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MAINSTORMING 2023

GS-III BOOSTER

MAY 2023 TO JULY 2023



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⌚ May 2023 to July 2023

1. ECONOMY

1.1 India- The Fastest Growing Economy

Why in news?

Indian PM Shri. Narendra Modi has assured that during the 3rd tenure of his government, India will be among the top three economies of the world.

Status of Indian Economy

- **Size** - India is the **5th largest economy** in the world with the GDP of around 3737 billion US Dollars.
- India was the 10th largest economy in 2014; it doubled its growth in 7 years.
- The International Monetary Fund (IMF) data shows that India is indeed forecast to become the **3rd largest economy by 2027**.
- It is expected to overtake Germany and Japan in future which is currently the 4th and 3rd largest economies respectively.
- **Per Capita GDP**- India's per capita GDP is only 2600 dollars per annum.
- **India's GDP growth**- All top 10 countries have seen their GDP stagnate or even contract, except China, India and the US.
- Even a more modest growth rate of 6% per annum will be enough for India to overtake Germany and Japan by 2027.
- The key reason for stagnation of global economies is due to Global Financial Crisis (GFC), it hit India too but the impact was so high in European countries.

Country	GDP Growth Rate (2014-23)
India	83%
China	84%
USA	54%

Country	Per Capita GDP (per annum)
India	2600 dollars
UK	47000 dollars
Brazil	10000 dollars

What is the forecast for India's GDP in 2027?

- It will be around 38% more than what it is in 2023, while that of Japan and Germany will be only 15% more than their 2023 levels.
- This relatively faster growth will help India overtake these countries & become the 3rd largest economy by 2027.
- In 2027, *India's GDP will be 1/5th of China's* (short by 20 trillion dollar) and one-sixth of the US (short by 26 trillion dollar).

What are the challenges?

- **Weak per capita GDP**- This is due to the growing population.
 - India is the *largest populous country* in the world.
- **Poor skills**- Indian workforce is dominated by informal sector (*around 90% of the total workforce*) due to lack of proper skillset.
- **Unemployment**- There is a lack of job creation for growing population, which leads to vicious circle of poverty.
- **Human Development Index**- India's rank in HDI is *132 out of 192 countries* in 2022.
- India needs to focus on health, education and standard of living aspects.
- **Universal health coverage**- A crucial element of becoming richer as a country is the quality of life available to citizens.
 - As per National Health Estimates the share of *out of the pocket expenditure is 47%*.

Steps Taken to Fasten the Economic Growth

- **Niti Aayog**- It released "15-year Road Map", "7-Year Vision, Strategy and Action Plan" to foster economic policy decisions through cooperative federalism.
- **Startup India**- It was launched in 2016 with aim to catalyse startup culture and build a strong and inclusive ecosystem for innovation and entrepreneurship in India.
- **Goods and Service Tax**- It is an indirect tax announced in 2017 with a motto of "One Nation One Tax" to improve growth momentum by reducing barriers to trade, business and related economic activities.
- **Ujjwal DISCOM Assurance Yojana (UDAY)**- It was launched in 2015 that aims for financial turnaround and revival packages for electricity companies in India.
- **National Infrastructure Pipeline**- It is a roadmap for 5 years (2020-25) to invest around Rs 100 lakh crores in social and economic infrastructure.
- **National Monetization Pipeline**- It was launched in 2021 with the principal aim of asset creation through monetisation.
- **Atmanirbhar Bharat Abhiyan**- It is a self-reliant India mission launched in 2020 as an economic stimulus package for revival of COVID situation.
- **PM Gati Shakti**- It is a National Master Plan for Multimodal Connectivity launched in 2021.
- Simplified and liberalized the procedures for Foreign Direct Policy.

What are the opportunities that lies ahead of India?

- **Demographic dividend**- India's should leverage the potential of population in stimulating economic growth.
- **Poverty**- As per National Multidimensional Poverty Index 2023 released by Niti Aayog there has been steep decline in poverty levels.
- **G20 Presidency**- India holds the presidency of G20 in 2023 with the theme of "One Earth One Family One Future".
- This will have a geopolitical significance for India with neighbour countries and will have a reach globally.

1.2 IMF's World Economic Outlook (WEO) (April 2023)

Why in news?

IMF's latest World Economic Outlook (WEO) has stated that outlook is uncertain again amid financial sector turmoil, high inflation, ongoing effects of Russia's invasion of Ukraine, and three years of COVID.

What is the World Economic Outlook about?

- The World Economic Outlook (WEO) is an International Monetary Fund (IMF) report providing output, inflation, employment, fiscal balances, and debt statistics for member countries.
- The report forecasts the global growth, summarizes the state of global economy and highlights the most important developments.
- The IMF publishes the WEO report twice a year (April and October) based on data obtained from its consultations with member countries' governments.
- The IMF also publishes two additional and less comprehensive WEO updates a year, each three months after the main WEO report.

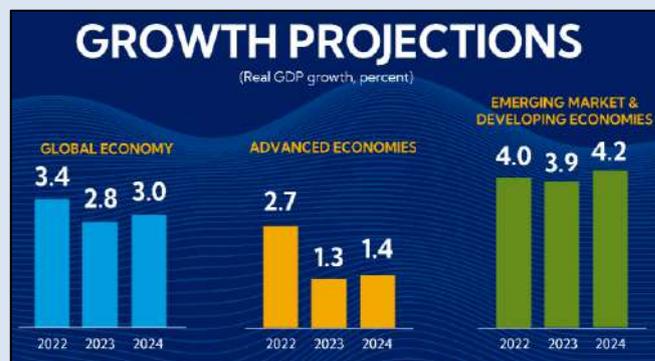
What is the model used by IMF?

- **Macroeconomic model** – The IMF used a macroeconomic model based on Platzer and Peruffo (2022) to analyse the impact of different forces on the world economy.
- This includes foreign developments affecting domestic interest rates through net international capital flows.
- **8 economies** – The model represents 8 major global economies, including the United States, Japan, Germany, the United Kingdom, France, China, India, and Brazil.
- The model is calibrated to reflect demographic developments, productivity trends, retirement age, and other factors.

- **Global GDP** – These are the 5 largest advanced economies and the three largest emerging market and developing economies, which cover some 70% of global GDP.

Findings of the latest report

- The baseline forecast is for growth to fall from 3.4% in 2022 to 2.8% in 2023, before settling at 3.0% in 2024.
- Advanced economies are expected to see an especially pronounced growth slowdown, from 2.7% in 2022 to 1.3% in 2023.
- In a plausible alternative scenario with further financial sector stress, global growth declines to about 2.5% in 2023 with advanced economy growth falling below 1%.
- Global headline inflation in the baseline is set to fall from 8.7% in 2022 to 7.0% in 2023 on the back of lower commodity prices but underlying (core) inflation is likely to decline more slowly.
- Inflation's return to target is unlikely before 2025 in most cases.



Global Prospects and Policies

- **Steady growth** – Tentative signs in early 2023 that the world economy could achieve a soft landing, with inflation coming down and growth steady.
- **Price pressure** – Although inflation has declined as central banks have raised interest rates and food and energy prices have come down, underlying price pressures are proving sticky.

Rate of Interest

- **Real interest rate** – The natural rate of interest, the real interest rate that neither stimulates nor contracts the economy, is important for both monetary and fiscal policy.
- It is a reference level to gauge the stance of monetary policy and a key determinant of the sustainability of public debt.
- Once the current inflationary episode has passed, interest rates are likely to revert toward pre-pandemic levels in advanced economies.

Public Debt

- **Public debt** – Public debt as a ratio to GDP soared across the world during COVID-19 and is expected to remain elevated.
- Economic growth and inflation have historically contributed to reducing debt ratios.

Geo-economics Fragmentation and Foreign Direct Investment

- **Geopolitical tensions** – Supply-chain disruptions, rising geopolitical tensions, brought the risks & potential benefits of geo-economics fragmentation to the centre of the policy debate.
- **FDI** – FDI flows are increasingly concentrated among geopolitically aligned countries, particularly in strategic sectors.
- Multilateral efforts to preserve global integration are the best way to reduce the large and widespread economic costs of FDI fragmentation.

What is the forecast for India?

- **In bright spot** – The International Monetary Fund (IMF) has identified India as a bright spot in the world economy and a key contributor to global growth in the coming years.
- **Contribute to global growth** – The report showed that India is likely to grow 5.9% in 2023 and will contribute 15% of the global growth in 2023.
- **Impressive performance** – The report cites India's impressive performance, with digitization helping to pull the country out of pandemic lows.
- **Prudent policies** – The country also has prudent fiscal policies and significant financing for capital investments which are expected to sustain growth momentum.

1.3 Tackling 'Twin Balance Sheet Syndrome'

Why in news?

The Financial Stability Report (FSR) of the RBI indicated that the challenges of 'twin balance sheet syndrome' (TBS) is fast receding.

What is 'Twin Balance Sheet Syndrome' (TBS)?

- The twin balance sheet problem refers to the *deteriorating balance sheets of corporates and banks* at the same time. This is due to
 1. High levels of non-performing assets (NPAs)
 2. High provision requirements
 3. Low profits and
 4. Low capital adequacy ratios (CAR)
- Under TBS the corporates are overleveraged to the extent that they cannot repay their loans.
- In the mid-2000s, infra companies faced TBS problem.

Status of TBS in Indian Banking Sector

- TBS is fast shaping into a '***Twin Balance Sheet Advantage***' (TBA).
- This is due to the improvement in the performance of banks and the corporate sector through various measures and efforts.
- The analysis based on 6 BSI indicators in FSR show that the banks are well-capitalised and capable of absorbing macroeconomic shocks over a one-year horizon even in the absence of any further capital infusion.
- The gross non-performing assets (GNPAs) of banks sharply fell from 11.5 % in FY18 to 3.9% in FY23. The return on assets (ROA) of banks trailing in the negative zone (-0.2%) in FY18 improved significantly to 1.1% by FY23.

