VAJIRAM & RAVI
Institute for IAS Examination
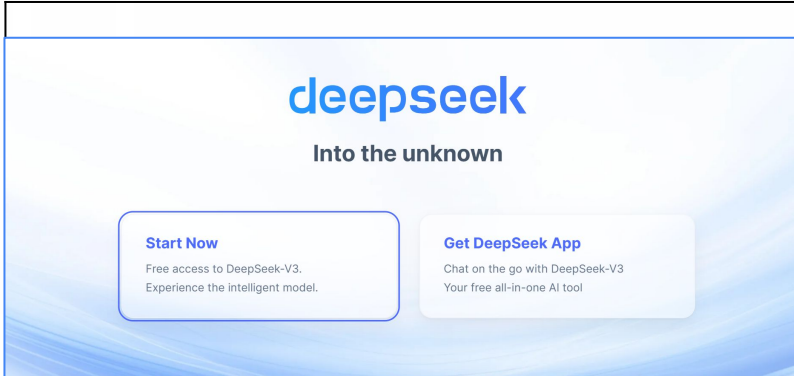
The Analyst

CURRENT AFFAIRS Handout

29th January 2025
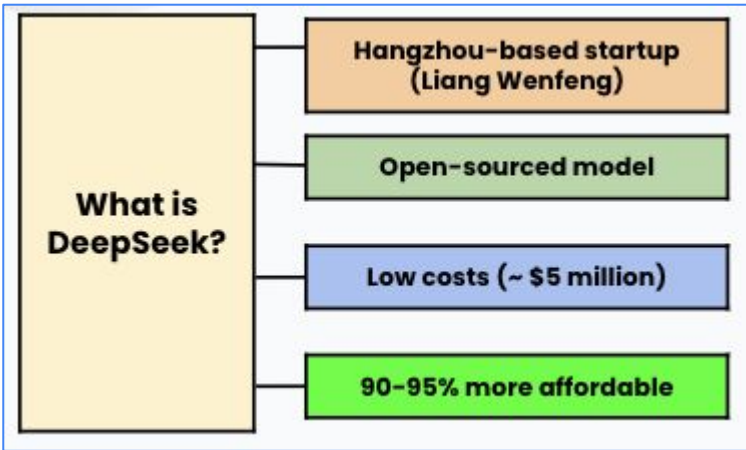
DeepSeek & AI Race

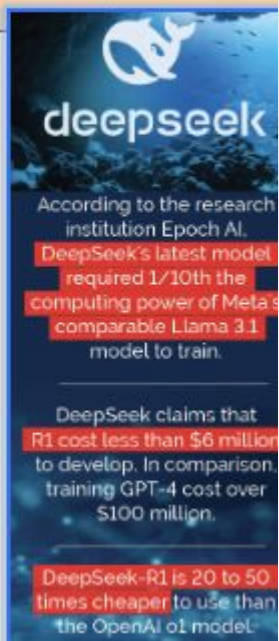**CONTEXT**: Chinese AI startup DeepSeek shakes up Silicon Valley, global stock markets and the world

deepseek

Into the unknown

Start Now
Free access to DeepSeek-V3.
Experience the intelligent model.

Get DeepSeek App
Chat on the go with DeepSeek-V3
Your free all-in-one AI tool

What is DeepSeek?

- Hangzhou-based startup (Liang Wenfeng)
- Open-sourced model
- Low costs (~ $5 million)
- 90-95% more affordable

ChatGPT vs DeepSeek: The AI Battle ⚔️🤖

Parameter	ChatGPT 💻	DeepSeek 🇨🇳
Development Time	Several Years ⏳	Less than 2 Months ⚡
Employees	4,500+ 👥	Less than 200 🧑‍💼
Chips Used	Advanced (H100) 🚀	Outdated (H800) 🛠️
Development Cost	Billions 💸	$10 Million 💰
Model Training Cost	$100M+ 🔥	$5.8 Million 🏭
Output Performance	Coding Benchmarks ✅	AIME, MATH-500, GPQA Benchmarks 🏆
App Store Ranking	#2 📲	#1 🚀
Cost (1M Tokens)	$60 🟧	$2.19 🏷️
Valuation	$157 Billion 🥇	N/A 📊

How is it cheaper than its US peers?

- Using **NVIDIA H800**
- **Low-level code** optimisations to enhance memory usage
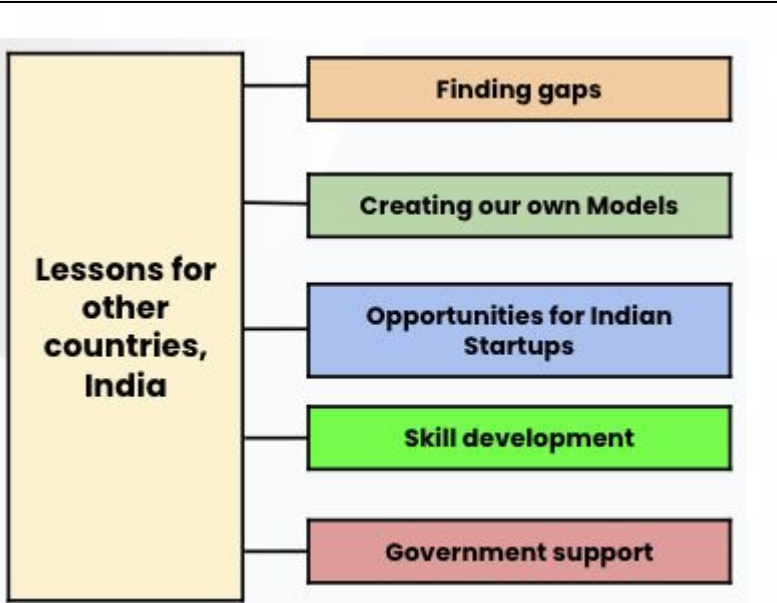- **"Multi-Head Latent Attention"** and **"Auxiliary-Loss-Free Load Balancing"**

deepseek

According to the research institution Epoch AI. DeepSeek's latest model required 1/10th the computing power of Meta's comparable Llama 3.1 model to train.

DeepSeek claims that R1 cost less than $6 million to develop. In comparison, training GPT-4 cost over $100 million.

DeepSeek-R1 is 20 to 50 times cheaper to use than the OpenAI o1 model.

