

Reforming Agricultural Subsidies



For Prelims : Agricultural Subsidies , PM-KISAN , Pradhan Mantri Krishi Sinchayee Yojana , Nutrient-Based Subsidy (NBS), Pradhan Mantri Fasal Bima Yojna , MSP , Food Corporation of India , Agriculture Marketing Infrastructure Fund (AMIF) , Pradhan Mantri Garib Kalyan Anna Yojana , Per Drop More Crop (PDMC) , Shanta Kumar Committee (2015) , World Trade Organization (WTO) , Zero Budget Natural Farming (ZBNF) .

For Mains : Need and challenges related to agricultural subsidies, Types of agricultural subsidies, Ways to reform agricultural subsidies.

Source: PIB

Why in News?

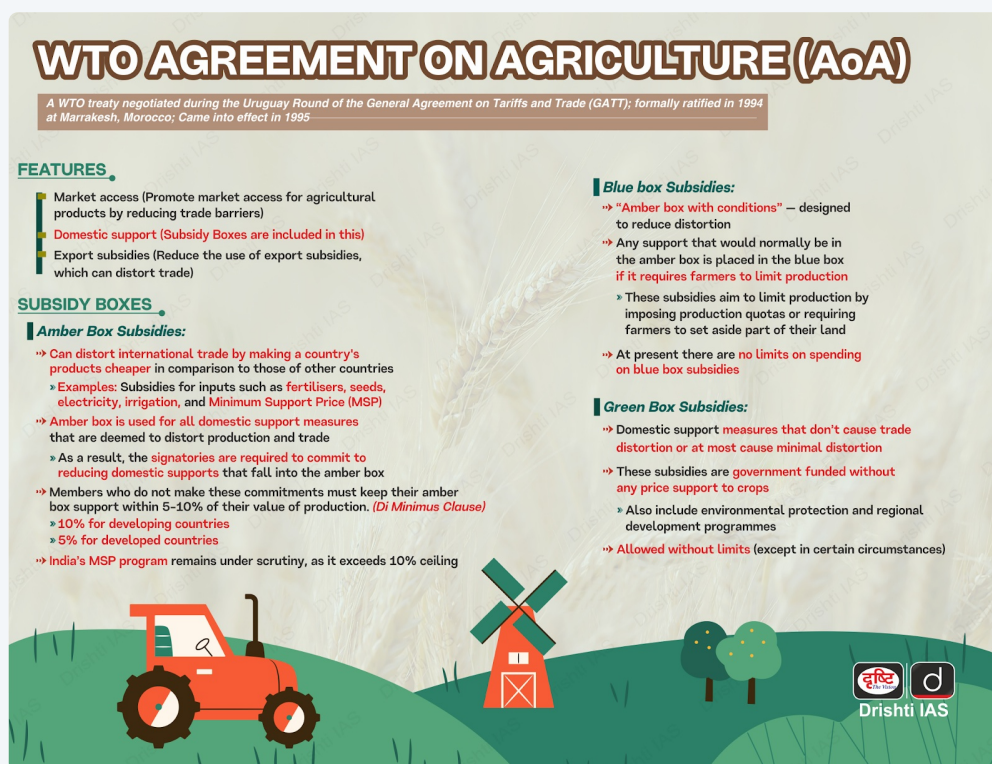
The Vice President stated that **direct transfer of agricultural subsidies** could significantly boost **farmers' income** , estimating each could receive at least **Rs 35,000 annually** if all aid reaches them directly (instead of indirect subsidies).

What are the Various Types of Agricultural Subsidies in India ?

- **Direct Benefit Transfer (DBT):** It provides **direct income support** in form of cash transfers to farmers. E.g., **PM KISAN**, **Rythu Bandhu** (Telangana), **KALIA** (Odisha) .
- **Input Subsidies:**
 - **Fertilizer Subsidy:** It makes fertilizers like **urea** affordable by paying the **difference** between **production cost and selling price** . E.g., **Di-Ammonium Phosphate (DAP)** fertiliser, **Nutrient-Based Subsidy (NBS)** scheme for **non-urea fertilizers** .
 - **Seed Subsidy:** It offers **high-yielding, disease-resistant seeds** at subsidized rates, e.g., **Seed Village Program** , **Seed Bank** , **Mukhyamantri Beej Swavalamban Yojana** in Rajasthan.
 - **Irrigation Subsidy:** The **irrigation subsidy** , under **PM Krishi Sinchai Yojana (PMKSY)** , offers up to **55% support** for **drip and sprinkler systems** to promote **water conservation**.
 - **Power Subsidy:** It provides **free or subsidized electricity** for agricultural pumps, with **states like Punjab offering free electricity to tubewell irrigation** , though this has raised concerns about **groundwater depletion** .
- **Credit & Insurance Subsidies:**

- **Pradhan Mantri Fasal Bima Yojna (PMFBY): PMFBY** protects farmers from crop failure by requiring them to pay a **1.5-5% premium**, with the government covering the remaining cost.
- **Interest Subvention Scheme:** Under the **Modified Interest Subvention Scheme**, farmers get short-term loans up to **Rs 3 lakh** via **Kisan Credit Card** at a **7% subsidised interest rate**, with a **1.5% subvention** to eligible lending institutions.
- **Output Subsidies (Price Support):**
 - **Minimum Support Price (MSP):** **MSP** guarantees minimum prices for **22 crops** like **wheat, rice, pulses, and oilseeds**, and **fair and remunerative price (FRP)** for sugarcane, procured by agencies such as **Food Corporation of India (FCI)** and **NAFED**.
 - Also, **state level** schemes like **Bhavantar Bhugtan Yojana (Madhya Pradesh)** compensate farmers if market prices fall below MSP.
- **Infrastructure & Post-Harvest Subsidies:**
 - **Warehouse & Cold Storage Subsidy:** The **National Horticulture Board (NHB)** offers a **capital investment subsidy** scheme providing a credit-linked back-ended subsidy of **35% in general areas and 50% in North East, hilly, and scheduled areas** for building or modernizing cold storage facilities with capacities between **5,000 and 10,000 million tonnes**.