How TBS was tackled?

- The corporate sector, banks and the RBI played a critical role in tackling the perils of TBS.
- **Banks** - Significantly improved their performance to come out of the toxic loan crisis.
- Banks also came out of irrational lending.
- **Corporate sector** - It realised the risks of excessive borrowing.
- Corporates started deleveraging balance sheets.
- **RBI Measures** - The merger of PSBs during 2017-21 brought them down from 27 to 12 and turned PSBs into stronger entities with potential higher risk appetite.
- **Data collection and sharing** - Introduced the Central Repository of Information on Large Credits (CRILC) to enable banks to share information on large loan accounts of ₹5 core and above in 2014.
- RBI insisted collection of information on loans overdue up to 90 days known as Special Mention Accounts (SMA).
- The RBI having detected divergence in the asset quality data introduced an Asset Quality Review (AQR) in September 2015.
- **IBC** - The enactment of the Insolvency and Bankruptcy Code (IBC) in 2016 and the formation of the Insolvency and Bankruptcy Board of India (IBBI) helped hasten problem loan resolution.
- **EASE** -To perpetuate TBS, PSBs needed large capital infusion.
- To fulfil that condition, the government introduced another set of bank reforms called 'Enhanced Access to Service Excellence' (EASE) in 2018.
- The format of EASE reforms got modified and now EASE 5.0 is in use.
- **Bad bank** - National Asset Reconstruction Company Ltd (NARCL), also had to be formed to tackle toxic assets.

What lessons can be learnt from the TBS experience?

- **Banks** - Now the banks have strong stability, and adequate working regulatory controls, banks will now have to focus on improving the quality of credit origination, monitoring, and control of credit.
- The risk governance and all 3 lines of defence in risk management (SMAs) should be well equipped to ring-fence the banks against credit risk.
- The internal credit rating system needs to be more robust and credit risk managers should receive priority.
- **Corporates** - Proportionality in lending to the corporate sector must be maintained with the right kind of credit assessment.
- The corporate sector should adopt responsible borrowing and ensure timely repayment of loans to bring down the cost of borrowing.
- Taking advantage of the scenario, banks and corporates can play a more strategic role in taking the economy to a higher trajectory of growth to put it into the orbit of developed economies in coming years.

Banking Stability Indicator (BSI)

- BSI is an overall assessment of changes in underlying conditions and risk factors that have a bearing on the banking sector's stability during a period.
- The six composite indices represent risks in six dimensions are soundness, asset quality, profitability, liquidity, efficiency, and sensitivity to market risk.

1.4 Debt Dilemma

Why in news?

The elevated levels of India's fiscal deficit and public debt have been a matter of concern for a long time in India.

Debt to GDP ratio	The debt-to-GDP ratio is the ratio of a country's public debt to its gross domestic product.
Fiscal deficit	It is the indication of the total borrowings made by the government as expenditure is more than revenue.

What are the issues associated with India's debt?

- **Financial repression**- When the interest rate on government debt is lower than the growth of GDP, the debt may decline but the financial market gets distorted.
- **Electoral budget cycle**- With elections to a number of States scheduled in 2023 and the general election for 2024, this could push the debt ratio further.
- **Large interest payments**- It constitutes over 5% of GDP and 25% of the revenue receipts which is more than the government expenditure on education and health care put together.
- This reduces the expenditure capability in physical infrastructure, human development and emerging priorities to make the green transition.
- **High levels of debt**-This make it difficult to calibrate counter-cyclical fiscal policy and reduces the ability of the government to respond to shocks.
- **Captive debt market**- This is due to the participation of commercial banks and insurance companies in reserve and priority lending requirements.
- The resources available for lending to the manufacturing sector gets squeezed, driving up the cost of borrowing of the sector.
- **Low sovereign ratings**- Rating agencies keep low sovereign ratings if deficit and debts are high, this will drive the cost of borrowings of the manufacturing sector.

Picture of India's Debt

- **Debt ratio** - As per International Monetary Fund, India's debt ratio projected to be *84% of its GDP in 2022*.
- **Fiscal Deficit** - The fiscal deficit stands at *6.4% of GDP*, India aims to keep the same fiscal deficit in 2023.
- The fiscal deficit in 2020-21 increased to 13.3% and the aggregate public debt to 89.6%.
- As the economy recovered after the pandemic, the deficit and debt ratios have receded to 8.9% and 85.7%, respectively.
- **External debt** - India's External debt stands at 18% of GDP as per RBI for the FY 2023.
- Loans remained the largest component of external debt, with a share of 32.5%, followed by currency and deposits (22.6%), trade credit and advances (19.9%) and debt securities (16.7%)

To know about fiscal health of the states click [here](#)

- **Tax burden-** As today's borrowing is taxing tomorrow' and the burden of large deficits and debt will have to be borne by the next generation, this will increase the tax burden of the people.
 - Every individual in the country already bears a debt burden of Rs 1,64,000.

What lies ahead?

- Fiscal consolidation is critical to reduce the fiscal deficit.
- After 6 years, Goods and Services Tax (GST) has stabilised and has shown high growth potential.
- Technology stability is expected to maintain high buoyancy in the medium term.
- India can privatise telecom to the private sector, so that India can invest positively in reducing fiscal deficit of the country.
- Redistribution of resources is best with direct cash transfers rather than providing subsidies.
- The states can be allowed to borrow through the enforcement of Fiscal Responsibility and Budget Management (FRBM) rules.

Commercial bank requirements	Percentage
Cash Reserve Ratio	4.5%
Statutory Liquidity Ratio	18%
Priority sector	40%

1.5 NPAs, Write-Offs and Recoveries

Why in news?

Recently, Gross Non-Performing Assets (NPAs) have fallen, but emergence of fresh NPAs and unsatisfactory recoveries needs banks intervention.

What are NPAs?

- **NPA** - An asset becomes non-performing when it ceases to generate income for the bank.
- It is a loan or advance for which the principal or interest payment remained overdue for a period of 90 days.
- **Types** - Banks are required to classify NPAs into Substandard, Doubtful and Loss assets.
 1. **Substandard assets** - Assets which has remained NPA for a period *less than or equal to 12 months*.
 2. **Doubtful assets** - An asset would be classified as doubtful if it has remained in the substandard category for a *period of 12 months*.
 3. **Loss assets** - Loss asset is considered *uncollectible* and of such little value that its continuance as a bankable asset is not warranted, although there may be some salvage or recovery value.

Trend in NPAs						
<ul style="list-style-type: none"> • There is a <i>decline in gross non-performing assets (GNPA)</i> ratio of Indian banks. • In 2017-18, this ratio was as high as 11.2 % raising concerns on the stability of the banking system. • During last three years (2019-22) alone fresh NPAs add up to ₹10.61 lakh crore 						
NPA movement						
Year	Gross NPA (in ₹ lakh crore)	GNPA % to credit	New NPA	Recovery & upgrades	Write-off	Net NPA %
2022-23		3.90				1
2021-22	7.43	4.30	2.83	1.95	1.79	1.70
2020-21	8.35	7.30	4	1.18	2.08	2.40
2019-20	8.99	8.20	3.78	1.57	2.37	2.80
2018-19	9.36	9.10	3.14	1.79	2.36	3.70
2017-18	10.3	11.20	6.04	1.28	1.62	6.00
2016-17	7.9	9.30	4.15	1.2	1.08	5.30

What is loan write-off?

- A loan write-off is a tool used by banks to *clean up their balance-sheets*. It is applied in the cases of bad loans or non-performing assets (NPA).
- If a loan turns bad on the account of the repayment defaults for **at least three consecutive quarters**, the loan can be written off.
- By writing-off a loan, the banks set free the money parked for the provisioning and utilise the amount for business (it will no longer be counted as an asset).
- Lost inventory, unpaid debt obligation, bad debts, and unpaid receivables are also written off.
- In the cases of NPA, 100 % provisioning is required in accordance with the Basel-III norms.
- Some recent data show that *private banks have been more active in writing off NPAs* than public sector banks (PSBs).

To know more loan write-off click [here](#).

What is the significance of loan write-off?

- **Tax benefits-** Lenders become eligible for a tax rebate on the total loan value by writing them off.
- **Loan provisioning-** By writing-off loans, lenders don't need to release the remaining limit to defaulting borrowers.
- Doing this helps them release funds previously blocked for a borrower.
- They can use these to provide loans to others in need or for their business.
- **Right to recover-** Lenders don't lose the right to recover outstanding loans even after writing them off.
- They can use the means necessary to recover the full or partial loan amount.
- **Governance-** Writing-off loans help lenders maintain a clean and updated balance sheet, it results in significant decline in NPAs.

How to prevent NPA accumulation?

- **Revisit business models-** Banks need to revisit business models as fault-lines would lead to higher NPAs and credit losses.
- Ideally, from lending perspective, banks need as many business models as credit segments and customer segments.
- **Governance** - The layers of governance such as business, risk and operational governance must be regulated along with corporate governance.
- **Fine tune risk appetite-** It is the amount of risk the lender is willing to undertake.
- It needs to be aligned with risk culture, underwriting skills in a particular domain and risk tolerance.
- **Check fund diversion-** The diversion of funds in corporate lending is more widespread and intense.
- Bank collaboration is needed to detect the practice and find a remedial solution for the same.
- **Increase NPA recoveries-** NPA recoveries is low around 25 % of the claim amount.
- Even under the Insolvency Bankruptcy Code 2016, regime the recovery rate has fallen from 45 % to 23.8 %.
- The government, regulators and lenders need to rework these recovery/resolution frameworks.
- **Need of skilled expertise-** Underwriting skills and turnaround skills require high expertise because the changes in industry and real economy are quite fast and global.

1.6 Evergreening of Loans

Why in news?