Immediate observations

- Stock **market selloff** in the West
- **Realisations**
  - Ability to train foundational model
  - Lower costs by using far fewer chips
  - America's lead in AI looks smaller
  - Despite US chip export controls
- **C Raja Mohan:** Sputnik moment
- **Hope** for India and other middle powers

DeepSeek & AI Race

CONTEXT: Chinese AI startup DeepSeek shakes up Silicon Valley, global stock markets and the world

Lessons for other countries, India
- Finding gaps
- Creating our own Models
- Opportunities for Indian Startups
- Skill development
- Government support

CABINET APPROVES Rs 10,372 CRORE INVESTMENT FOR AI MISSION

- More than 10,000 GPUs
- A marketplace for AI
- 2-3 India AI centres for multi modal LLMs
- India AI datasets platform for non personal data availability for AI research and startups
- India AI application development initiative for critical sectors
- Financing for AI deeptech startups
- A governance framework for AI tools and innovation

Skill development in AI for youth - UG, PG courses in AI being designed

Concerns of DeepSeek

- The **China** factor
- Recently faced "**large-scale**" cyberattack
- Personal **data**; **Privacy** issues
- **Past Chinese apps**
- **National security**

Way ahead
- US choose the partnership model
- "Sovereign AI"
- Sputnik lessons of cooperation
- Creation of a set of rules
- Imperatives for India

AI for progress: some leading initiatives for growth
1. Skill India AI Portal
2. National AI Skilling Program
3. AI Youth Bootcamp
4. AI in Vocational Training
5. AI Research and Innovation Fund
6. AI Competency Development Centers
7. Collaborations with Global Tech Giants

Mains Practise Question

The emergence of DeepSeek AI has had a significant impact on a global level. Discuss
(15 Marks, 250 words)

UPSC PYQ (P) 2020

With the present state of development, Artificial Intelligence can effectively do which of the following?
1. Bring down electricity consumption in industrial units
2. Create meaningful short stories and songs
3. Disease diagnosis
4. Text-to-Speech Conversion
5. Wireless transmission of electrical energy

Select the correct answer using the code given below:
(a) 1, 2, 3 and 5 only
(b) 1, 3 and 4 only
(c) 2, 4 and 5 only
(d) 1, 2, 3, 4 and 5

Formulation & Implications of Budget

CONTEXT: An article on the Union Budget and its relevance.

Key facts about Union Budget

Article 112 in Constitution of India

112. Annual financial statement

(1) The President shall in respect of every financial year cause to be laid before both the Houses of Parliament a statement of the estimated receipts and expenditure of the Government of India for that year, in this Part referred to as the "annual financial statement".

(2) The estimates of expenditure embodied in the annual financial statement shall show separately--

(a) the sums required to meet expenditure described by this Constitution as expenditure charged upon the Consolidated Fund of India; and

(b) the sums required to meet other expenditure proposed to be made from the Consolidated Fund of India,

and shall distinguish expenditure on revenue account from other expenditure.

Article 112 of Constitution of India

1st Budget: James Wilson (1860)

Key Budget documents
- AFS (A112)
- Demand for Grants (A113)
- Finance Bill (A110)

Fiscal Policy Statements
- Macro-Economic Framework Statement
- Medium-Term Fiscal Policy
- Fiscal Policy Strategy Statement

INTERESTING FACTS ABOUT THE UNION BUDGET OF INDIA

April 7, 1860: Budget was introduced for the first time in India by the East India Company to the British Crown

10 times: Morarji Desai presented the budget. Desai holds the record for presenting most budgets by any finance minister in the history of India. With eight budgets, P Chidambaram is in second place.

April 7, 1860: The then-Finance Minister of India James Wilson, under the British rule, presented the first budget of India

November 26, 1947: The first Union Budget of Independent India was presented by RK Sanmukham Chetty. The first budget of the Republic of India was presented by John Mathai.

1st budget of independent India: Only for seven-and-a-half months. Since then the term 'Interim Budget' that meant budget for short period came into being.

February 28, 1970: Indira Gandhi was the first woman Finance Minister to present the budget

1987-89: Rajiv Gandhi presented the budget after VP Singh quit his government. Rajiv Gandhi, Indira Gandhi and Jawaharlal Nehru are the only three Prime Ministers belonging to the same family to have presented the budget.

18,650 words: The longest budget speech was delivered by former PM Dr Manmohan Singh during his tenure as Finance Minister in 1991.
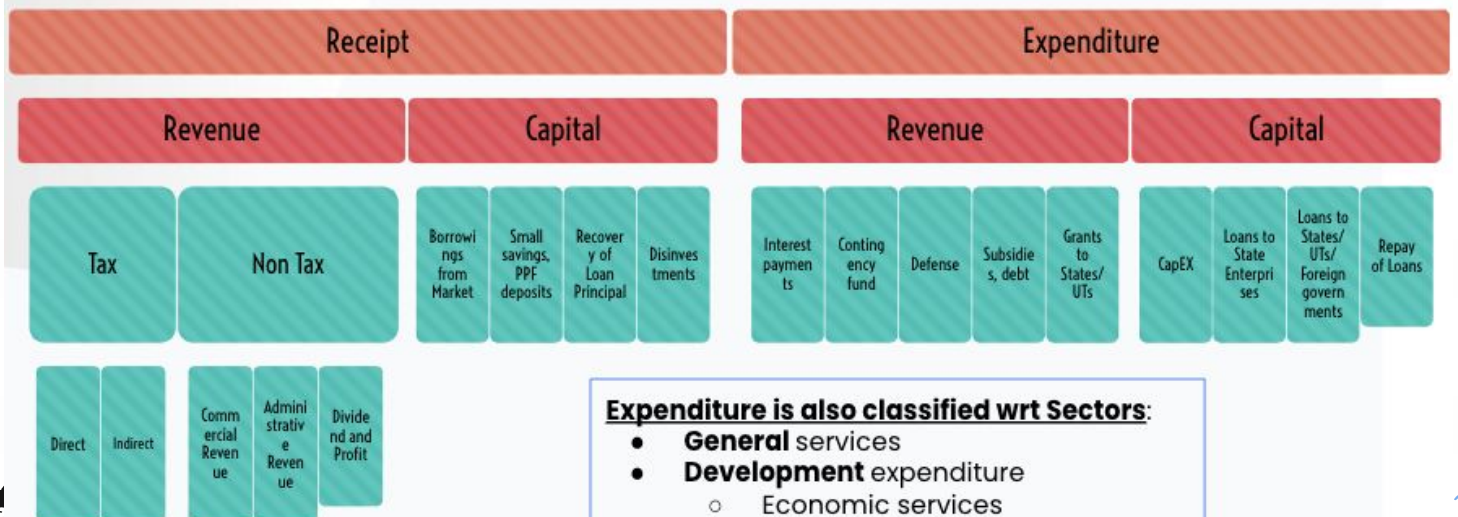
800 words: In 1977 HM Patel gave the shortest budget speech while delivering the Interim Budget.

2001: NDA Finance Minister Yashwant Sinha changed the time of budget presentation from 5 pm to 11 am. Since then, this tradition has continued

2017: Rail Budget, which was presented separately for 92 years, got merged with the Union Budget

---

Budget Components

Receipt		Expenditure	
Revenue	**Capital**	**Revenue**	**Capital**

Tax	Non Tax	Borrowings from Market	Small savings, PPF deposits	Recovery of Loan Principal	Disinvestments	Interest payments	Contingency fund	Defense	Subsidies, debt	Grants to States/UTs	CapEX	Loans to State Enterprises	Loans to States/UTs/Foreign governments	Repay of Loans

Direct	Indirect	Commercial Revenue	Administrative Revenue	Dividend and Profit

Expenditure is also classified wrt Sectors:
- **General** services
- **Development** expenditure
  - Economic services
  - Social services
- **Grants-in-aid** and **contribution**

Formulation & Implications of Budget

CONTEXT: An article on the Union Budget and its relevance.