Agriculture Subsidies and WTO



What are the Consequences of Agricultural Subsidies in India?

- **Fiscal Burden on Government:** The **Union Budget 2025-26** has allocated **Rs 3.71 lakh crore** for **food and fertiliser subsidies** and as of **January 2025**, over **Rs 3.46 lakh crore** has been disbursed to more than **11 crore PM-KISAN** beneficiary farmers.
 - It strains public finances and worsen the **debt crisis** for fiscally stressed states like **Punjab**.

- **Soil Degradation:** India's consumption ratio of **nitrogen, phosphorus and potassium (NPK)** is **6.7:2.4:1** (ideal of 4:2:1), leading to **soil toxicity** & declining yields.
 - **Punjab & Haryana** have the highest urea consumption, causing **groundwater pollution & cancer clusters**.
- **Groundwater Depletion:** Free electricity encourages **excessive tube-well use** , depleting groundwater table.
 - Agriculture consumes **87% of India's groundwater** , with **extraction exceeding 100%** in states like **Punjab, Rajasthan, Haryana** , and **Delhi** in **2024**.
- **Market Distortions:** The **Shanta Kumar Committee (2015)** reported that only **6% of farmers** — mainly in **Punjab, Haryana, and Andhra Pradesh** —actually benefit from **MSP** . This skewed procurement has led to **overproduction of rice and wheat** while **pulses and oilseeds remain underproduced** .
 - In **2024** , the **FCI had to dispose of 18 million tonnes of rotting grains** , causing a **waste of taxpayer money**.
- **Hurt Export Competitiveness:** **World Trade Organization (WTO)** rules **limit India's farm export subsidies** , affecting trade.
 - **Developed countries, led by the US** , accuse **India** of providing **up to 93.9% subsidy** to **rice farmers** in **2020-21** , breaching the **10% limit** set under **WTO rules**.

What are the Advantages and Limitations of Replacing Agricultural Subsidies with Direct Benefit Transfers?

Advantages	Limitations
Improved Targeting: Ensures subsidies reach only eligible farmers , reducing leakage and inefficiency .	Exclusion Risks: Small or marginal farmers without proper documentation may be left out .
Increased Transparency: Direct payments reduce intermediaries , lowering corruption and misallocation.	Digital Divide: Reliance on banking and digital infrastructure may disadvantage remote or unbanked farmers .
Promotes Farmer Autonomy: Farmers have freedom to decide how to use funds , encouraging diversified investment.	Misuse of Funds: Transfers may be spent on non-agricultural needs , diluting the intended impact on productivity.
Reduces Market Distortion: Avoids overuse or misuse of inputs like fertilizers and power by unlinking subsidies from physical inputs.	Price Volatility Exposure: Without input subsidies, farmers may face higher costs during price spikes , increasing vulnerability.
Administrative Efficiency: Lowers cost and complexity of managing large input subsidy programs.	Implementation Challenges: Requires robust beneficiary identification , grievance redressal, and monitoring systems.

How can India Reform its Agricultural Subsidies?

- **Targeted Direct Benefit Transfers (DBT) with Geo-Tagging:** Subsidy allocation should balance **input subsidies** with **precision-targeted DBT** using **geo-tagging** and **farmer identification technologies** in **project mode** and scale in **phased-wise manner** .
 - It will reduce **leakage** , aiding **smallholders** , promoting **financial inclusion** , and encouraging **efficient resources and build upon Shanta Kumar Committee's (2014)** recommendation to shift from **grain-based distribution** to **cash transfers**.
- **Market-Responsive MSP Reform:** Reform MSP into a **dynamic, market-responsive system** using real-time data on **input costs** , **demand-supply** , and **regional prices** . Ensure **transparency** by publishing the pricing method and involving **farmers** and **experts** to prevent issues like the **2020 farm protests** .
- **Green Subsidy Transformation:** To promote **sustainable agriculture** , restructure **power** and **fertilizer subsidies** by directly linking them to adoption of **water-efficient technologies** like **drip** and **micro-irrigation systems** under programs like the **Per Drop More Crop (PDMC)** initiative .
 - Phase out subsidies for **water-intensive crops** and incentivize **diversification** with tailored support to boost **agro-biodiversity** , conserve **groundwater** , and match **regional agro-climates**.
- **Post-Harvest Infrastructure:** Increase **Agriculture Mechanization and Infrastructure Fund (AMIF)** **subsidies** to curb post-harvest losses and **incentivize agro-processing units** near farms to boost value addition and farmer incomes.
 - **Localized infrastructure** boosts **farmer incomes** by capturing higher **market value** , reducing reliance on **distant markets** , and strengthening **agricultural supply chains**.

- **WTO-Compliant Subsidy Reforms:** Shift subsidies to **non-trade-distorting** areas like **agricultural R&D** , **extension services** , **rural infrastructure** , and **capacity building** , aligning with **WTO** rules, while advocating higher subsidy ceilings for developing countries to protect smallholders and boost exports.
- Additionally, adopting the **Kelkar Committee's (2012)** suggestion to reduce **subsidies** on **fuel, food, and fertilizers** is essential to curb excessive **public spending** .

Conclusion

India's agricultural subsidies though beneficial need urgent **reforms** to balance **farmer welfare** with **fiscal** and **environmental sustainability** . Shifting to **direct cash transfers** , **rationalizing MSP** , promoting **sustainable farming** , and investing in **post-harvest infrastructure** can enhance **efficiency** while reducing **distortions** . **WTO-compliant policies** and **crop diversification** will ensure long-term **food security** , **farmer prosperity** , and **ecological balance** .

Drishti Mains Question:

Q.Examine the role of agricultural subsidies in ensuring food security in India. Should subsidies be continued in their current form?