The Reserve Bank of India (RBI) Governor Shaktikanta Das raised red flags over banks adopting innovative methods for evergreening of loans.

What does evergreening of loans mean?

- The evergreening of loans is a term in which banks try to revive a loan that is on the verge of default by granting further loans to the same borrower.
- It is a form of zombie lending in which banks provide more loans to the borrowers to stop them from turning into huge non-performing assets.
- It is typically a temporary fix for a bank covering up the real status of stressed loans.

A loan turns into a nonperforming asset (NPA) if the interest or instalment remains unpaid even after the due date and remains unpaid for a period of more than 90 days.

Why do banks follow evergreening of loans?

- If an account turns into NPA, banks are required to make higher provisions which will impact their profitability.
- To avoid classifying a loan as an NPA, banks adopt the evergreening of loans.
- Banks offer fresh loans to borrowers on the verge of default to ensure they repay an old loan.
- Banks delay the recognition of losses through evergreening process.
- Banks also avoid provisioning to cover loan losses and increase their liquidity.

What do bankers say?

- It is difficult for banks to indulge in the evergreening of loans as the RBI monitors each and every loan on a regular basis. Once an account is classified as an NPA, the situation will become worse.
- By evergreening, banks try to save a borrower from becoming NPA by extending temporary liquidity.

Evergreening Methods	Problems in Evergreening Methods
<ul style="list-style-type: none"> • Bringing two lenders together to evergreen each other's loans by sale and buyback of loans or debt instruments. • Good borrowers being persuaded to enter into structured deals with a stressed borrower to conceal the stress. • Use of internal or office accounts to adjust borrower's repayment obligations. • Renewal of loans or disbursement of new/additional loans to the stressed borrower closer to the repayment date. 	<ul style="list-style-type: none"> • Bad loans are made to look good at the risk of additional lending to unviable borrowers. • Evergreening of loans put lenders at risk of huge amounts of default. • The RBI does not approve of evergreen loans and it is going against its norms. • This is a misgovernance in banking.

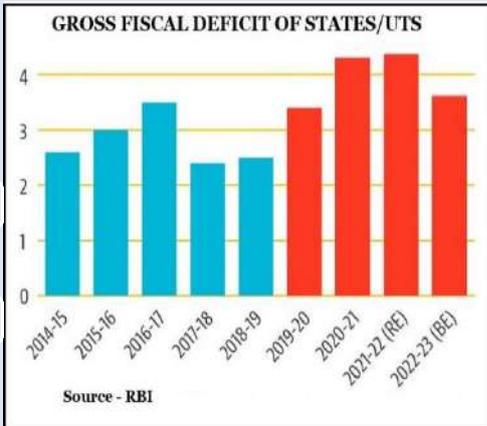
How can ever greening be stopped?

- The audit committee needs to be particularly vigilant.
- It becomes necessary to levy penalties and action against the erring officers.
 - Penalties should be levied through cancellations of unvested stock options.
 - Claw-back of monetary bonuses on officers concerned and on all whole-time directors.
- The Chairman of the audit committee could be asked to step down from the board.

1.7 Fiscal Health of the States

Why in news?

A comprehensive revenue deficit reduction framework is essential to improve the fiscal health of the states.

Status of the fiscal health of States																					
<ul style="list-style-type: none"> • State mobilises <u>more than one-third of total revenue</u>, spend 60% of combined government expenditure. • Around <u>40% in Government borrowing</u> is shared by the states of India. • At the Union level, the fiscal deficit declined from 9.1% of GDP in 2020-21 to 5.9% in 2023-24. • All State fiscal deficit declined to 3.24% of GDP in 2022-23 from 4.1% of GDP in 2020-21. • For the major States, fiscal deficit is expected to be at 2.9% of GDP in 2023-24. 	 <p>GROSS FISCAL DEFICIT OF STATES/UTS</p> <table border="1"> <caption>Data for Gross Fiscal Deficit of States/UTs (as % of GDP)</caption> <thead> <tr> <th>Year</th> <th>Fiscal Deficit (%)</th> </tr> </thead> <tbody> <tr><td>2014-15</td><td>2.6</td></tr> <tr><td>2015-16</td><td>3.0</td></tr> <tr><td>2016-17</td><td>3.5</td></tr> <tr><td>2017-18</td><td>2.5</td></tr> <tr><td>2018-19</td><td>2.6</td></tr> <tr><td>2019-20</td><td>3.4</td></tr> <tr><td>2020-21</td><td>4.5</td></tr> <tr><td>2021-22 (RE)</td><td>4.6</td></tr> <tr><td>2022-23 (BE)</td><td>3.2</td></tr> </tbody> </table> <p>Source - RBI</p>	Year	Fiscal Deficit (%)	2014-15	2.6	2015-16	3.0	2016-17	3.5	2017-18	2.5	2018-19	2.6	2019-20	3.4	2020-21	4.5	2021-22 (RE)	4.6	2022-23 (BE)	3.2
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<p>Fiscal deficit</p> <ul style="list-style-type: none"> • Its the condition where the the expenditure of the government exceeds its revenue in a financial year. 																					
<p>Revenue deficit</p> <ul style="list-style-type: none"> • It occurs when the government's total revenue expenditure exceeds its total revenue receipts. 																					

Why is this fiscal consolidation significant?

- **Fiscal prudence of the States-** The states in aggregate managed to be fiscally prudent despite a significant contraction in revenues even during peak of COVID-19 peak.
- **Union-State fiscal Coordination-** It is needed for emergency provision during the pandemic to spend for health and livelihood.

- States were able to *reprioritise expenditure* and quickly contain the Fiscal Deficit.
- **Reduction in Fiscal Deficit** - It is due to combination of expenditure-side adjustments, improved Goods and Service Tax (GST) collection and higher tax revenues.
- **Non-GST revenues** – It is also showing signs of recovery post pandemic in many states.

What are the fiscal challenges?

- **Increase in Revenue Deficit (RD)** - The reduction in fiscal deficit has not resulted in corresponding reduction in revenue deficit.
- The all state share of Revenue Deficit in Fiscal Deficit for 2023-24 is expected to be at 27%.
- **Debt to GSDP** - Most States also have large debt to GSDP ratios.
- This creates a *fiscal imbalance* which has long-run fiscal implications.

All-State Revenue Deficit - 0.78% of GSDP
All-State Fiscal Deficit - 2.9% of GSDP

What steps can be taken for revenue deficit consolidation?

- **Tackling the revenue deficit** - Re-emergence of revenue deficit in recent years can be tackled with incentive compatible framework.
- **Interest-free loans** - It can be given to the States by the Union Government to eliminate the possibility of a substitution of States' own capital spending.
- It also prevents the diversion of borrowed resources to finance revenue expenditure.
- **Fiscal adjustment plan** – A defined time path with a credible fiscal adjustment plan would help restore fiscal balance and improve quality of expenditure.
- A forward-looking performance incentive grants can be launched based on the different approaches provided by earlier Finance Commissions.
- It is necessary to achieve the targets as prescribed in Fiscal Responsibility and Budget Management Act 2003, *FRBM Act*.

Fiscal Responsibility and Budget Management (FRBM) Act

- The Fiscal Responsibility and Budget Management (FRBM) Act was enacted in 2003.
- It led to the framing of *FRBM Rules in 2004* that sets targets for the Central government to ensure fiscal discipline.
- **Amendment** - In 2018, the Centre is mandated to take appropriate steps to limit its *fiscal deficit to 3% of GDP* by March 31, 2021 although this is an operational target.
- The mandated target pertains to the *Centre's debt-GDP ratio* which is to be brought down to **40%**.

To know more about Union Budget 2023-24 on Fiscal Consolidation click [here](#).

1.8 Manufacturing Productivity in India

Why in news?

The growth rate of manufacturing productivity in India is in negative trend which got accelerated during COVID-19.

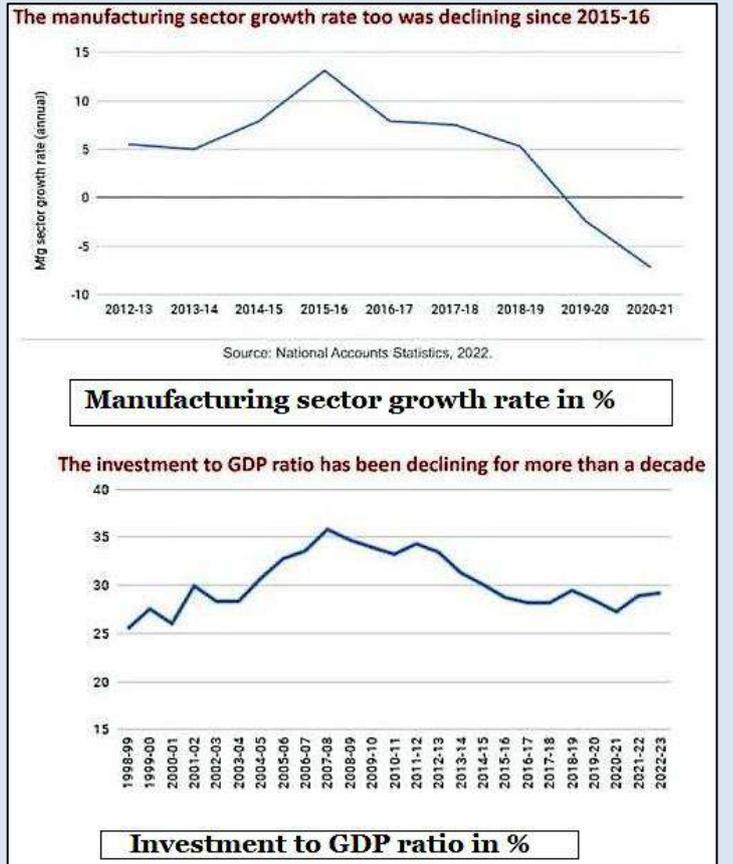
What is the significance of manufacturing sector?