Deficit Indicators

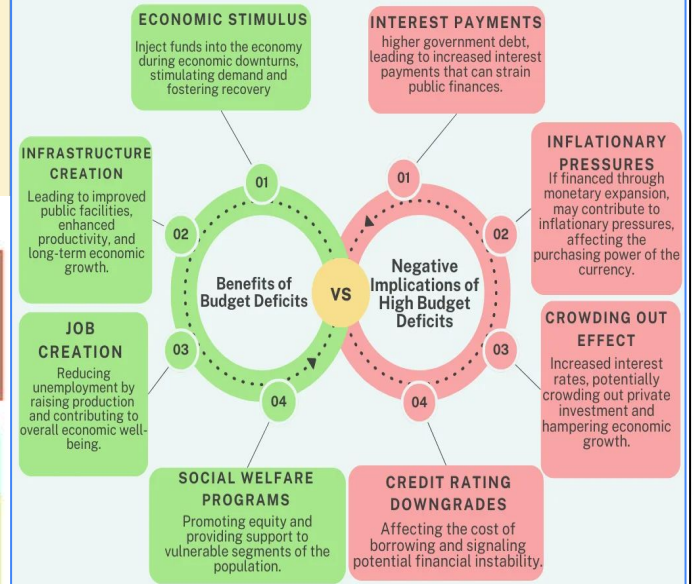**Fiscal Deficit** = Total Expenditure - (Revenue Receipts + Non-Debt Receipts)

- **Primary Deficit** = Fiscal Deficit - Interest Payments.

- **Revenue Deficit** = Fiscal Deficit - Capital Expenditure

Government's estimated Revenue
=
Government's proposed Expenditure.

TYPES OF BUDGET

DEFICIT BUDGET	BALANCED BUDGET	SURPLUS BUDGET
EXPENSE > REVENUE	EXPENSE = REVENUE	EXPENSE < REVENUE

Implications of the Budget on the Economy

Aggregate Demand

- **More Government spending →**
- **Higher taxes →**

Deficit Impact:

- Lower **fiscal deficit/GDP ratio** →
- Higher deficit **may boost ___** but raises **___** costs.

Income Distribution:

- **Welfare schemes**
- **Tax cuts**

ECONOMIC STIMULUS
Inject funds into the economy during economic downturns, stimulating demand and fostering recovery

INTEREST PAYMENTS
higher government debt, leading to increased interest payments that can strain public finances.

INFRASTRUCTURE CREATION
Leading to improved public facilities, enhanced productivity, and long-term economic growth.

INFLATIONARY PRESSURES
If financed through monetary expansion, may contribute to inflationary pressures, affecting the purchasing power of the currency.

Benefits of Budget Deficits **VS** Negative Implications of High Budget Deficits

JOB CREATION
Reducing unemployment by raising production and contributing to overall economic well-being.

CROWDING OUT EFFECT
Increased interest rates, potentially crowding out private investment and hampering economic growth.

SOCIAL WELFARE PROGRAMS
Promoting equity and providing support to vulnerable segments of the population.

CREDIT RATING DOWNGRADES
Affecting the cost of borrowing and signaling potential financial instability.

Fiscal Rules and Policy Constraints

FRBM Act
- Limit **Fiscal Deficit**
- Limit **General** Govt + **Central Govt Debt**
- No additional guarantees wrt 1.5% of GDP
- **Borrowing restrictions**
  - **Escape clause (2018)**
- **Periodical review** by
  - Finance Minister (½ yearly)
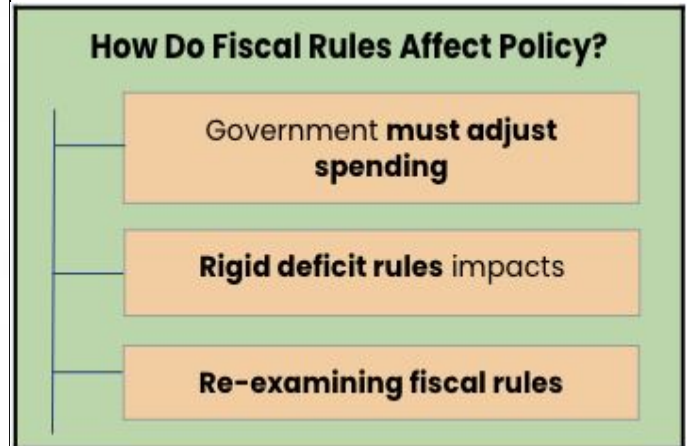 - CAG (2012)
- **Budget-2021**: 4.5% FD target by 2025-26

Formulation & Implications of Budget

CONTEXT: An article on the Union Budget and its relevance.

	Fiscal Indicators	Target detail	Principal Act/ Rules	1st Amendment (in 2004)	2nd Amendment (in 2012)	3rd Amendment (in 2015)	4th Amendment (in 2018)
1.	Revenue Deficit[2]	Target	Zero	Zero	2	2	Target has been removed
		Annual reduction	0.50	0.50	0.60	0.40	
		Beginning with	2004-05	2004-05	2013-14	2015-16	
		Sunset Target date	31 March 2008	31 March 2009	31 March 2015	31 March 2018	
2.	Fiscal Deficit[3]	Target	3	3	3	3	3
		Annual reduction	0.30	0.30	0.50	0.40	0.10
		Beginning with	2004-05	2004-05	2013-14	2015-16	2018-19
		Sunset Target date	31 March 2008	31 March 2009	31 March 2017	31 March 2018	31 March 2021
3.	Effective Revenue Deficit[4]	Target	Introduced in 2012		Zero	Zero	Target has been removed
		Annual reduction			0.80	0.50	
		Beginning with			2013-14	2015-16	
		Sunset Target date			31 March 2015	31 March 2018	
4.	Guarantee	Aggregate guarantees in any Financial Year not to exceed 0.50 *per cent* of GDP, beginning with 2004-05					No additional guarantee for any loan on security of CFI, in excess of 0.50 *per cent* of GDP, in any financial year
5.	Liability/ Debt	Not to assume additional liabilities (including external debt at current exchange rate) in excess of nine *per cent* of GDP for 2004-05 and progressively reduce the limit of nine *per cent* of GDP by at least one *percentage* point of GDP in each subsequent Financial Year					General Government debt and Central Government debt not to exceed 60 *per cent* and 40 *per cent* of GDP respectively by the end of the 2024-25.