[Watch Video on YouTube: [▶ https://www.youtube.com/embed/O5QL9IMBMIM](https://www.youtube.com/embed/O5QL9IMBMIM)]

UPSC Civil Services Examination, Previous Year Questions (PYQs)

Prelims

Q. With reference to chemical fertilizers in India, consider the following statements: (2020)

1. At present, the retail price of chemical fertilizers is market-driven and not administered by the Government.
2. Ammonia, which is an input of urea, is produced from natural gas.
3. Sulphur, which is a raw material for phosphoric acid fertilizer, is a by-product of oil refineries.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 2 and 3 only
- (c) 2 only
- (d) 1, 2 and 3

Ans: (b)

Mains

Q. How do subsidies affect the cropping pattern, crop diversity and the economy of farmers? What is the significance of crop insurance, minimum support price and food processing for small and marginal farmers? (2017)

Q. In what way could replacement of price subsidy with direct benefit Transfer (DBT) change the scenario of subsidies in India? Discuss. (2015)

Q. What are the different types of agriculture subsidies given to farmers at the national and at state levels? Critically, analyse the agricultural subsidy regime with reference to the distortions created by it. (2013)

India Achieves Fiscal Deficit Target of 4.8% for FY25



For Prelims: Gross Domestic Product , Controller General of Accounts, inflation , Revenue deficit , Goods and Services Tax , National debt

For Mains: Fiscal Deficit, Fiscal Consolidation, Fiscal Policy and its Role in Economic Stability

Why in News?

The Government of India has successfully met its fiscal deficit target of **4.8% of Gross Domestic Product (GDP)** for the financial year 2024–25, as revealed in the provisional data released by the **Controller General of Accounts (CGA)**.

Note: The CGA, under the **Department of Expenditure, Ministry of Finance**, is the Principal Accounting Adviser to the Government of India.

- The CGA manages the **government's accounting system**, prepares fiscal reports, and submits **Union Finance and Appropriation Accounts** to Parliament under **Article 150**.
- It also enhances transparency and efficiency in **public fund management** through integrated, IT-enabled financial systems and conducts internal audits to assess risk management, control mechanisms, and governance processes.

What is the Fiscal Deficit?

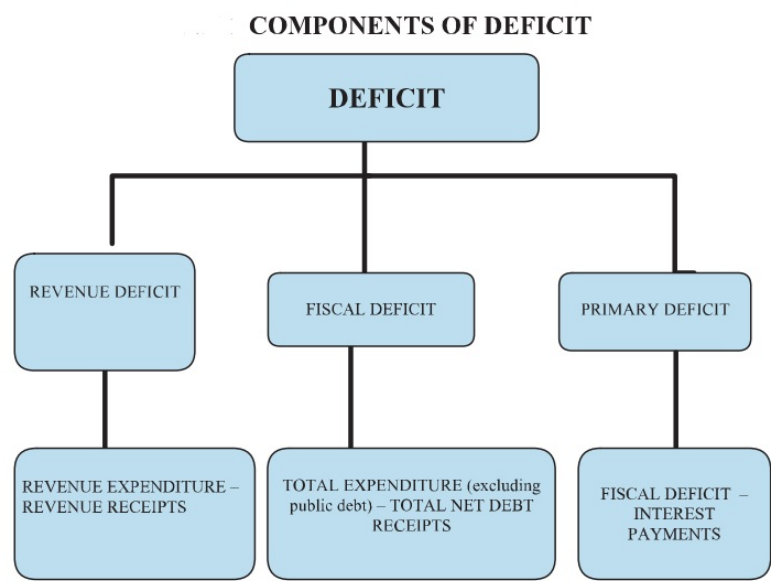
- **About:** Fiscal Deficit is the difference between the **government's total expenditure and its total receipt (excluding borrowings)** in a given fiscal year.
 - **Fiscal Deficit = Total Expenditure - Total Receipts (excluding borrowings)**. Total receipts include **revenue receipts and capital receipts** (both debt and non-debt creating).
 - **Non-debt creating capital receipts** are those that neither involve borrowings nor result in future repayment obligations. Examples include recovery of loans and proceeds from **disinvestment** of Public Sector Undertakings (PSUs).
 - Fiscal Deficit is usually expressed as a percentage of GDP to assess its impact on the broader economy.
 - It indicates how much the government needs to borrow to meet its expenses when its income is insufficient.
- **Implications of Fiscal Deficit:** A manageable fiscal deficit helps **ensure macroeconomic stability**.
 - A higher fiscal deficit increases **borrowing needs**, leading to a **rising debt burden and inflationary pressures**.
 - It can cause the **crowding out effect**, where private investment declines due to **higher borrowing costs**.
 - Over time, it reduces **fiscal space**, limiting the government's ability to spend on development, and may weaken investor confidence and macroeconomic stability, potentially increasing debt levels.
- **India's Fiscal Deficit:** In FY 2024–25 fiscal deficit stood at **Rs 15.77 lakh crore, amounting to 4.8% of GDP**.
 - **Revenue Collections** : Total revenue receipts, comprising tax, non-tax, and capital revenues, amounted to **Rs 30.78 lakh crore**.
 - **Expenditure:** Total expenditure for 2024–25 stood at Rs 46.55 lakh crore. Capital expenditure reached Rs 10.52 lakh crore, while revenue expenditure (salaries, subsidies, pensions) was Rs 36.03 lakh crore.
 - The government has now laid out a tighter target of **4.4% fiscal deficit for FY 2025–26**.
- **Fiscal Deficit and National Debt:** **National debt** represents the cumulative borrowing by a