- Agriculture contributes only about 20% of India's Gross Value Added but still employs close to 55% of India's workforce.
- The fact that agriculture is not as remunerative is made worse by the fact in India there are just too many people dependent on agriculture (**disguised unemployment**).
- The better solution is to pull people out of farms and get them employed in other sectors such as manufacturing which requires fewer soft skills.
- Having more people in manufacturing will make India the preferred factory of the world and will pull millions out of poverty.
- The Indian government hopes to have 25% of the economy's output come from manufacturing by 2025.

India is the 3rd most sought-after manufacturing destination in the world & has the potential to export goods worth US\$ 1 trillion by 2030.

Status of Manufacturing Sector

- **GDP** - Manufacturing sector contributes to **17% of GDP** and employs **20% of the workforce** in the country.
- Most of India's GDP comes from service sector while millions languish in the agriculture sector and manufacturing stayed stagnant.
- **Employment** - The data from CMIE shows that employment in India's manufacturing sector has fallen from over 51 million in 2016 to less 36 million in 2023, **a fall of over 30%**.
- **Productivity** - The growth rate of productivity fluctuated between 10 to 15 % in the 1990s and 2000s and began to **stagnate after 2015**.
- This **negative trend** accelerated into the several years preceding the pandemic.
- **Regional disparity**- Western and Central Indian states tend to have the highest average productivity in manufacturing, while the Southern and Eastern states have the lowest.
- **Investment** - Data shows that investing in workers (either as higher salary or better benefits) pays rich dividends for firms.



What are the reasons for low manufacturing growth productivity?

- **Premature deindustrialisation** - At a macro-manufacturing level, India experienced premature deindustrialisation.
- It observed a **sudden fall in its manufacturing-GDP ratio** before achieving an optimal rate of development resulting in a sub-optimal manufacturing scenario and a fragmented labour market.
- **Jobless growth**- It is an economic which refers to a situation where **economic growth does not lead to job creation**, but is due to quantum jump in service sector with minimal growth in manufacturing sector.
- **Unskilled labour**- The majority of the workers in India lack the proper skills to work in the manufacturing industry. **Only 10% of the Indian workforce falls into formal economy.**
- **Lack of investment**- Manufacturing sector is capital intensive industry, lack of entrepreneurial spirit and low investment leads to low growth rate.
- **Low production capacity**- In India, MSMEs contribute around **29% of GDP**, but having large number of small enterprises lead to increase in the cost of production.
- **Trade deficit**- It is due to cheap imports and high import duty on raw materials which hikes the production cost. Further, exports is less than imports.
- **Connectivity issues**- India's average logistic cost is **14% of the GDP whereas, the global average is 8%**.

Steps Taken to Promote the Manufacturing Sector

- **Make in India** - It was launched in 2014 to facilitate investment, foster innovation, build best in class infrastructure and make India a hub for manufacturing, design and innovation.
- **Industrial Corridor Development Programme**- It is to develop Greenfield Industrial regions with sustainable infrastructure.
- As part of National Industrial Corridor Program, 11 Industrial Corridors are being developed in 4 phases.

- **Ease of Doing Business-** The key focus areas of the initiative are simplification of procedures, rationalization of legal provisions, digitization of government processes etc.,
- **National Single Window System-** Announced in Budget 2020-21, it is envisioned as a one-stop shop for investor related approvals and services in the country.
- **PM Gati Shakti-** It is a transformative approach to facilitate data-based decisions related to integrated planning of multimodal infrastructure, thereby reducing logistics cost.
- **National Logistics Policy-** It was launched in 2022 that aims to reduce the logistics cost, which stands at 14% of GDP to 9-10%.
- **Production Linked Incentive (PLI) scheme-** It has identified 14 key sectors with an outlay of Rs. 1.97 lakh crore to enhance India's manufacturing capabilities and exports.
- **National Manufacturing Policy-** It is launched in 2011 which works on the principle of economic and industrial growth in partnership with states

What lies ahead?

- **Improve capacity utilization-** Government can incentivise industry focus on increasing capacity utilisation and lower the production cost.
- **Focus on power sector-** Power sector is the lifeline of manufacturing industry, power fluctuation and shortage must be checked for consistent increase in the production.
- **Incentivise production-** The coupled efforts of tax profit and production incentives will increase in the manufacturing capability of India which would also increase the job opportunities.
- **Localize defence production-** Defence production in India will leverage its Atmanirbhar Bharat vision and reduce the high military spending on imports.
- **Skill development-** Proper skill enhancement will have a positive impact on demographic dividend of the country.
- **Increase investments-** It needs a holistic approach of improvement in land, labour, entrepreneur and capital.
- **Improve infrastructure-** Reducing the infrastructure bottlenecks and improving the connectivity will play a major role in manufacturing sector.

1.9 Need for reform in CPI basket

Why in news?

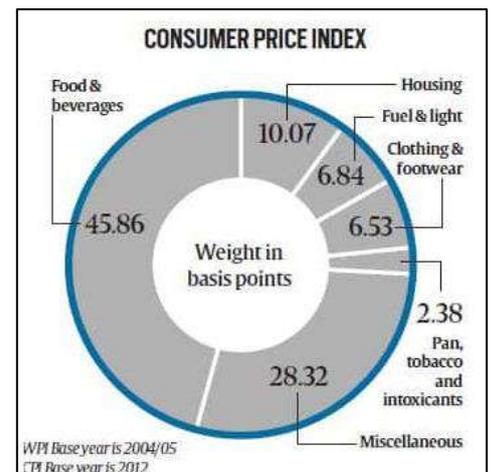
The items in the CPI basket and the weights assigned to them should not remain unchanged as it conceals the actual inflation picture.

What is Consumer Price Index (CPI)?

- CPI is a comprehensive measure used for estimation of price changes in a basket of goods and services representative of consumption expenditure in an economy.
- Inflation is measured using CPI.
- The percentage change in this index over a period of time gives the amount of inflation over that specific period.
- The National Statistical Office (NSO) under Ministry of Statistics and Programme Implementation (MoSPI) releases CPI in India with the base year 2012.

What is Household Consumption Expenditure Survey (CES) data?

- The Household Consumption Expenditure Survey (CES) is a recurring survey taken every five years by the government's National Sample Survey Office (NSSO).
- The data from the Household CES is used to shift the weights for CPI.
- Currently, the Ministry of Statistics and Programme Implementation (MoSPI) is in the midst of the CES.
- **Effects of CES data absence** - Inability to determine the population under the poverty line accurately.
- Inability to track inflation effectively.



What are the issues with the present CPI?

- CPI is used in accurately measuring the cost of living and economic well-being.
- The real consumption basket of a common Indian is fluid and continually evolving, mirroring the shifts in societal needs, preferences, and economic conditions.
- **Archaic parameters** - Tracking items that no longer hold the same relevance in our consumption patterns.
- According to Engel's Law, as the economy grows, the proportion of income spent on food decreases.
- **Higher food weightage** - In the current CPI (base year 2012), weightage of food and beverages is still 45.86 (46.2 in 2001).
- Over-reliance on food inflation today distinguishes Indian inflation from many other developed countries.
- **Modified consumption pattern** - The high weight of cereals (9.67) in the current CPI highlights two critical issues.
- With economic development of a country, there should be a paradigm shift in dietary habits of its people.
- The Pradhan Mantri Garib Kalyan Yojana has substantially reduced cereal expenditure for a large segment of the populace.
- This modifying consumption patterns further led to reducing the relative expenditure on cereals.
- **Dependence on TOP** - Tomatoes, onions and potatoes have a considerably higher impact on inflation. It should be lower.
- **Technical lag** - In a rapidly evolving digital economy, our data collection and inflation estimation methods must adapt and evolve in tandem.



What are the challenges?

- CPI and inflation should accurately reflect the realities of modern-day consumption and living.
- An up-to-date consumption expenditure data is required to effectively reflect the evolution of consumption patterns in our inflation metrics.
- Efficient data processing should be given non-negotiable priority.
- Early collection and processing of data and integrated usage of technological advancements.

1.10 Greedflation

Why in news?

There is a growing consensus across the world that corporate turns crisis into an opportunity for businesses to make supernormal profits.

How inflation is contained in an economy?

- Inflation is the rate of increase in prices over a given period of time.
- Central banks use monetary policy to contain the inflation.
 - It raise interest rates to bring overall demand in line with overall supply containing demand-pull inflation.
 - It raise interest rates to contain demand which in turn contains cost-push inflation.
- In case of Greedflation, the whole monetary policy prescription becomes more unjust and ineffective because it is neither due to higher input cost nor due to excess demand.

What is Greedflation?

- Greedflation is the exploitation of inflation by corporates to create excessive profits. It simply means (corporate) greed fuelled inflation.

- In normal inflation situation, corporates go for the wage-price spiral, whereas in Greedflation corporates choose the profit-price spiral.
- This is used to maximise their profit margins that, in turn, further fuelled inflation.
- Greedflation happens in two scenarios.
 - When the price mark-up is far in excess of the increase in inputs.
 - When businesses do not bring down the market prices even when the input prices fall.

What are the implications of greedflation?

- Less likeliness to spend money will lead to reduced economic activity.
- Creates social unrest due to raising cost of living.
- Forces governments to intervene like windfall tax to contain inflation.
- Reduces the purchasing power of the people making even basic needs hard to afford.
- On the corporates' side it affects the business as well as loss of customer trust.

Cost-push inflation

• Prices get pushed up because input costs have risen

Demand-pull inflation

• Prices are pulled up because there is excess demand

Wage-price spiral

• A cyclical condition where the rise in wages leads to increased prices, resulting in inflation

Profit-price spiral

• Companies exploit the existing inflation by putting up their prices way beyond just covering their increased costs

Is Greedflation happening in India?