How Do Fiscal Rules Affect Policy?
- Government **must adjust spending**
- **Rigid deficit rules** impacts
- **Re-examining fiscal rules**

Mains Practise Question

The Union Budget is a crucial tool for economic policy, influencing growth, inflation, and income distribution. Discuss the major components of the Budget and their implications on the economy. Also, critically analyze the role of fiscal rules in shaping India's fiscal policy.
(15 Marks, 250 words)

N.K. Singh Committee recommendations

- **Fiscal Deficit target** of **3%** (<2020) => **2.8%** (2020-21) => **2.5%** (2023)
  - Minimum annual reduction @ **0.3%** of GDP
- **Debt to GDP ratio:** 60% (Centre + States)
- **Revenue Deficit Target**: reduced to **0.8%** of GDP (2023)
  - Minimum annual reduction @ **0.5%** of GDP

UPSC PYQ (P) 2020

Along with the Budget, the Finance Minister also places other documents before the Parliament which include 'The Macro Economic Framework Statement'. The aforesaid document is presented because this is mandated by
(a) Long standing parliamentary convention
(b) Article 112 and Article 110(1) of the Constitution of India
(c) Article 113 of the Constitution of India
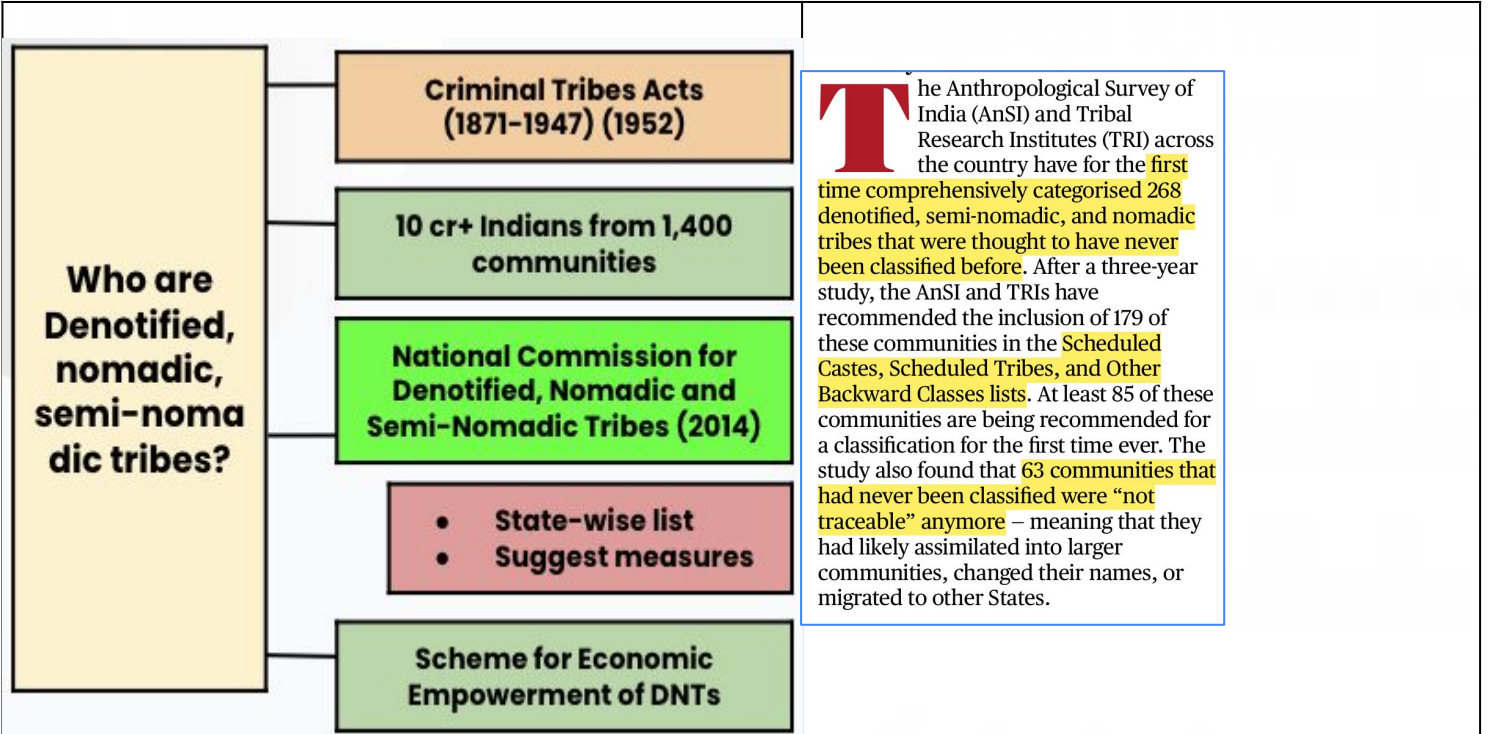(d) Provisions of the Fiscal Responsibility and Budget Management Act, 2003

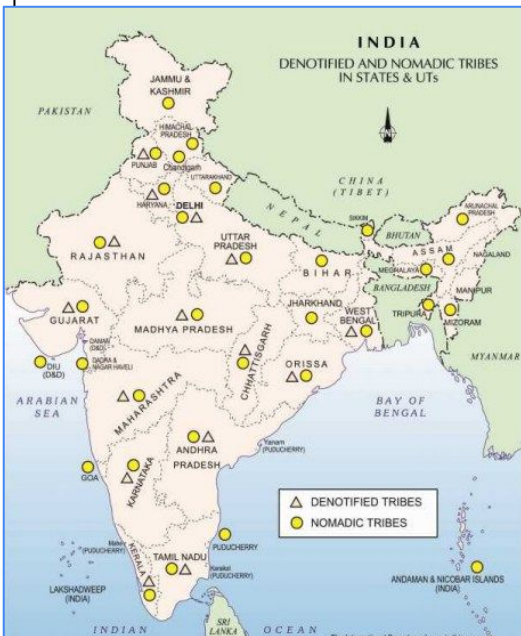# Classifying denotified tribes

VAJIRAM & RAVI

Who are Denotified, nomadic, semi-nomadic tribes?

- **Criminal Tribes Acts (1871-1947) (1952)**
- **10 cr+ Indians from 1,400 communities**
- **National Commission for Denotified, Nomadic and Semi-Nomadic Tribes (2014)**
  - State-wise list
  - Suggest measures
- **Scheme for Economic Empowerment of DNTs**

The Anthropological Survey of India (AnSI) and Tribal Research Institutes (TRI) across the country have for the first time comprehensively categorised 268 denotified, semi-nomadic, and nomadic tribes that were thought to have never been classified before. After a three-year study, the AnSI and TRIs have recommended the inclusion of 179 of these communities in the Scheduled Castes, Scheduled Tribes, and Other Backward Classes lists. At least 85 of these communities are being recommended for a classification for the first time ever. The study also found that 63 communities that had never been classified were "not traceable" anymore – meaning that they had likely assimilated into larger communities, changed their names, or migrated to other States.

Why was the study needed?
Ever since the Criminal Tribes Act of 1924 was repealed in August 1949, after which communities notified as "criminal" had been denotified, successive commissions have tried to classify these communities, starting with the First Backward Classes Commission headed by Kaka Kalelkar.
   Since then, the Lokur Committee (1965), the Mandal Commission (1980), the Renke Commission (2008), and the Idate Commission (2017) have tried to classify such tribes across the country. However, they have fallen short of being able to identify all such communities.
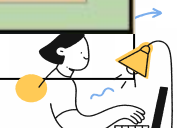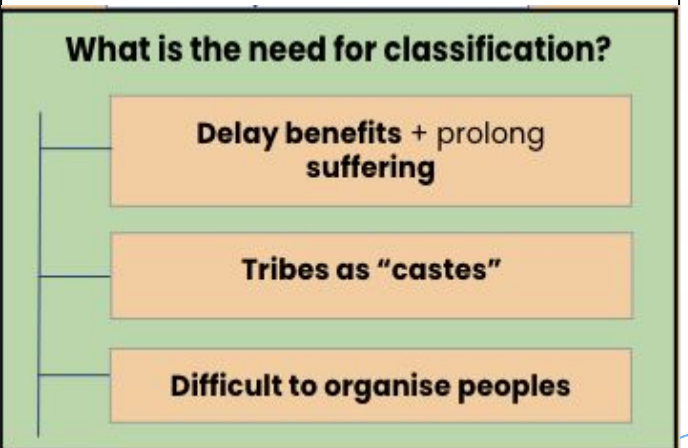
INDIA
DENOTIFIED AND NOMADIC TRIBES IN STATES & UTs

△ DENOTIFIED TRIBES
○ NOMADIC TRIBES

What is the need for classification?

