BAS will allow Indian scientists to conduct experiments impossible on Earth.
- **Technology Leap**:
    - BAS will serve as a testbed for **Environmental Control and Life Support Systems (ECLSS)**, **orbital docking systems**, and **radiation protection technologies**.
- **Economic Growth**:
    - By enabling **commercial microgravity research, satellite servicing, and even space tourism**, BAS will open new markets for India's private sector.
    - ISRO's collaboration with start-ups under **Space Policy 2023** ensures that the station becomes an anchor for India's share in the **global space economy projected at $1 trillion by 2040**.
- **Global Diplomacy**:
    - Much like the ISS brought together rival nations, BAS can become a platform for **international collaboration** in science and technology
- **National Vision**:

- The BAS aligns with India's roadmap to **Viksit Bharat 2047**, where mastery of cutting-edge technologies is central to development.
- Controlling such space infrastructure will give India long-term advantages in **communications, navigation, Earth observation, and disaster management**, making space capabilities a direct contributor to national growth and security.