- Net profits of 4,293 listed companies reached Rs.2.9 trillion in the March 2023 quarter.
- This spike in profits is over 3.5 times the average quarterly profit earned by listed companies till before the pandemic of 2020.
- The data shows the Indian corporate sector has generated superlative profits in the post pandemic period.
- The sharp spike in profits depicts there is a very good chance that corporate greed also played a role in spike the inflation rate in India.

According to the Centre for Monitoring Indian Economy (CMIE), '60% of the growth in net profit can be attributed entirely to the increase in profit margin.'

1.11 Withdrawal of 2000 Rupee Currency Notes

Why in news?

The RBI has decided to withdraw 2000 rupees currency notes in circulation due to increasing digital payments and in pursuance of the clean note policy.

Why did RBI decide to withdraw 2000-rupee currency notes?

- **Introduction** - The 2000 rupee note was introduced in November 2016 to address the aftermath of demonetisation to meet the currency requirement of the economy in an expeditious manner.
- **Withdrawal** - The RBI decided to withdraw 2,000 rupees notes from circulation as a part of its currency management.
- The 2000 rupee notes continues to be legal tender, as the withdrawal is not regarded as demonetisation.
- These notes can be exchanged at any bank branch or RBI offices up to September 30, 2023.

Indian currency system

- As per Section 22 of the RBI Act 1934, RBI has the sole authority to issue banknotes in India.
- RBI Act 1934 empowers RBI to issue all the banknotes except 1 Rs. note.
- Every currency notes, other than Rs. 1 rupee note, bears on its face a promise from the Governor of RBI.
- Coins and 1 Rs. notes are issued by the Government of India under the Coinage act 1909.
- One Rupee note is considered as coins as per the definition of coins given under Coinage Act.
- One Rupee note is issued by the Ministry of Finance and it bears the signatures of the Finance Secretary.

- Exchange of Rs.2,000 bank notes to notes of other denominations can be made up to a limit of Rs 20,000 at a time.
- Since they were intended to replenish the Indian economy's currency in circulation quickly after demonetization and has achieved its objective.
- Some experts feel the upcoming state and general elections also may be the reasons since the usage of cash spike these times.
- In pursuance of the 'Clean Note Policy' of the Reserve Bank of India, it has been decided to withdraw the Rs 2000 denomination banknotes from circulation.
- The majority of the Rs 2000 denomination notes were issued prior to March 2017 and they have an estimated lifespan of 4-5 years.

In value terms, share of 2,000 rupee denomination notes (at Rs.3.62-lakh crore) was at 10.8% as on March 2023.

What is the clean note policy?

- The Clean Note Policy seeks to give the public good-quality currency notes and coins with better security features, while soiled notes are withdrawn out of circulation.
- The RBI had earlier decided to withdraw from circulation all banknotes issued prior to 2005 as they have fewer security features as compared to banknotes printed after 2005.
- However, the notes issued before 2005 continue to be legal tender.
- They have only been withdrawn from circulation in conformity with the standard international practice of not having notes of multiple series in circulation at the same time.

ICICI Securities Primary Dealership estimates the liquidity surplus could increase to Rs.1.5-2 trillion.

What are the other impacts?

- **Liquidity** - About 2.5-3 trillion rupees of banking sector liquidity leaks out as currency in circulation each year.
- The Deposit of 2,000 rupee notes in Banks could result in a boost in bank deposits and its liquidity.
- **Deposit** - There is a surge in incremental C/D (Credit-Deposit) ratio, nearing pre-pandemic levels.
- The banks are ready to meet funding needs from diverse sectors giving boost to the economy.
- **e-RUPI push** - The absence of higher denomination notes gives rise to the usage of digital payments.
- The RBI's retail CBDC project ([e-RUPI](#)) is ready to hit the streets.
- It will propel faster adoption of e-RUPI for merchant transactions, concurrent with physical fiat currency.
- **Short term rates** - If liquidity surplus improves sharply because of these deposits, the weighted average call rate could sustain below the repo rate for a short period of time.
- Short-term interest rates for G-secs, bank bulk deposits and corporate borrowings is also likely to ease.
- **T-bills** - Due to the ease in interest rates, there will be a demand for Treasury bill auctions.
- **Bonds** - The spill over to 3-year and 5-year bonds and yields of such notes could fall by up to 10 basis points.

Implications of the Withdrawal

Slowdown economic growth in the short term

- Since withdrawal could lead to a slowdown in cash based transactions.

Long term benefits

- Even though in short term the economy may down in long term it will lead to increased transparency and efficiency in the economy.

Banks

- Ease the pressure on deposit rate hikes. There will be reduction in cash in circulation and that will in turn help improve banking system liquidity.

Shorter term government securities

- Improved banking system liquidity and an inflow of deposits into banks could mean that short term interest rates in the market drop as these funds get invested in shorter-term government securities.

Clean Notes

- To provide good quality currency notes with better security features to the public.

1.12 Ways and Means Advances

Why in news?

RBI capped the limit of ways and means advances to Rs 1,50,000 crore for the first half of the financial year to address the poor cash management.

What are Ways and Means Advances (WMA)?

- Ways and means advances are *temporary advances given by the RBI to the Centre and state governments* to tide over any mismatch in receipts and payments.
- It was introduced in 1997 and comes under *Section 17(5) of the RBI Act of 1934*, to end the four-decade-old system of ad-hoc treasury bills to finance the central government deficit.
- The government can avail of immediate cash from the RBI is required, but it has to return the amount *within 90 days*, the interest is charged at the existing *repo rate*.
- If the WMA exceeds 90 days, it would be treated as an *overdraft* (the interest rate on overdrafts is 2% points more than the repo rate).
- WMA is not a resource to finance government expenditure. It is *not part of the Fiscal Responsibility and Budget Management Act (FRBM)* because they get paid within the year itself.

What are the impacts of arbitrarily fixing the WMA?

- Lack of transparency.
- Lacks integrity of the interface between the monetary authority and the fiscal authority.
- Government's poor cash management.
- Mismatch in WMA (actuals) and Budget Estimates. In 2019-20, receipts for WMA (actuals) were Rs 11,79,582 crore as against Budget Estimates of Rs 5,00,000 crore.
- Weakens the integrity of the union budget.

What is the need of the hour?

- **A new model** - Should be formulated which considers the actual data for the past three years of actual budgetary transactions in receipts and expenditure before fixing WMA limits.
- **Revenue deficit** - WMA should not be used as a resource to meet the revenue deficit.
- **Expert committee** - On the similar line of the State governments should be formed for fixing WMA limits and overdrafts.
- **Monetary limit** - On the overdraft facility should be fixed to address the poor cash management.
- **RBI press release** - Should explicitly provide the current position of availment of the overdraft.
- **Ensure data transparency** - The RBI and the government should consider publishing the WMA data along with the overdraft position in the RBI bulletin to ensure data transparency.

1.13 The Internationalization of the Rupee

Why in news?

The Reserve Bank of India (RBI) has put in place the mechanism for rupee trade settlement with as many as 18 countries.

What is internationalization of Rupee?

- **Internationalization of the Rupee** – It is the process of increased cross-border transactions involving the Indian currency.
- It corresponds to trade especially in import-export, current account transactions, and capital account transactions.
- **International settlement** - This would enable the international settlement of trade in Indian rupees in foreign trades, as opposed to other currency including US dollars.
- The goal of internationalizing the rupee is to make it a more widely accepted currency in international trade and investment.

Internationalization of Rupees	
Benefits	Challenges
<ul style="list-style-type: none"> • Mitigate exchange rate risk - Internationalization of the INR can lower transaction costs of cross-border trade and investment operations by mitigating exchange rate risk. • Reduce risk – Eliminates the risk of exposure to currency volatility faced by Indian businesses. • Exports becoming competitive - Reducing currency risk can reduce the cost of doing business and can hence help in making exports more competitive in the global market. • Increased financial integration - Help to integrate the Indian financial system with the global financial system. • This could lead to increased investment and economic growth. • Reduced need for foreign exchange reserves - The need to maintain foreign exchange reserves can reduce if a sizeable share of India's trade can be settled in terms of the domestic currency. 	<ul style="list-style-type: none"> • Process being complex - Rupee-trade arrangements have not been easy to implement. • Tarde arrangement with Russia is not yet fully operational even after a year-long engagement between the two partner countries. • Large trade deficit - With Russia would saddle Russia since with large rupee balances, it would have to find a way to use or invest. • Small market - The Indian economy is not as large as some other economies, so there is less demand for the rupee in the global financial markets. • Too much regulation - The Indian government has a number of controls on the rupee and these controls make it difficult for the rupee to be used as a global currency. • Lack of liquidity - The Indian rupee is not as liquid as some other currencies, so it can be difficult to buy and sell large amounts of rupees.