- **Delay benefits + prolong suffering**
- **Tribes as "castes"**
- **Difficult to organise peoples**

Classifying denotified tribes

IMPACT

Within the Development and Welfare Board for De-notified, Nomadic and Semi-Nomadic Communities, there are now two strands of thoughts. One calls for the completion of the classification process so that all denotified, nomadic, and semi-nomadic tribes get benefits meant for them as per the classification of SC, ST, or OBC, including that of reservation. The other calls for creating a separate classification altogether – for denotified tribes in the form of a Schedule in the Constitution. Secondly, depending on what action the government takes on the recommendations on this study, it will make it easier for State governments to initiate the process of inclusion if they so decide to do it.

What next?

While the AnSI and TRIs have completed the ethnographic study, this report remains with the Special Committee headed by the Vice-Chairperson of the NITI Aayog. Officials have said that this committee is now "scrutinising" the recommendations and will soon prepare a final report, on which the Government will take a call.

Annual Status of Education Report

Pratham
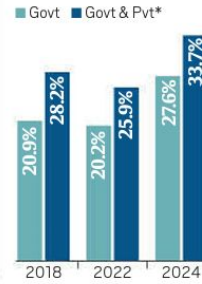Every Child in School & Learning Well

- **Annual**, Nationwide survey of children's ability
- **Citizen-led** survey
- **Basic' ASER survey** tracks enrollment for children aged 3-16 and assesses basic reading and arithmetic of children aged 5-16
- **Alternate-year model**
- **2024**: 605 rural districts => 6,49,491 children
- **Focus**: Reading, arithmetic, and digital literacy
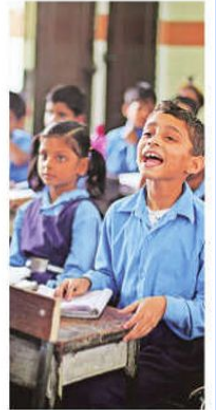
LEARNING CURVE: STEADY IMPROVEMENT

Children in Std III who can read Std II level text
- Govt
- Govt & Pvt*

Year	Govt	Govt & Pvt*
2018	20.9%	27.3%
2022	16.3%	20.5%
2024	23.4%	27.1%
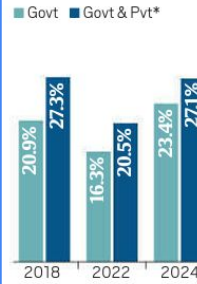
Children in Std III who can do at least subtraction
- Govt
- Govt & Pvt*

Year	Govt	Govt & Pvt*
2018	20.9%	28.2%
2022	20.2%	25.9%
2024	27.6%	33.7%

*This is the weighted average for children in govt and pvt schools only

Digital Literacy (14–16 Years Old)

Digital Skill	Boys (%)	Girls (%)
Ability to Use Smartphones	85.5	79.4

- 29 States and UTs
- 605 Districts
- 17,997 Villages
- 15,728 Schools
- 352,028 Households
- 649,491 Children

State-Wise Progress in Reading Levels (2024 vs. 2022)

State	Increase in Reading Levels (%)
Kerala	+10
Himachal Pradesh	+10
Uttarakhand	+10
Haryana	+10
Uttar Pradesh	+10
Odisha	+10
Maharashtra	+10

- **I**mproved foundational skills
- Regional Progress
- Government schools
- Digital Divide

ASER 2024 Report

Prelims : Social Development
GS2 : Issues relating to development and management of Social Sector/Services relating to Education
Newspaper : The Hindu **Page Number :** 7

What contributed to this positive trend?

NATIONAL EDUCATION POLICY 2020

Universalization of Education from pre-school to secondary level with 100% GER in school education by 2030

GER in higher education to be raised to 50% by 2035; 3.5 crore seats to be added in higher education

NEP 2020 will bring 2 crore out of school children back into the main stream

New 5+3+3+4 school curriculum with 12 years of schooling and 3 years of Anganwadi/Pre-schooling

No rigid separation between academic streams, extracurricular, vocational streams in schools

Vocational Education to start from Class 6 with Internships

Teaching upto at least Grade 5 to be in mother tongue/regional language

Children who go to private schools come from more affluent homes and have more educated parents. Nevertheless, ASER 2024 shows that the recovery has been pronounced in government schools, with learning levels in private schools still below pre-pandemic levels.

What has led to this sudden improvement in learning levels? We have not seen improvements of this magnitude in the last 20 years since ASER has been presenting data on foundational reading and arithmetic. Everything seems to point towards the National Education Policy (NEP) 2020 and its focus on foundational skills. While this is not the first time that programmes have been introduced to improve learning, what is different is that it is the first time that there has been a systemic national push to improve foundational learning outcomes. Almost all states have shown improvements as compared to 2022. In fact, the low-performing states like Uttar Pradesh, Bihar, Madhya Pradesh, and Tamil Nadu have made a remarkable recovery.

On the need to build on some of these gains, he added, "We need to take external assessment seriously. There is still a lot to be done in terms of support to teachers etc. FLN is not the only thing we need to do. We also need to focus on middle grades, board exam reforms etc. There is a whole menu of things that can be done. If we continue with business as usual, these gains will peter out."

UPSC PYQ (P) 2012

Which of the following provisions of the Constitution does India have a bearing on Education?
1. Directive Principles of State Policy
2. Rural and Urban Local Bodies
3. Fifth Schedule
4. Sixth Schedule
5. Seventh Schedule

Select the correct answer using the code given below:
(a) 1 and 2 only
(b) 3, 4 and 5 only
(c) 1, 2 and 5 only
(d) 1, 2, 3, 4 and 5

UPSC PYQ (M)

Q1. How have digital initiatives in India contributed to the functioning of the education system in the country? Elaborate on your answer. (2020)

Q2. Discuss the main objectives of Population Education and point out the measures to achieve them in India in detail. (2021)

Prevention of Atrocities Act

Prelims : Economic & Social Development
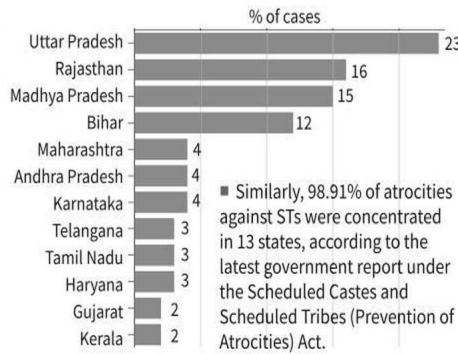**Newspaper :** The Indian Express **Page Number :** 15

Scheduled Caste and Scheduled Tribe (Prevention of Atrocities) Act, 1989

Atrocities on Dalits, tribal people
The chart shows the States accounting for 97.7% of total cases of atrocities against members of Scheduled Castes during the year 2022.