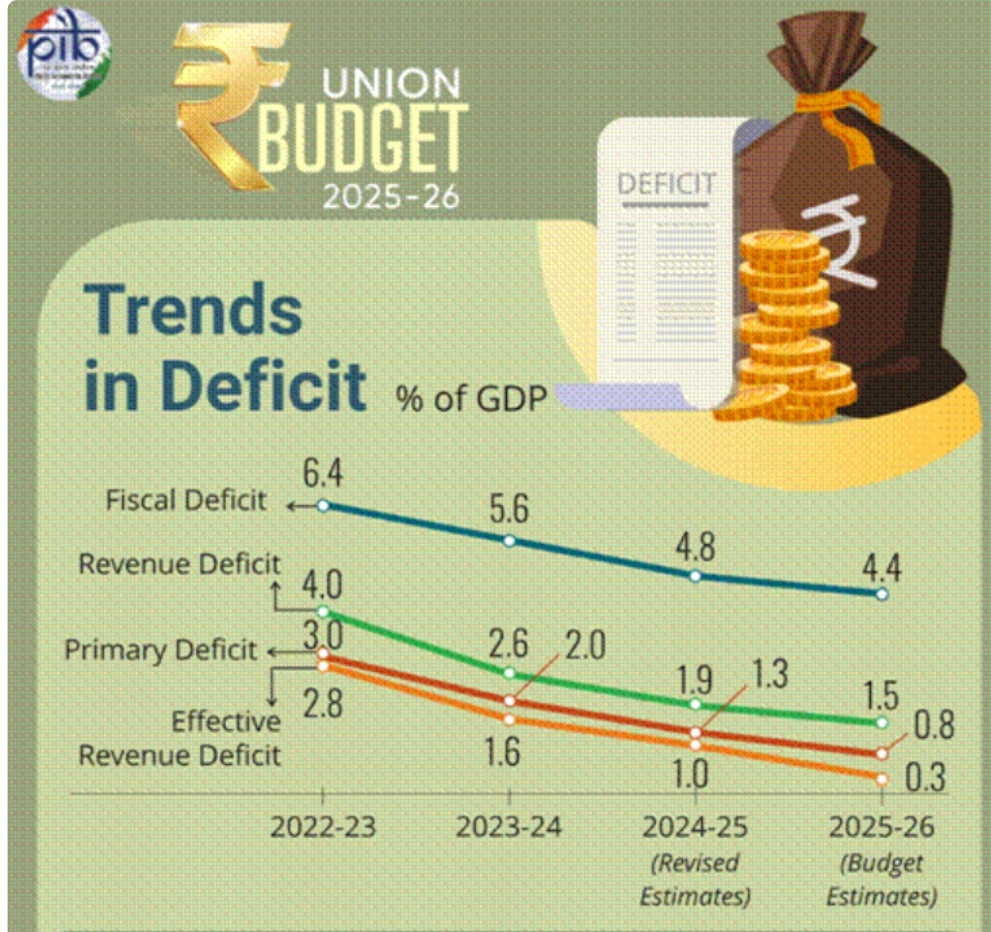
government to finance past **fiscal deficits** .

- It includes liabilities like **domestic/external loans, small savings, provident funds, and special securities** requiring regular interest and principal repayments.
- India’s total outstanding debt is projected to rise to **Rs 196.78 lakh crore by end of FY 2025-26, up from Rs 181.74 lakh crore in FY 2024-25** .

Types of Deficit

- **Revenue Deficit:** This deficit of a government or business can be determined by subtracting the total revenue receipts from the total income expenditure.
 - **Revenue deficit = Total revenue receipts - Total revenue expenditure.**
- **Effective Revenue Deficit = Revenue Deficit - grants for capital asset creation.**
- **Primary Deficit:** It occurs when a government's spending, excluding interest payments, is greater than its revenue from non-interest sources.
 - **Primary Deficit = Fiscal Deficit - Interest Payments.**
- **Twin Deficits:** It refers to a situation where a country simultaneously experiences a **fiscal deficit** and a **current account deficit** (when imports exceed exports).





What are the Factors that Influence the Fiscal Deficit?

- **Fiscal Policy:** It involves government decisions on taxation and spending, directly impacting the fiscal deficit.
 - **Expansionary Fiscal Policy (More Spending / Less Taxes):** Used when the economy is slow or in recession. The government spends more (like on jobs or infrastructure) or reduces taxes to increase people's income.
 - But this leads to a **higher budget deficit**, since earnings (revenue) are lower than expenses.
 - **Contractionary Fiscal Policy (Less Spending / More Taxes):** Used when the economy is overheating or when debt is too high. The government spends less or increases taxes.
 - This helps to reduce the deficit, as spending and income become more balanced.
- **Economic Cycles:** During **recessions**, deficits increase as governments spend more and tax revenues fall. During **booms**, **higher revenues** and controlled spending help reduce deficits.
- **Unexpected Events:** **Natural disasters**, wars, or **pandemics** often cause sudden rises in government spending, increasing the deficit.
- **Inefficient Tax Collection:** When **tax systems are weak or compliance is low**, governments collect less revenue than expected, widening the fiscal deficit.
- **Global Factors:** Inflation, commodity price shifts, and changes in trade affect revenues and spending, influencing deficits.

What are India's Initiatives to Achieve Fiscal Consolidation?

- **Fiscal Responsibility and Budget Management (FRBM) Act, 2003:** It was enacted to institutionalize **financial discipline by setting targets** for fiscal deficits and public debt.
 - **FRBM Act** amended in 2018, it defined the **debt-to-GDP ratio (total debt of a country relative to its GDP)** as the primary fiscal anchor, aiming to reduce the **fiscal deficit** and the **debt-to-GDP ratio**.
- **Glide Path for Fiscal Deficit Reduction:** Following the Covid-19 pandemic, India adopted a "**glide path**" approach to fiscal consolidation , in line with the recommendations of the **N.K. Singh Committee (2017)**.
 - This approach aims for a **gradual reduction of the fiscal deficit** , balancing the need for economic support with long-term fiscal discipline.
 - It led to a planned decrease in the fiscal deficit from **6.7% of GDP in 2020-21 to 4.8% in 2024-25** .
- **Increased Capital Expenditure (Capex):** India has significantly increased its **capital expenditure (capex)** over the past few years, rising from 1.6% of GDP in FY 2014-15 to a planned 3.1% of GDP in FY 2025-26.
 - This focus on infrastructure development aims to stimulate economic growth and improve long-term fiscal health.
- **Revenue Mobilization:** Efforts to enhance revenue collection include implementing the **Goods and Services Tax (GST)** to create a unified tax base and digitizing the tax system.
 - As a result, India's direct tax collections rose **16.15% year-on-year to Rs 25.86 lakh crore in FY 2024-25** .
- **State-Level Fiscal Responsibility:** States have been encouraged to adopt their own fiscal responsibility legislations (FRLs) to complement the central government's efforts.
 - The **Reserve Bank of India (RBI)** has recommended that states with elevated debt levels establish a path for debt consolidation aligned with macroeconomic objectives.