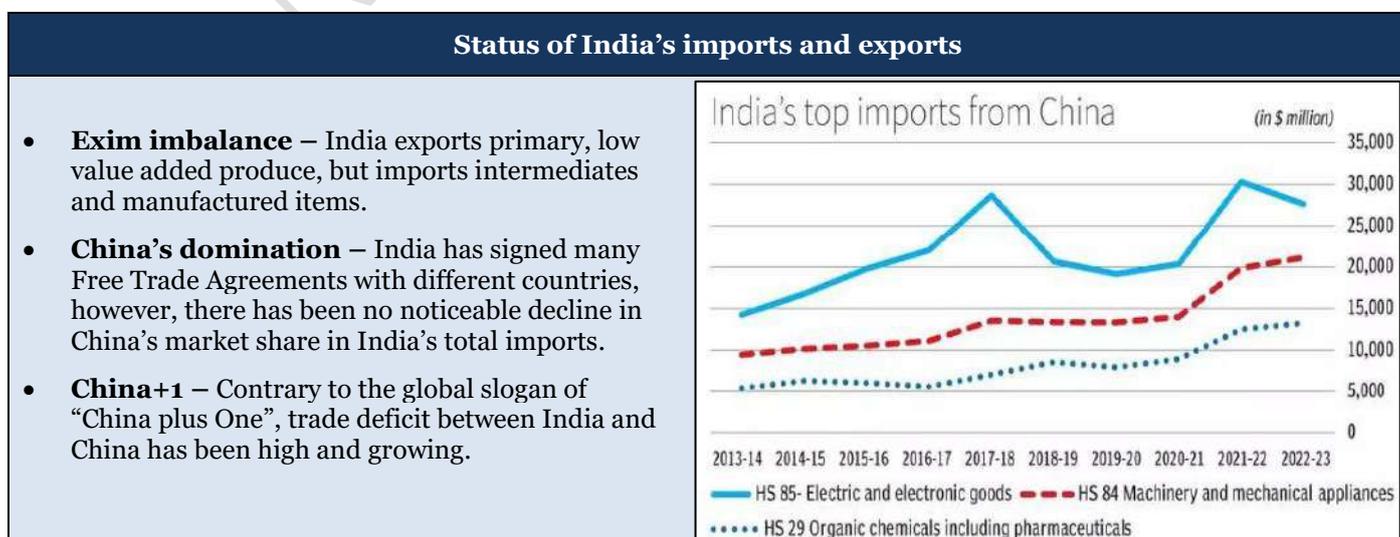
What is the way forward?

- India should learn from China's Experience of China's success in internationalizing the renminbi (RMB) and it also had trade surplus across the world.
- Currency swap agreements and creation of offshore market should be enhanced.
- Considerable thinking and planning would be required to make it function in a manner that does not adversely affect the economy's fundamentals.
- Allow the settlement of foreign trade in rupees.
- Create special rupee-denominated bonds.

1.14 India's Trade Dilemma with China

Why in news?

China has emerged as India's top source of imports and the share of China in India's total merchandise imports has steadily increased.



What are the commodities that constitute the Indo-China trade basket?

- **Harmonized System (HS)** – The HS of global trade is a standardised numerical method of classifying traded products.
- Using the dataset on international trade maintained by the Ministry of Commerce, 10 product groups' account for about 80% of India's total imports from China.

Import basket	Export basket
<ul style="list-style-type: none"> • At HS 2-digit level – Among these, the top three product groups, make up for more than 60% of India's total imports from China. • These product categories include products like electronic goods, mobile phones, semiconductors, electrical appliances, organic chemicals including pharmaceuticals. • In each of these three product categories, China's share in India's total imports varies between 40 and 50%. • And for the last 10 years these top 3 product categories have remained unchanged. • At HS 4-digit level – India's top 10 imports from China are mostly value-added manufacturing products. • These are electrical goods and machinery, electronics and semiconductors, organic chemicals and pharmaceuticals. 	<ul style="list-style-type: none"> • India's exports to China have been more volatile and the latest data show that in 2022-23, India's exports to China has declined in absolute terms. • India's merchandise imports from China was more than 6 times of its merchandise exports to China. • Refined petroleum – These products have become India's most important export item to China. • Agri products – Other than that, India's exports to China have been mostly dominated by agricultural goods and metals. • Metal ores – Iron ores, semi-finished products of iron, copper and copper products, cotton and cotton yarn, fish and marine products, vegetables, vegetable oils and rice are India's major export items to China.

What does these trade patterns indicate?

- **More import than export** – Such trade pattern reveals that trade is not only highly unbalanced between China and India, but India is also primarily exporting low value added products.
- India mostly imports value-added manufacturing goods and intermediate goods from China.
- **Low value exports** – India's exports are mostly resource intensive primary or semi-processed products.
- In international trade, it has been observed that countries which operate at the lower end of the value chain tend to gain much less from trade because gains from exports depend to a large extent on domestic value addition and export sophistication.
- While China has emerged as a big export market for India, India ends up exporting low value-added goods to China, then its gains will be limited.

Does manufacturing sector gain from this trade pattern?

- **Cheap inputs** – It can be argued that certain manufacturing sectors in India may be gaining from Indo-China trade as availability of cheap intermediate inputs from China.
- **Competitive markets** – The cheap inputs has possibly helped them stay competitive in the domestic and international markets.
- However, it is also true that some sub-sectors of Indian manufacturing may have been adversely affected because of imports from China.

Among India's top imports from China, most of them are intermediate goods which are used as inputs in Indian industries.

What can India do?

- **High value exports** – If India wants to make a mark in the global value chain and at the same time emerge as a manufacturing giant, then Indian exports need to move up the value chain.
- **Impetus to manufacturing** – The renewed emphasis on manufacturing in India should further improve the quality of Indian exports.
- Given that China is the world's second largest economy, it is a huge market and India must look to break into the higher value-added segments there.
- India's trade strategy needs to be linked up with China in a more organic manner and come out from its current pattern.

1.15 Welfare Expenditure

Why in news?

The Union Budget 2023 was criticized over a decline in allocations for welfare schemes in real terms, at a time of post-COVID-19 recovery.

What is welfare expenditure?

- Welfare expenditure is expenditure on social welfare programmes that provide a social safety net to citizens and ensure basic rights, including livelihoods, health, nutrition and education.
- The budget 2023 indicates that it is the first time since 2009, that social sector spending is less than 20% of total government expenditure.
- The reduction in welfare expenditure is mainly due to *increased capital expenditure spending*.

Trends of welfare expenditure

Hunger and malnutrition	Healthcare
<ul style="list-style-type: none"> • Saksham Anganwadi and Poshan 2.0 – Aims to address child malnutrition and hunger. • The expenditure on Saksham Anganwadi and Poshan 2.0 went down from 0.13% of GDP in 2014-15 to 0.07% in 2023-24. • Mid-day meal (MDM) scheme – For improvement in class attendance, learning as well as nutritional outcomes and reduced stunting in children. • National Food Security Act (NFSA) - Provides subsidised grains to over 80 crore people. • For NFSA, expenditure as a share of GDP went to 0.65% this year from 0.94% in 2014-15. 	<ul style="list-style-type: none"> • The share of central health expenditure in GDP went up from 0.25% in 2014-15 to 0.30% this year but it is too little in a post-COVID world. • PM Matru Vandana Yojana (PMMVY)- Provides maternity benefits as a conditional cash transfer of Rs. 5,000 to women in the unorganised sector • The PMMVY Budget is yet to cross Rs 3,000 crore against the need of Rs 14,000 crore. • Out-of-pocket expenditure - India's out-of-pocket expenditure on health remains much higher than the global average, pushing millions into poverty each year.

Working class

- **Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA)** - Guarantees 100 days of employment to every rural household
- Expenditure of MGNREGA as share of GDP went t from 0.26% in 2014-15 to 0.20% in 2023-24.
- However, since 2020-21, NFSA and MGNREGA allocations have declined rapidly as a share of GDP.
- **National Social Assistance Programme (NSAP)**- Provides pensions to elderly, widows, and disabled individuals below the poverty line and monetary assistance to families that have lost a breadwinner.
- Expenditure on NSAP as a share of GDP went down from 0.06% in 2014-15 to 0.03% in 2023-24.
- **Real wages** - Real wages of casual workers grew at less than 1% per year from 2014-15 to 2021-22.

What are the impacts of reduced welfare expenditure?

- The impacts of reduced welfare expenditure include
 - Lower economic growth
 - Lower rate of people coming out of poverty
 - Low human development index
 - Reduced economic activities
- Its result can be seen in India's stagnant [Human Development Index](#) rank at 132 and rising malnutrition levels.

1.16 New PMLA Rules

Why in news?

Finance Ministry brought chartered accountants, company secretaries, and cost and works accountants under the ambit of the money laundering law.

What were the changes made to Prevention of Money Laundering Act 2002?

- **Section 2(1) (sa) of PMLA, 2002** - The recent changes are made under this section of [PMLA](#) which already includes Gaming activity, Registration Authority, Real Estate Agents, Dealer in precious metals and stones.
- **Politically exposed persons (PEPs)** - Defined PEPs under PMLA as individuals who have been “entrusted with prominent public functions by a foreign country.
- It also includes heads of States or Governments, senior politicians, senior government or judicial or military officers, senior executives of state-owned corporations and important political party officials.
- **Increased the ambit** - Finance Ministry brought in practicing chartered accountants, company secretaries, and cost and works accountants carrying out financial transactions on behalf of their clients into the ambit of the money laundering law.
- **Financial transaction** - Included are
 1. Buying and selling of any immovable property,
 2. Managing of client money, securities or other assets,
 3. Management of bank, savings or securities accounts,
 4. Organization of contributions for the creation, operation or management of companies,
 5. Creation, operation or management of companies, limited liability partnerships or trusts, and
 6. Buying and selling of business entities.
- **Non-banking reporting entities** - Are widened to allow 22 financial entities to verify the identity of their customers via Aadhaar under the ambit of the money laundering law.

PMLA states that both the Adjudicating Authority and the Appellate Tribunal shall not be bound by the Code of Criminal Procedure, 1908 but by the principles of natural justice.

What is the need for the changes?

- Plug loopholes ahead of India’s proposed assessment later this year under the Financial Action Task Force (FATF).
- To bring uniformity in the definition of PEPs.
- To aid investigative agencies further in their probe against dubious transactions involving shell companies and money laundering.
- To address the Chinese loan app scams, in which professionals were actively involved in assisting to set up shell companies to act as a foil for the apps.

What is the way forward?

- Institute of Chartered Accountants of India (ICAI) will work with authorities and will conduct an awareness programme amongst its members for the implementation of the changes in PMLA 2002.
- Lawyers and legal consultants needs to be included in the PMLA act.
- Encompassing professionals under PMLA could also be a pre-cursor to India becoming a part of the Financial Action Task Force (FATF).

1.17 6 years of GST

Why in news?

Touted as one of the biggest tax reforms, India’s Goods & Services Tax (GST) turned six years this year.

What is Goods and Service Tax?