% of cases

State	%
Uttar Pradesh	23
Rajasthan	16
Madhya Pradesh	15
Bihar	12
Maharashtra	4
Andhra Pradesh	4
Karnataka	4
Telangana	3
Tamil Nadu	3
Haryana	3
Gujarat	2
Kerala	2

■ Similarly, 98.91% of atrocities against STs were concentrated in 13 states, according to the latest government report under the Scheduled Castes and Scheduled Tribes (Prevention of Atrocities) Act.

Source: Ministry of Social Justice and Empowerment

Provisions
- 37 "Offences of atrocities" by persons "other than SCs and STs"
- Responsibilities of Centre/ States
- Cognizable; ‹DSP investigation 30 days=› Report to Dir of St Police
- Special Court (State + CJHC); Special Public Prosecutor
- Punishment: ‹6m/1yr/ life/death
- Immediate relief (DM/SDM/ExM)

Decoding the news

Co-founder of Infosys, 17 others booked under SC/ST Act

Bengaluru: The Bengaluru police Monday booked Infosys co-founder Senapathy Kris Gopala-krishnan, former IISc director Balaram P and 16 others under Scheduled Caste and Scheduled Tribe (Prevention of Atrocities) Act following a complaint by a former faculty member of IISc.

The Hindu Bureau
BENGALURU

The rate of conviction in cases of atrocities committed on people belonging to the Scheduled Castes and Scheduled Tribes, which was about 10% in 2020, has fallen to 7% now.

After chairing a meeting of the State-level vigilance and monitoring committee for the welfare of SC/STs here on Tuesday, Karnataka Chief Minister Siddara-

Siddaramaiah chaired a meeting of State-level monitoring panel for welfare of SC/STs on Tuesday.
H.S. MANJUNATH

"The public prosecutors and the Police Department should have a review meeting. The deputy commissioners should also review the cases every three months to increase the rate of conviction. The govern-

He directed authorities to make effort to get the stay given by courts in atrocities cases vacated, besides proceeding with investigation in 665 pending cases in which investigation is yet to be complet-
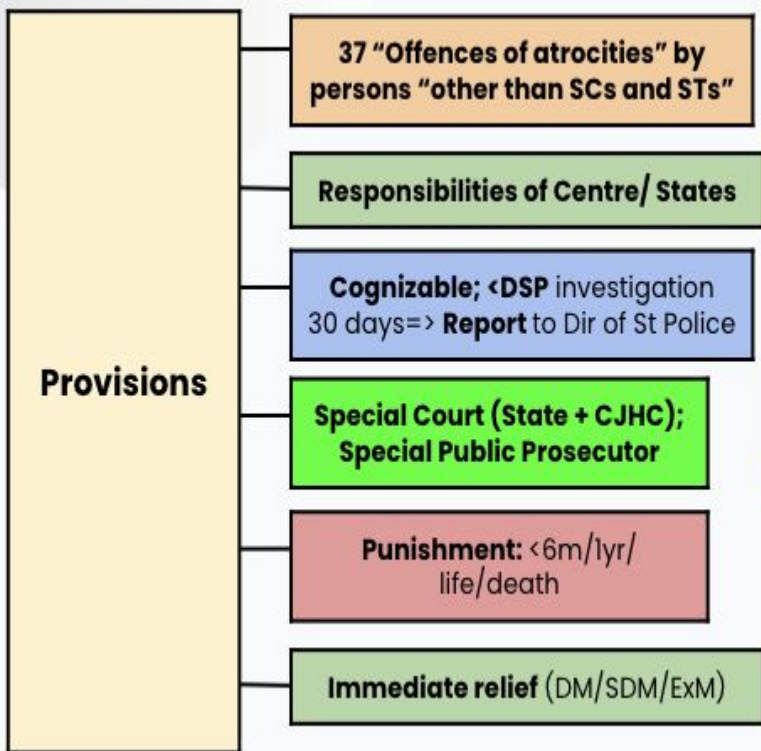
Prevention of Atrocities Act

Prelims : Economic & Social Development
Newspaper : The Indian Express **Page Number :** 15

Decoding the news

made to ensure that bail is denied to perpetrators of atrocities, and chargesheet should be filed on time, he added.

A meeting will be convened to review injustice meted out to employees belonging to SC/ST communities in promotions, said Mr. Siddaramaiah.

UPSC PYQ (M) 2017

What are the two major legal initiatives by the State since Independence addressing discrimination against Scheduled Tribes (STs)?
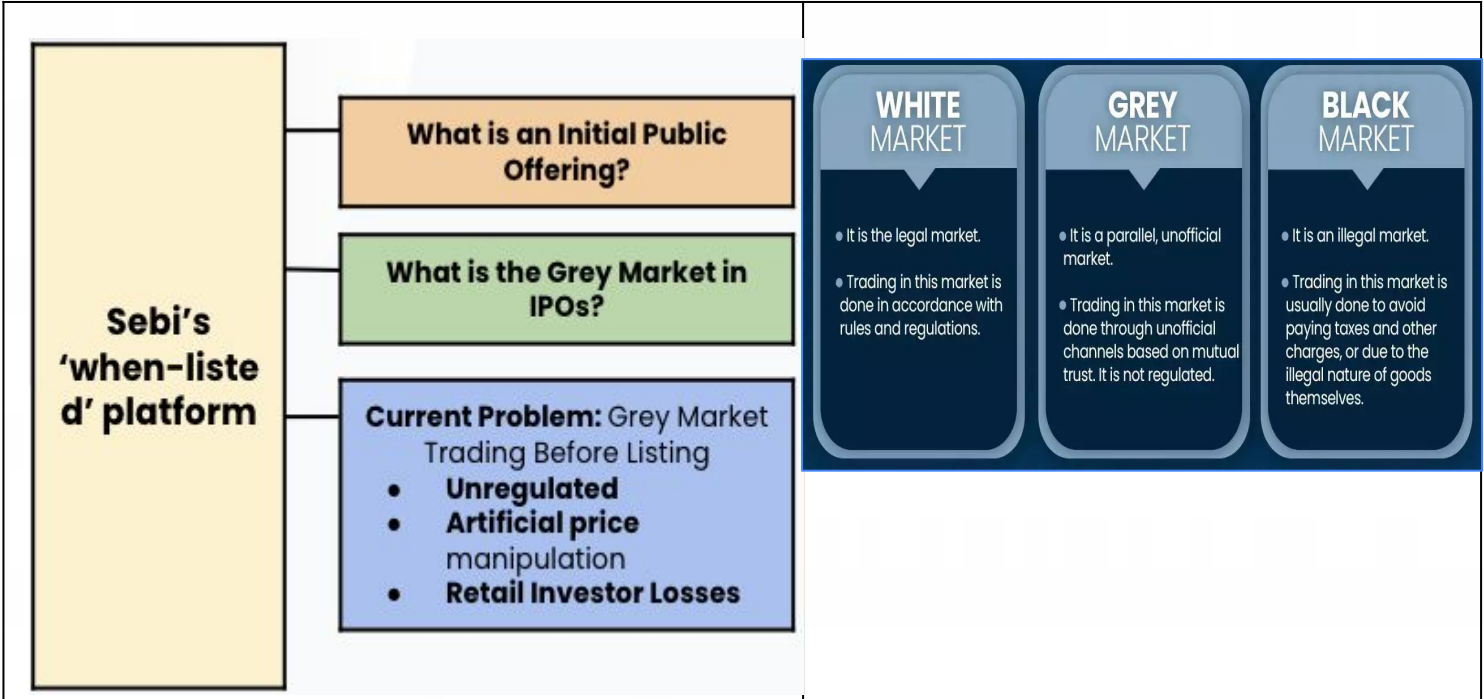
'When listed' Platform