Fiscal Consolidation

- It refers to the responsible management of government finances to ensure long-term economic stability.
- It aims to **balance revenue (tax and non-tax) with expenditure** , minimizing fiscal deficits and maintaining sustainable public debt.
- Fiscal consolidation promotes **macroeconomic stability** by controlling inflation and exchange rate volatility, reduces the debt burden on future generations, builds investor confidence, and ensures efficient use of public resources for development.

Drishti Mains Question:

Q. What is the fiscal deficit? Critically analyze India's fiscal performance in FY 2024-25 in light of the government's target.

UPSC Civil Services, Previous Year Questions (PYQ)

Prelims

Q. Suppose the revenue expenditure is 80,000 crores and the revenue receipts of the Government are 60,000 crores. The Government budget also shows borrowings of 10,000 crores and interest payments of 6,000 crores. Which of the following statements are correct? (2025)

1. Revenue deficit is 20,000 crores.
2. Fiscal deficit is 10,000 crores.
3. Primary deficit is 4,000 crores.

Select the correct answer using the code given below.

- (a) I and II only
- (b) II and III only
- (c) I and III only
- (d) I, II and III

Ans: (d)

Q. A country's fiscal deficit stands at 50,000 crores. It is receiving 10,000 crores through non-debt creating capital receipts. The country's interest liabilities are 1,500 crores. What is the gross primary deficit? (2025)

- (a) 48,500 crores
- (b) 51,500 crores
- (c) 58,500 crores
- (d) None of the above

Ans: (a)

Q. Which one of the following is likely to be the most inflationary in its effect? (2021)

- (a) Repayment of public debt
- (b) Borrowing from the public to finance a budget deficit
- (c) Borrowing from the banks to finance a budget deficit
- (d) Creation of new money to finance a budget deficit

Ans: (d)

Mains

Q1. One of the intended objectives of the Union Budget 2017-18 is to 'transform, energise and clean India'. Analyse the measures proposed in the Budget 2017-18 to achieve the objective. **(2017)**

Q2. Distinguish between Capital Budget and Revenue Budget. Explain the components of both these Budgets. **(2021)**

Q.3 Do you agree with the view that steady GDP growth and low inflation have left the Indian economy in good shape? Give reasons in support of your arguments. **(2019)**

India Rolls Over USD 50 Million Treasury Bill to Support Maldives



Source: TH

Why in News?

India has extended financial support to the **Maldives** by **rolling over (renewing) a USD 50 million Treasury Bill** , under a special **government-to-government (G2G) framework** that began in 2019.

What are the Significant Dimensions of India-Maldives Bilateral Relations?

- **Historical Ties:** India recognized Maldives in 1965 and established its mission in Malé in 1972 . Both are founding members of **SAARC** and signatories to **SAFTA** .
- **Trade and Economy:** India and Maldives signed a trade agreement in 1981, boosting bilateral trade.
 - In 2024, India extended **USD 400 million** in support and a **bilateral currency swap of Rs 3,000 crore to the Maldives** , reinforcing its economic assistance.
 - Additionally, the SBI rolled over **USD 100 million of Treasury Bills** for the Maldives.
 - India became the **Maldives' 2nd largest trade partner in 2022** and the largest in 2023.
 - Visa-free entry for Indian business travelers in 2022 further enhanced commercial relations.
 - In 2024, India and the Maldives have finalized a framework to promote the use of local currencies for cross-border trade.
- **Tourism & Culture:** Tourism forms **25% of Maldives' GDP** and **70% of employment** , with **India as the top tourist source since 2020**. The **2022 open skies agreement** enhanced air connectivity.
- **Defence Partner:** Under India's **Neighborhood First policy** and **SAGAR** (now MAHASAGAR) initiatives, India has provided **critical defence support** including **Operation Cactus (1988)** .
 - **Defence infrastructure, joint exercises (Ekuverin , Ekatha, Dosti)** , and **training** over 70% of Maldives National Defence Force personnel.



Note

- **Eight Degree Channel** separates **Indian Minicoy** (part of Lakshadweep Islands) from that of **Maldives**.

What are Treasury Bills (T-Bills)?

- **T-Bills** are **short-term debt instruments** issued by the **Government of India** through the **Reserve Bank of India (RBI)**.
 - They form part of **Government Securities (G-Secs)** and help raise short-term funds.
 - These are **zero-coupon securities**, meaning they **do not pay periodic interest**. Instead, they are issued at a discount and redeemed at face value on maturity.
 - **G-Secs** are **tradable debt instruments** issued by the **Central or State Governments** to **borrow funds** from the public with a contractual obligation to **repay the principal on a specified date**.

Different Types of Government Securities



Treasury Bills (T-bills)

Short-term money market instruments where the maturity period is less than 1 year.



Cash Management Bills (CMBs)

Short-term money market instruments where the maturity period is less than 1 year.



Dated G-Secs

Long-term money market instruments that offer a wide range of tenures from 5 to 40 years.



State Development Loans (SDLs)

Issued only by the state governments of India with a wide range of investment tenures.

- They are issued with **maturities of 91, 182, and 364 days** and are **sold at a discount from their face value** . Investors **earn returns from the difference between the purchase price and maturity amount** .
- They are **issued through RBI auctions via competitive and non-competitive bidding** and **offer high liquidity** due to their **short tenure** .
- Gains from T-Bills are **taxable as short-term capital gains**, and their fixed returns may be eroded by **inflation** .