- **History** - The idea of a Goods and Services Tax (GST) for India was first mooted during the Prime Ministership of Shri Atal Bihari Vajpayee.
- The Constitution (**122nd Amendment**) Bill was introduced in 2014 in the Lok Sabha and was passed by Lok Sabha in May 2015.

- The Constitutional amendment was passed and notified as Constitution (**101st Amendment**) Act 2016 which paved way for introduction of Goods and Services Tax in India.
- GST was launched with effect from **1st July 2017**.
- **Goods and Services Tax** - GST completely transformed the indirect tax structure of India.
- GST was born out of subsuming of 17 taxes and 13 cesses levied by the Central and State governments.
- Apart from zero-rated goods, the new structure has just four tax slabs 5%, 12%, 18 and 28%.
- **GST Council** - The GST Council is a joint forum of the Centre and the States which makes recommendations to the Union and the States on GST.
- Every decision of the GST Council is taken at its meeting by a majority of not less than 3/4th of the weighted votes of the Members present and voting.

Over the last 5 years, the Value of Goods Transported Inter-State (Domestic Only) increased by 44% and the Cumulative Value of Imports and Domestic Goods increased by 34%. - Economic Advisory Council to the Prime Minister (EAC-PM)

The taxpayer base has witnessed a remarkable increase, surging from 63.9 lakh in 2017 to approximately 1.40 crore currently.

Why was GST launched?

- GST was launched with the motto, "**One nation, One market, One tax**".
- It aimed to bring unity and benefits for all stakeholders, governments, taxpayers, and administrators alike.
- It also simplifies the compliance for businesses and makes the tax system more transparent with several features.
- **Features of GST**
 - Unified taxpayer base governed by a uniform set of laws and procedures;
 - Common management of business records and filing returns;
 - An uninterrupted input tax credit chain through the mechanism of Integrated Goods and Services tax (IGST);
 - Completely automated and faceless administration with all processes being online.

Benefits of GST	Challenges of GST
<ul style="list-style-type: none"> • Despite the introductory challenges, one cannot deny the benefits that GST has provided to businesses and the Indian economy. • Few highlights of the GST regime <ul style="list-style-type: none"> ○ Single indirect tax regulatory framework for businesses ○ GST eliminated the cascading effect of taxes and reduced manufacturing costs. ○ Reduction of cascading effect of taxes ○ Digitization of compliances ○ Federal cooperation and enhanced economic integration of the States. • Revenue standpoint - this tax reform has witnessed a considerable increase in average revenue per month including in most cases during the pandemic year 2020-21. <ul style="list-style-type: none"> • It simplified the processes of return filing through technological advancement in GST continues. • E-invoicing today covers a taxpayer base which contributes more than 80% of GST revenue. 	<ul style="list-style-type: none"> • Initially the tax regime's technical, structural and procedural challenges took a while to sort out. • Bogus firms and <u>fake invoices</u> causes revenue loss and also adversely affects the competitiveness of honest taxpayers. • Dispute resolution remains a pain point for industry, with <u>GST appellate tribunals</u> still not set up. • There is <u>no road map</u> in sight on the rate rationalisation exercise or the inclusion of excluded items such as electricity, petroleum and real estate, without which the efficiency gains from the GST remain constricted. • The GST Council needs to <u>meet more often</u> and turn its to-do list into a must-do list expeditiously. • Extension of GST <u>Compensation cess</u> levies till at least March 2026, instead of the initial 5-year tenure.

What is the way forward?

- The risk parameters for the new applicants are continuously refined through use of data analytics and AI to control the rogue players.
- Taxation of online gaming activities and transactions involving cryptocurrency are few new areas that deserve attention under GST.
- Setting up of Centralised Authority to address the issues arising from contradictory orders passed by the Authority for Advance Rulings (AARs) in different states.
- A National Appellate Authority for Advance Ruling with the inclusion of judicial members in bench may improve this tax reform.
- A white paper for each industry with clarifications on major issues should help further improve the certainty index.
- Operationalization of the GST Appellate Tribunal to help taxpayers in getting quicker cost-effective resolution.

E-invoicing

- A system of electronic, standardised invoicing that enables seamless data sharing and tracking between businesses and the government.

1.18 GST on Online Gambling

Why in news?

The GST Council has said that the government will impose a goods and service tax of 28% on the turnover of online gaming companies, horse racing and casinos.

Market Overview of Online Gaming in India

- **Online gaming market** - The revenue of the Indian mobile gaming industry is expected to exceed *1.5 billion dollar in 2022*, and is estimated to reach 5 billion dollar in 2025.
- While India's gaming market is currently *smaller than the US and China*, it is worth about US 1.5 dollar billion and is expected to triple in size to reach US 5 billion dollar by 2025.
- India's percentage of *new paying users (NPU)* in gaming has been the *fastest growing* in the world.

Types of Online game

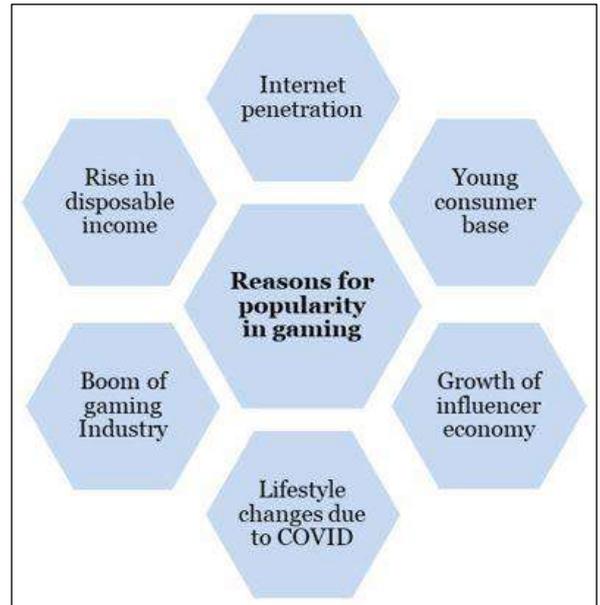
- **A game of skill** – It is the one in which a player's superior knowledge, training, attention, experience, personal traits, and abilities are crucial to success.
 - Example - Fantasy sports (Dream 11 and MPL fantasy cricket), casual games, and card games (Rummy or Poker)
- **A game of chance** – It is the one in which chance rather than skill determines the outcome.
 - Example - Playing cards, roulette, rolling a dice, or even picking a numbered ball are reflected upon as chance-based games.

What is the decision of GST meeting?

- The latest provision means that tax will be levied on the *entry bet at 28%* rather than the earlier tax which is levied on the *Gross Gaming Revenue (GGR) at 18%*.
- It is considered to do away with the distinction between game of skill and game of chance, thus, treating all games as demerit goods, thereby attracting a 28% GST rate.
- The government will bring amendments to the GST-related laws to include online gaming and horse racing in *Schedule III as taxable actionable claims*.
- As per GST, an actionable claim is defined as goods under the Central Goods and Services Tax Act, 2017.
- It is a claim to an unsecured debt or a claim to any beneficial interest in movable property that is not in the possession of the claimant.
- So far, lottery, betting, and gambling were classified as actionable claims. Now, horse racing and online gaming will be added.

What are the advantages of the move?

- **Transparency** - The move will simplify the mechanism, eradicate complexity and imbibe transparency.
- **Check on addiction**- The Government quoted that the increase in taxation would reduce children addiction to online gaming.
- **Tax payments** - The move would result in a 55% increase in GST payments.



What are the issues in this aspect?

- **Entire gaming industry as gambling**- The Government considers the entire gaming industry as gambling, which is not only against the established jurisprudence but may also fall *foul of the CGST Act 2017* itself.
- Even within the games of skill, all the games *cannot be equated*.
- **Impact on online gambling companies**- It will increase the *tax burden* where the tax exceeds the revenue and boost the growth of illegal gambling platforms.
- **Game of chance vs Game of skill**- Under the CGST Act, actionable claims are sought to be excluded from the ambit of GST, except for lotteries, betting and gambling.
- ‘Betting and gambling’ must be interpreted as *betting on a game of chance and not staking or betting on a game of skill*.
- **Games of skill vs. Casino games**- It is extremely difficult to *distinguish between incidence of taxation on casino games* with some games of skill like rummy and poker, which are played both online and on the casino floors.
- **Offends Article 14**- It offends the fundamental principle that *‘equals are to be treated equally and unequals are to be treated unequally’* and falls foul of Article 14 of the Constitution of India.
- **Against judgements**- Various [Court judgements](#) have reaffirmed the states of online skill-based games as legitimate business activity protected as fundamental right under the Constitution.
- **Increase in black market activities** - The tax could hinder the Digital India Initiative, leading to an increase in black market activities and criminal offences, due to a 400-500% increase in the GST burden.
- **Benefit offshore gambling sites** - The change may benefit offshore gambling sites, leading to a significant tax loss for the government and exposing Indian gamers to unregulated websites.
- **Deter foreign investment** - The industry also fears that the change could deter foreign investment.

All India Gaming Federation (AIGF), founded in 2016, is a self-regulatory apex industry body for online skill gaming in India.

1.19 Co-Lending Model of Loan

Why in news?

The RBI tightened the norms for co-lending models since borrower’s misuse the provision.

What is Co-lending?

- Co-lending is an arrangement where the *loan origination is by one entity usually non-banking financial company (NBFC) but the risk is shared by two entities (NBFC and banks)*.
- NBFC is the originator while a bank is where the major portion of the loan rests.
- Co-lending model is developed by [RBI](#) to address the flow to credit to unserved sectors of the economy.



What are the advantages of co-lending?