Prelims : General Science
GS 3 : Infrastructure: Energy, Science and Technology- developments
Newspaper : The Indian Express **Page Number :** World

Sebi's 'when-listed' platform

- **What is an Initial Public Offering?**
- **What is the Grey Market in IPOs?**
- **Current Problem:** Grey Market Trading Before Listing
  - **Unregulated**
  - **Artificial price** manipulation
  - **Retail Investor Losses**

WHITE MARKET
- It is the legal market.
- Trading in this market is done in accordance with rules and regulations.

GREY MARKET
- It is a parallel, unofficial market.
- Trading in this market is done through unofficial channels based on mutual trust. It is not regulated.

BLACK MARKET
- It is an illegal market.
- Trading in this market is usually done to avoid paying taxes and other charges, or due to the illegal nature of goods themselves.

Decoding the News

What is the platform on which Sebi is working?

In order to reduce grey market activity in stocks of companies that have allotted shares to investors after the completion of the IPO bidding process but are awaiting listing on bourses, the capital markets regulator is working on a "when-listed" facility.

"We are actively considering "when-listed" trading. Today, we are at T+3 (trading plus three working days) from closure of the issue to listing, but even in those three days there is a lot of "kerb trading" (grey market trading). So, we feel that if anyway investors do that (kerb trading), why not give them an opportunity (to trade) in a proper regulated way?" Buch recently said.

How would 'when-listed' help investors?

The Sebi Chairperson said that as soon as the allotment of shares in an IPO is over, the entitlement to that share gets crystalise, which means that investors have the right to sell that entitlement.

"The idea is that whatever the grey market (trading) is going on right now in the pre-listing period, we think that's not suitable. If you got your allotment and you want to sell it, sell it in the organized market," Buch said.
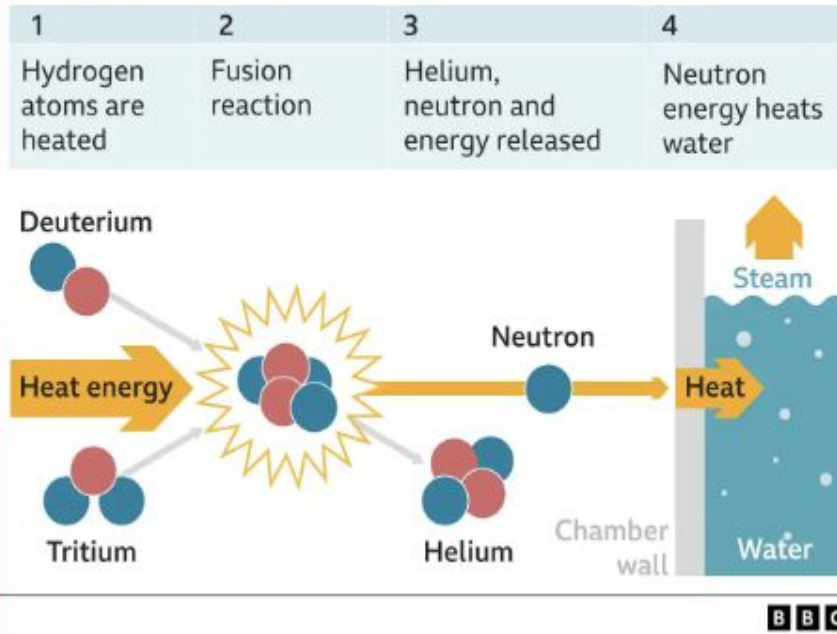
How Will It Work?

Step 1: IPO closes.
Step 2: Shares allotted on T+1 day.
Step 3: Trading starts on the 'When-Listed' platform immediately.
Step 4: Official stock exchange listing happens on T+3.

Nuclear Fusion Energy

How nuclear fusion works

1	2	3	4
Hydrogen atoms are heated	Fusion reaction	Helium, neutron and energy released	Neutron energy heats water

Deuterium

Heat energy

Neutron

Steam

Heat

Tritium

Helium

Chamber wall

Water

BBC

Difficulties

- **Present technology**
- **Containing + Storage**
- **High cost**
- **Plasma instability**

Decoding China's developments

Satellite photos show four outlying "arms" that will house laser bays, and a central experiment bay that will hold a target chamber containing hydrogen isotopes the powerful lasers will fuse together, producing energy, said Decker Eveleth, a researcher at U.S.-based independent research organisation CNA Corp.

It is a similar layout to the $3.5 billion US National Ignition Facility (NIF) in Northern California, which in 2022 generated more energy from a fusion reaction than the lasers pumped into the target - "scientific breakeven".

In November 2020, U.S. arms control envoy Marshall Billingslea released satellite images he said showed China's buildup of nuclear weapons support facilities. It included images of Mianyang showing a cleared plot of land labeled "new research or production areas since 2010". That plot is the site of the fusion research centre, called the Laser Fusion Major Device Laboratory, according to construction documents that Eveleth shared with *Reuters*.

Nuclear Fusion Energy

Prelims : Economic & Social Development
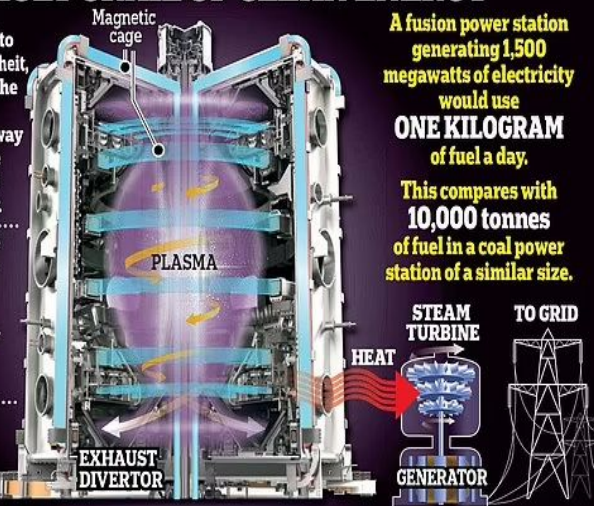**Newspaper :** The Indian Express : **Page Number :** 15

China's 'artificial sun' nuclear fusion reactor sets a new world record after running at 126MILLION°F for more than 17 minutes