10 REASONS WHY MALDIVES IS IMPORTANT FOR INDIA




- 1** Strategically located in the Indian Ocean, Maldives archipelago comprising 1,200 coral islands lies next to key shipping lanes which ensure uninterrupted energy supplies to countries like China, Japan and India
- 2** Since China started to send naval ships to Indian Ocean roughly 10 years ago —and right up to Gulf of Aden in the name of anti-piracy operations — Maldives' significance has steadily grown and now it's at the heart of international geopolitics
- 3** As the pre-eminent South Asian power and a 'net security provider' in the Indian Ocean region, India needs to cooperate with Maldives in security and defence sectors
- 4** China's massive economic presence in Maldives is a major concern for India. With the country now said to owe 70% of its external aid to China, many believe that Yameen has done to Maldives what Rajapaksa did to Sri Lanka. India had to push back at some stage and the current political crisis might just have offered India the right opportunity
- 5** A large section of population which supports the opposition parties like Nasheed's MDP wants India to act against Yameen
- 6** Maldives is also a member of Saarc. It is important for India to have Maldives on board to maintain its leadership in the region. Maldives was the only Saarc country which seemed reluctant to follow India's call for boycott of Saarc summit in Pakistan after the Uri attack
- 7** Under Yameen, radicalisation grew rapidly and it was often said that archipelago accounted for one of the highest numbers of foreign fighters in Syria in terms of per capita. India can ill-afford a neighbour which fails to check Islamic radicalisation
- 8** India and Maldives share ethnic, linguistic, cultural, religious and commercial links. India was among the first to recognise Maldives after its independence in 1965 and later established its mission at Malé in 1972
- 9** There are 25,000 Indian nationals living in Maldives (second largest expatriate community). Indian tourists also account for close to 6% of tourists Maldives receives every year
- 10** India is also a preferred destination for Maldivians for education, medical treatment, recreation and business. According to MEA, more and more Maldivians are seeking long term visa for pursuing higher studies/ medical treatment in India

UPSC Civil Services Examination, Previous Year Question (PYQ)

Q. In the context of Indian economy, 'Open Market Operations' refers to (2013)

- (a) borrowing by scheduled banks from the RBI
- (b) lending by commercial banks to industry and trade
- (c) purchase and sale of government securities by the RBI
- (d) None of the above

Ans: (c)

Q2. In the context of the Indian economy, non-financial debt includes which of the following? (2020)

- 1. Housing loans owed by households
- 2. Amounts outstanding on credit cards
- 3. Treasury bills

Select the correct answer using the code given below:

- (a) 1 only
- (b) 1 and 2 only
- (c) 3 only
- (d) 1, 2 and 3

Ans: (d)



Source: TH1, TH2

Why in News?

Recent research by **National Centre for Biological Sciences (NCBS-TIFR)** and other studies has revealed that **neurodegenerative diseases** may **start long before symptoms appear**, driven by **blood vessel dysfunction** and **abnormal protein activity** in the brain.

- This new understanding moves the focus from direct **neuron** damage to **early vascular and molecular changes**, paving the way for earlier diagnosis and prevention.

What are Neurodegenerative Diseases?

- **About:**

- **Neurodegenerative Diseases** are a group of disorders in which the **brain and nerve cells (neurons)** gradually **break down or die over time**.
 - This leads to **problems with memory, movement, speech**, and other important body functions.
- These diseases usually **get worse over time** and currently have **no complete cure**, though treatments can help manage symptoms.

- **Common Examples:**

- **Alzheimer's Disease**, which affects memory and thinking.
- **Parkinson's Disease**, which affects movement and balance.
- **Amyotrophic Lateral Sclerosis (ALS)**, which affects **nerve cells (motor neurons)** in the brain and **spinal cord**, which control voluntary muscle movement.
- **Huntington's Disease**, which causes nerve cells in the brain to decay over time
- **Guillain-Barre syndrome**, a serious **autoimmune disorder** that **affects the peripheral nervous system**.

What does Recent Research Reveal about Early Causes of Neurodegenerative Diseases?

- **Vascular Dysfunction and Blood-Brain Barrier (BBB) Breakdown:** The **BBB** is a **protective layer formed by tightly connected cells lining brain blood vessels**, regulating what enters the brain. **Damage to this barrier**, caused by **dysfunction of the protein TDP-43**, leads to **leakage** that allows **harmful substances to enter**, causing **inflammation and neuron loss**.
 - Studies in mice show these **vascular changes occur early**, before symptoms, suggesting **blood vessel damage is a key early factor in neurodegeneration**.
- **Intracellular Membrane Signaling Failure (Esys Protein Dysfunction):** Neurons depend on **membrane contact sites** between the **plasma membrane and endoplasmic reticulum** for transferring essential molecules like **lipids and calcium**, crucial for cell signaling and survival.
 - The **Esys protein** regulates this process by **binding calcium**. When Esys function is impaired, this **signaling breaks down, disrupting neuron health and potentially initiating degeneration**.

What are the Key Factors Contributing to Neurodegenerative Diseases?

- **Genetic Factors: Mutations in specific genes** disrupt normal neuronal function and repair, **increasing susceptibility to degeneration**. These mutations **may be inherited or arise spontaneously**.
- **Protein Abnormalities: Misfolded proteins**, such as **amyloid-beta in Alzheimer's disease or alpha-synuclein** in Parkinson's disease, accumulate and interfere with cell function, triggering **neuronal toxicity and progressive damage**.
- **Oxidative Stress: Excess free radicals** cause **damage to neuronal DNA, proteins, and membranes**. When antioxidant defenses are overwhelmed, this accelerates neuronal cell death.
- **Mitochondrial Dysfunction: Impaired mitochondria** produce **insufficient energy and release harmful byproducts**, compromising neuron survival and promoting degeneration.
- **Chronic Inflammation: Persistent inflammation in the brain** activates immune cells that can damage neurons, exacerbating disease progression.
- **Environmental Factors: Exposure to toxins** like **pesticides, heavy metals, or infections** can induce cellular stress and damage, raising the risk of neurodegeneration.
- **Ageing: The natural ageing process weakens cellular repair and waste clearance systems**, making neurons more vulnerable to damage and loss over time.

Neurodegenerative Diseases V/s Neurological Disorders

- **Neurological disorders** are a **broader category of disorders affecting the nervous system**, including the **brain, spinal cord, and peripheral nerves** and **may be acute or chronic**.
 - **Eg: Stroke, epilepsy, and meningitis.**
 - Many **neurological conditions are treatable or reversible** with timely intervention. Eg: **Stroke (Ischemic Stroke)**.
- **Neurodegenerative diseases** are a subset of **neurological disorders** characterized by the **progressive and irreversible loss of structure or function of neurons**, often due to **abnormal protein accumulation, genetic factors**, or oxidative stress.
- They are **largely incurable and managed symptomatically**.