- China's nuclear fusion reactor ran at 126 million°F for a total of 1,056 seconds
- In May, China's fusion reactor set new world record by running at 216 million°F
- Nuclear fusion reactors mimic energy-producing process of stars like our sun

By SAM TONKIN and JONATHAN CHADWICK FOR MAILONLINE ✕

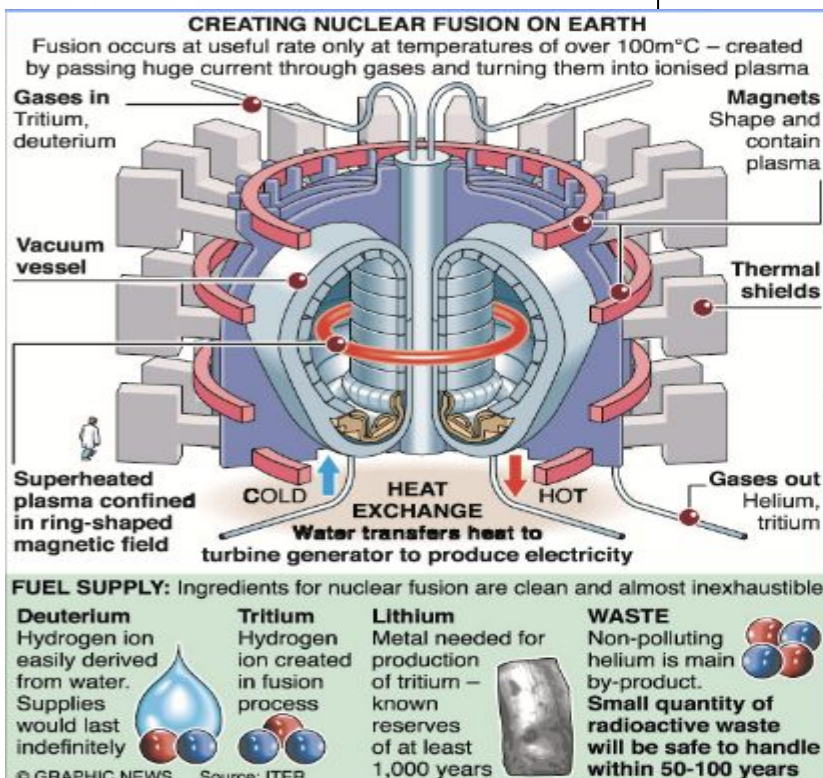### THE HOLY GRAIL OF CLEAN ENERGY

① The fusion reactor heats hydrogen fuel to 216 million degrees Fahrenheit, many times hotter than the Sun's core. A magnetic field keeps the hot gas away from any surfaces inside the reactor, which would otherwise melt instantly.

② Hydrogen atoms fuse together – creating a new element – helium, generating energy that can be used to heat water in a steam turbine to generate electricity.

③ The new exhaust system cools the exhaust gas – helium – down to around 572°F

Magnetic cage

PLASMA

EXHAUST DIVERTOR

A fusion power station generating 1,500 megawatts of electricity would use **ONE KILOGRAM** of fuel a day.

This compares with **10,000 tonnes** of fuel in a coal power station of a similar size.

STEAM TURBINE   TO GRID

HEAT

GENERATOR

UPSC PYQ (P) 2016

India is an important member of the International Thermonuclear Experimental Reactor. If this experiment succeeds, what is the immediate advantage for India?

(a) It can use thorium in place of uranium for power generation
(b) It can attain a global role in satellite navigation
(c) It can drastically improve the efficiency of its fission reactors in power generation
(d) It can build fusion reactors for power generation

CREATING NUCLEAR FUSION ON EARTH

Fusion occurs at useful rate only at temperatures of over 100m°C – created by passing huge current through gases and turning them into ionised plasma

Gases in Tritium, deuterium

Vacuum vessel

Superheated plasma confined in ring-shaped magnetic field

Magnets Shape and contain plasma

Thermal shields

Gases out Helium, tritium

COLD   **HEAT EXCHANGE**   HOT

Water transfers heat to turbine generator to produce electricity

ADITYA-U

Steady State Tokamak

IN-SPARC demonstration reactor

FUEL SUPPLY: Ingredients for nuclear fusion are clean and almost inexhaustible

Deuterium Hydrogen ion easily derived from water. Supplies would last indefinitely

Tritium Hydrogen ion created in fusion process

Lithium Metal needed for production of tritium – known reserves of at least 1,000 years

WASTE Non-polluting helium is main by-product. Small quantity of radioactive waste will be safe to handle within 50-100 years

© GRAPHIC NEWS   Source: ITER

Q1. Consider the following statements regarding DeepSeek:

1. DeepSeek is an advanced AI language model developed specifically for analysing deep-sea ecosystems.
2. It utilises transformer-based neural networks to process large datasets and generate human-like responses.
3. DeepSeek is primarily used in the field of quantum computing research.

Which of the statements given above are correct?
a) 1 and 2 only
b) 2 and 3 only
c) 1 and 3 only
d) 1, 2, and 3
Answer: a

Q2. Consider the following statements regarding Denotified Tribes in India:

1. Denotified tribes were officially classified as criminal tribes under the Criminal Tribes Act of 1871.
2. The Renke Commission was set up to examine the socio-economic conditions of denotified, nomadic, and semi-nomadic tribes.
3. The Criminal Tribes Act was repealed in 1952, leading to the reclassification of these communities.

Which of the statements given above are correct?
a) 1 and 2 only
b) 2 and 3 only
c) 1 and 3 only
d) 1, 2, and 3

Answer: d

Q3. Consider the following statements regarding the Prevention of Atrocities Act, of 1989:

1. The Act provides for special courts to ensure speedy trials of cases related to atrocities against Scheduled Castes (SCs) and Scheduled Tribes (STs).
2. The burden of proof in cases registered under this Act lies with the accused, not the victim.
3. The Act allows for anticipatory bail to the accused if they have no prior criminal record.

Which of the statements given above are correct?
a) 1 and 2 only
b) 2 and 3 only
c) 1 and 3 only
d) 1, 2, and 3

Answer: a

Q4. Consider the following statements regarding the Union Budget of India:

1. The Union Budget is presented under Article 110 of the Indian Constitution.
2. The Railway Budget was merged with the General Budget in 2017.
3. Along with the Budget presenting the 'The Macro Economic Framework Statement' is mandated by the Fiscal Responsibility and Budget Management Act, 2003.
4. The Union Budget is usually presented on the last working day of February every year.

How many of the statements given above is/are correct?
a) Only One
b) Only Two
c) Only Three
d) All Four
Answer: b

Q5. Consider the following statements regarding Nuclear Fusion:

1. Nuclear fusion occurs when two lighter atomic nuclei combine to form a heavier nucleus, releasing a significant amount of energy.
2. The International Thermonuclear Experimental Reactor (ITER) is a multinational project aimed at developing practical fusion energy.
3. Unlike nuclear fission, nuclear fusion does not produce any radioactive waste.

How many of the statements given above is/are correct?
a) Only One
b) Only Two
c) All Three
d) None
Answer: b