UPSC Civil Services Examination Previous Year Question

Q. Consider the following statements:

1. Genetic changes can be introduced in the cells that produce eggs or sperms of a prospective parent.
2. A person's genome can be edited before birth at the early embryonic stage.
3. Human induced pluripotent stem cells can be injected into the embryo of a pig.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 2 and 3 only
- (c) 2 only
- (d) 1, 2 and 3

Ans: (d)

New Caledonia



Source: TH

France's recent effort to establish a new political agreement for **New Caledonia** has been **unsuccessful**, increasing uncertainty about the **territory's future**. This follows years of unrest and three **referendums** held between 2018 and 2021, in which **independence was rejected**.

New Caledonia

- **Geography:** It is a **French overseas territory** in the **southwestern Pacific Ocean**, about **1,500 km east of Australia**.
 - It includes **Grande Terre** (with capital **Nouméa**), the **Loyalty Islands** (Ouvéa, Lifou, Tiga, Maré), **Belep archipelago, Isle of Pines**, and **remote islands**.



- **Historical Background:** Inhabited **originally by Kanaks** (indigenous Melanesian inhabitants of New Caledonia) , it was **seized by France in 1853**. Kanaks gained **French citizenship** post- **World War II** , but 1960s migration reduced their majority, sparking independence movements.
 - The **Matignon Agreements (1988)** and **Nouméa Accord (1998)** promised 3 independence referendums. All votes **favoured France** , though the 2021 referendum was boycotted by pro-independence groups.
- **Rivers & Climate:** The longest river is the **Diahot (100 km)** . It has a **subtropical climate** , the east coast receives significantly more rainfall than the west coast.
- **Biodiversity:** Home to *Amborella trichopoda* , a **rare plant species** and **endemic birds** like the **kagu** .
 - Its **lagoons** have been a **UNESCO World Heritage site** since 2008.

Overseas Territory :

- It refers to a **region or land** that is **geographically separated from a country's mainland** but **remains under its sovereignty and administration**.

Read More: [Referendum in New Caledonia](#)

International Conference on Glacier's Preservation

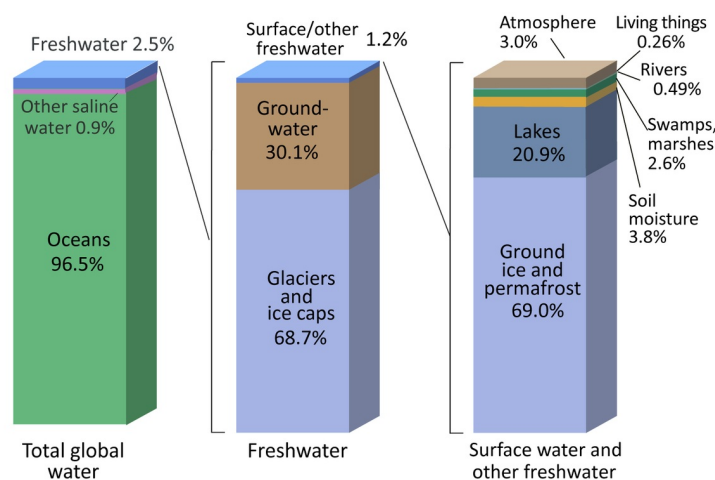


Source: TH

Tajikistan hosted the 1 st **UN International Conference on Glaciers’ Preservation** in **Dushanbe (Tajikistan)** in collaboration with **UNESCO** and **World Meteorological Organisation (WMO)** , leading to the adoption of the **Dushanbe Glaciers Declaration** .

- **About Glaciers:** **Glaciers** are **slow-moving ice masses** formed from **compacted snow** over centuries.
 - They mainly exist in **polar regions** (Greenland, Canadian Arctic, Antarctica) due to **low solar insolation** , while **tropical glaciers** occur at **high altitudes** near the **Equator** , like in the **Andes** .
- **Importance of Glaciers:**
 - **Freshwater:** Only **3%** of Earth’s water is **freshwater**, and glaciers hold about **70%** of the world’s freshwater supply.
 - **River Systems:** The **Hindu Kush Himalayas (HKH)** are referred as “**Water Tower of Asia**” and contribute approximately 40% of the **Indus River system’s water flow**.
 - **Climate Archives:** Glaciers **preserve climate records** dating back up to **800,000 years** , which help scientists study historical warming and cooling patterns.
 - **Monsoon Influence:** The **temperature difference** between the **Himalayan glaciers** and the **Indian Ocean** plays a key role in driving the **South West monsoon winds**.
- **Glacier Retreat:** Nepal lost Langtang’s **Yala Glacier** , while **Venezuela** became the 2 nd country after **Slovenia** to lose **all its glaciers**.
- **Initiatives Taken:**
 - **India:** **National Mission for Sustaining the Himalayan Ecosystem (NMSHE)** , **Centre for Cryosphere and Climate Change Studies** , **Glacial Lake Outburst Flood (GLOF)** risk mapping.
 - **Global:** **International Year of Glaciers Preservation (2025)** , **Decade of Action for Cryospheric Sciences (2025-2034)** , **International Centre for Integrated Mountain Development (ICIMOD)** .

Where is Earth’s Water?



Credit: U.S. Geological Survey, Water Science School. <https://www.usgs.gov/special-topic/water-science-school>
Data source: Igor Shiklomanov's chapter "World fresh water resources" in Peter H. Gleick (editor), 1993, Water in Crisis: A Guide to the World's Fresh Water Resources. (Numbers are rounded).

Read More: [2025 as International Year of Glaciers' Preservation](#)

India to Study Life Sustainability in Space under BioE3 Mission



Source: PIB

The **Union Minister of State for Science & Technology** announced that **India will conduct its first biological experiments** aboard the **International Space Station (ISS)** to explore the **sustainability of human life in space**.

- Led by **ISRO** in partnership with the **Department of Biotechnology (DBT)**, these experiments will be **part of the upcoming ISS mission, AXIOM-4** under the **BioE3 (Biotechnology for Economy, Environment & Employment) policy**.
- **Axiom Mission 4** is a private spaceflight to the ISS, operated by the US-based company **Axiom Space**.
 - Scheduled for launch in **June 2025**, the mission will also carry **2 Indian astronauts** from **ISRO** to the ISS.

Experiments Proposed in Space under BioE3 Mission:

- **Edible Microalgae in Space:** This experiment will check **how microgravity affects the growth of edible microalgae**, which are rich in **proteins, fats**, and useful compounds.
 - These algae can be used as **food in space** and also help **clean the air** by taking in CO₂ and giving out O₂.
- **Spirulina and Cyanobacteria:** This study will test how **cyanobacteria** like **Spirulina** grow in space using two types of nutrients - **urea** and **nitrate**.
 - It will help scientists understand **how to recycle waste (like carbon and nitrogen) from humans** to support life in space.
 - **Spirulina**, which is a **protein-rich, antioxidant-packed blue-green algae**, is also being tested as a **“superfood”**.

BioE3 Policy (2024)

- **BioE3 Policy** promotes **high-performance biomanufacturing** to support a **circular bioeconomy** and India's **Net Zero goals**.
 - It focuses on **innovation, Bio-AI hubs, skilled workforce development**, and **sustainable biotech solutions**.

Read More: [BioE3 Policy and Biotechnology in India](#)

2025 Osaka World Expo



Source: TH

India has made a cultural statement at the **2025 Osaka World Expo**, embracing its **civilisational ethos and soft power** by blending ancient wisdom with modern innovation under the theme of **compassion and inclusivity**.

- **Osaka World Expo 2025:** Held in Japan under the theme *“Designing Future Society for Our Lives”*, the Osaka Expo serves as a “Living Lab” to co-create innovative solutions for global challenges using shared knowledge and cutting-edge technologies, aligned with the **Sustainable Development Goals (SDGs)**.
- **India's Pavilion:** It was curated by the **Indira Gandhi National Centre for the Arts (IGNCA)** under the Ministry of Culture, positioning itself as a modern **“sutradhar” (narrator) of India’s civilisational story**.
- **Key Elements of the Pavilion:** The pavilion’s central motif is the **‘Bodhisattva Padmapani’** from **Ajanta Caves**, symbolizing compassion and knowledge in **Mahayana Buddhism**.
 - The Lotus Courtyard showcases **Bodhisattva forms** and frescoes from the 2,000-year-old UNESCO-listed Ajanta Caves.
 - The **‘Oneness Lounge’** features a reimagined **Bodhi Tree**, representing spiritual unity. The **‘Wall of Life’** promotes internal wellness through **Yoga and Ayurveda**.
 - The pavilion reflects India’s use of soft power in foreign policy, combining spiritual, cultural, and scientific achievements to foster global partnerships.

Read more: [Delivering Soft Power](#)

New Dwarf Planet and Planet Nine



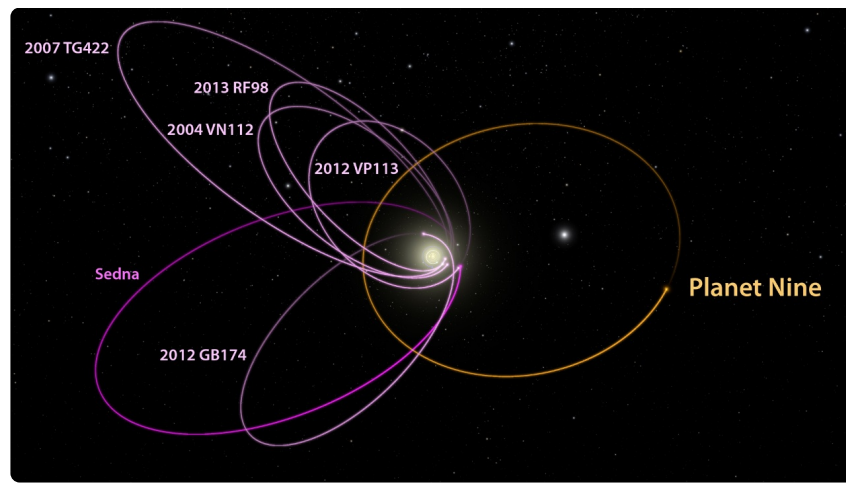
Source: HT

During the ongoing search for the **hypothetical Planet Nine** at the **outer edge of the solar system**, astronomers have discovered a new **distant dwarf planet** named **2017 OF201**, shedding light on the **unexplored regions beyond Neptune**.

- **About 2017 OF201:** **2017 OF201** is a **700 km-wide dwarf planet** with a **25,000-year orbit** that extends **1,600 times the Earth-Sun distance**, reaching far into the **Oort cloud** (outermost boundary

of the Sun's gravitational influence) .

- Its orbit **differs from the clustered patterns** of other **trans-Neptunian objects (TNOs)** , leading some scientists to propose the **gravitational influence of Planet Nine** or consider **alternative explanations** for these orbital behaviors.
- **Significance:** This discovery suggests the existence of **hundreds of similar icy bodies** in the **Kuiper Belt** beyond Neptune.
 - The Kuiper Belt is a **vast, doughnut-shaped** region of **icy bodies and dwarf planets** orbiting the Sun beyond Neptune. It is often called the "**outer solar system's asteroid belt**".
- **About Planet Nine:** The **Planet Nine hypothesis** suggests a **large, undiscovered planet** beyond Neptune causing unusual **gravitational effects** on distant **TNOs** .
 - This theory is based on the **clustered orbits** of extreme TNOs like **Sedna** and **2012 VP113** , indicating an **unseen gravitational influence** .



- **About Dwarf Planet:** A **dwarf planet** is a **celestial body** that **orbits the Sun** , is **nearly round** due to its own gravity, has **not cleared its orbital path** , and is **not a satellite (i.e., not a moon)**.
 - Unlike planets, **dwarf planets** do **not clear their orbits** and often share them with **asteroids** or **Kuiper Belt objects**.

Read More: [Dwarf Planet Ceres](#)