- **Multiple partners** - An NBFC can partner with multiple banks and a bank can partner with multiple NBFCs.
- **Wide range of loans** - It includes wide range of loans such as housing, affordable housing, gold, commercial vehicles, passenger vehicles or even microfinance loans.
- Basically it includes everything in retail.
- **Formulate its own policy** - The NBFC and banks can formulate their own policy on internal practices and risk management framework.
- **Risk sharing** - 80% of the loan risk is borne by the bank and the rest 20% by the NBFC.
- This ensures accountability on NBFC.
- **Financial inclusion** - This model allows banks to penetrate outside the urban and semi urban areas.
- It also accepts loans starting from Rs 3 to 5 lakhs and go up to Rs 1 crore.
- **Flow of credit** - This model improves the flow of credit to the unserved and underserved sector of the economy.
- **Higher growth for NBFCs** - This model has helped the NBFCs to grow substantially during recent years.

What are the impacts of tighter regulations by RBI?

- Borrowers with not-so-good credit record may find it more difficult to get loans.
- The penetration of loans to areas outside metro zones may be reduced.
- The borrower gets a loan from a particular bank and under stress pulls out and gets a new loan from different bank is addressed by RBI's tighter norms.

1.20 Legal remedies available to Gig Workers

Why in news?

The strikes by Blinkit workers has once again brought to the forefront the issues plaguing the gig economy in the country.

Who is a gig worker and what is platform work?

- **Gig workers** – It refers to workers outside the traditional employer-employee relationship.
- **Gig economy** – It falls outside the scope of traditional, full-time employment.
- There are two groups of gig workers, platform workers and non-platform workers.
- **Platform workers** – Those working for an organisation that provides specific services using an online platform directly to individuals/organisations.
- **Non-platform workers** – These include the construction workers and non-technology based temporary workers.

Governing the Workers in India

- In India, employees are entitled to a host of benefits under statutes such as the:
 - Minimum Wages Act, 1948
 - Employees' Provident Fund and Miscellaneous Provisions Act, 1952 (EPFA)
 - Payment of Bonus Act, 1965
- **Contract Labourers** – They are governed under the Contract Labour (Regulation and Abolition) Act, 1970 and are also entitled to benefits such as provident funds in accordance with the EPFA.

What is the proposed law for gig workers?

- **National Commission on Labour** – It recommended to consolidate central labour laws.
- Hence, the Ministry of Labour and Employment introduced the Code on Social Security, 2020 which brings workers within the ambit of labour laws for the first time.
- **Social Security Schemes** – The Code stipulates that Central and State Governments must frame suitable social security schemes for gig workers.
- The Code also mandates the compulsory registration of all gig workers to avail of benefits under these schemes.
- **National Social Security Board** – The Code also envisages the constitution of a National Social Security Board by the Central government to monitor the implementation of such schemes.

What are the concerns of the gig workers?

- **Mixed nature** – The unique nature of gig work display characteristics of both employees and independent contractors and thus do not squarely fit into any rigid categorisation.
- **Little recognition** – Out of the four new labour codes proposed, gig work finds reference only in the Code on Social Security.
- **Excluded** – Gig workers remain excluded from vital benefits and protections offered by other Codes such as minimum wages, occupational safety and health benefits, and overtime pay.

- **No unions** – They cannot create legally recognised unions and access a national minimum wage that applies to all forms of employment.
- **No minimum wage** – Even the proposed law does not guarantee minimum wages for gig workers.

Rulings of Various Courts

UK	Netherland	Germany	Singapore
<ul style="list-style-type: none"> • The UK Supreme Court classified Uber drivers as workers under the UK Employment Rights Act 1996, thus entitling them to various benefits like paid holidays and minimum wages. 	<ul style="list-style-type: none"> • The Dutch High Court also handed down a similar ruling, stating that the legal relationship between Uber and the drivers meets all the characteristics of an employment contract. 	<ul style="list-style-type: none"> • Germany's Temporary Employment Act provides for equal pay and equal treatment of gig workers. 	<ul style="list-style-type: none"> • It has also proposed legislative changes to extend work injury insurance and pension coverage to such workers.

- **Redundancy** – Minimum wages, which is presently governed by the Minimum Wages Act, will be subsumed under the Wages Code.
- **No redressal mechanism** – Gig workers are excluded from accessing the redressal mechanism under the Industrial Disputes Act, 1947.

What is the way forward?

- **Statutory affirmation** – The deplorable working conditions of the employees of digital labour platforms in India and the need for statutory affirmation of the rights of gig workers.
- **Legislations** – With the gig industry gaining prominence across the world it is necessary that legislations are being passed to that effect, over and above social security benefits.

1.21 A Digitally Unprepared Workforce

Why in news?

The need for the digital jobs is in high demand and India's demographic dividend could be a leverage if the youth are equipped with adequate digital skills.

What are the challenges to digital workforce?

- **Pace of technological change** - Continues to accelerate and demand for such skills doesn't meet the skill supply.
- **Availability of training is not available in wide range** - The training provided by the government is available only in the few areas within the digital space.
- **Artificial intelligence** - According to World Economic Forum the AI will replace the jobs of the digital workforce but also create new jobs in different fields.
- **Lack of skills in Data-driven field** - The jobs of the future are expected to rely more on data-driven and machine-powered processes.



- **Disproportionate enrolment** - Youth enroll in IT-ITeS vocational or technical courses, with a significantly high percentage of 34.7%, in comparison to other courses.
- **Inadequate training** - 29% of the 30% trained workforce are unemployed due to inadequate training content or poor training quality.

What can be done to address the digital skills crisis?

- **Revamping skills** - To adapt to the changing job market the entire skill development system needs to be restructured.
- **Upskilling** - To upskill the workforce in line with the emerging technologies.
- **Strategic investment** - Particularly in the reskilling of the workforce to keep up with the digital transformation.
- **Skill India Mission and Pradhan Mantri Kaushal Vikas Yojana (PMKVY) 4.0.** - Needs to be implemented efficiently to provide digital skills on emerging technologies like artificial intelligence, mechatronics and robotics.

1.22 First Loss Default Guarantee for Fintechs

Why in news?

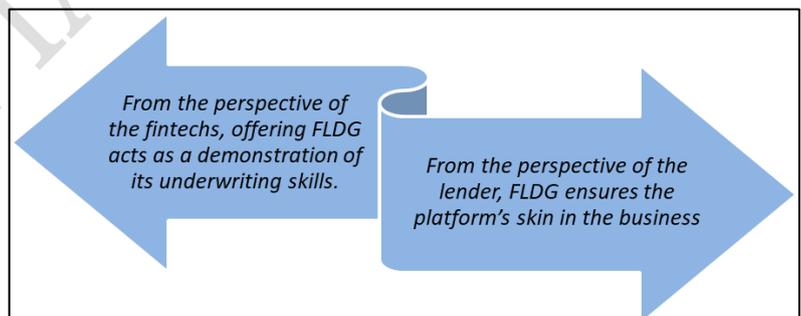
The Reserve Bank of India (RBI) has allowed First Loss Default Guarantee (FLDG) for fintech Lending Service Providers (LSP).

What is an FLDG arrangement?

- *Default loss guarantee* (DLG) is also known as First Loss Default Guarantee (FLDG).
- First loss default guarantee (FLDG) is a *lending model* between banks or non-banking finance companies (Regulated Entities) and lending service providers (fintech firms).
- In FLDG arrangement, the initial hit on a default is taken by a third party such as fintech firm that originated the loan.
- The fintech player (LSP) compensates lenders if the borrower defaults up to a certain threshold of the loan portfolio.

How do FLDG work?

- The LSP provides first loss guarantee up to a pre-decided percentage of loans generated by it.
- The loan portfolio backed by FLDG is similar to the off-balance sheet portfolio of the LSP.
- The lender do not partake in any lending process but the nominal loans sit in the balance sheet of the lender.
- But the credit risk is borne by the LSP without having to maintain any regulatory capital.



Why do we need FDLG?

- To avoid 'synthetic securitisation' as it is prohibited by the RBI.
- REs were hesitant to lend through fintechs without commitment towards loan loss.
- Fintech industry's business is affected by RE's hesitancy.

What did the RBI say on FDLG?

- The RBI has released a circular clearly specifying details on scope, eligibility, structure, form, cap, disclosure requirements, and exceptions.
- **Conditions** - A Regulated Entity (RE) can enter into DLG arrangements only with an LSP or other REs with which it has entered into an outsourcing (LSP) arrangement.
- The LSP-providing DLG must be incorporated as a company under the Companies Act, 2013.

- The total amount of DLG cover on any outstanding portfolio does not exceed 5% of the amount of that loan portfolio.
- The guarantee is accepted by the bank only in the form of a cash deposit, or fixed deposits in a bank.

What are the benefits of FDLG?

- Facilitates orderly development of the digital lending ecosystem and boosts fintech activity in the financial sector.
- Enhances credit penetration through digital space.
- Facilitate entry of small and medium fintechs into the digital lending space in partnerships with banks or NBFCs.
- The guidelines facilitates all players to participate in an effective and transparent manner.

Quick Facts

- **Regulated Entity (RE)** - All Commercial Banks (including Small Finance Banks), Co-operative Banks and Non-Banking Financial Companies (NBFC) as per RBI.
- **Lending Service Providers (LSP)** - Fintech players who use technology platforms in the lending space.
- They are agents of a bank or NBFC who carry out one or more of a lender's functions.
- The functions include customer acquisition, underwriting support, pricing support, disbursement, monitoring and recovery of specific loan on behalf of REs.
- **Underwriting** - It is the process through which an individual or institution takes on financial risk for a fee.
- **Synthetic Securitization** - A structure where credit risk of an underlying pool of exposures is transferred (in whole or in part) through the use of credit derivatives or credit guarantees.
- In this, the credit risk of the portfolio remains on the balance sheet of the lender.

1.23 Fundraising Issues in Indian Startup Ecosystem

Why in news?

Due to interest rate hikes of global central banks and the ongoing banking crisis in the US, startups are facing difficulties in fund-raising.

What is a startup?

- **Startup** - A startup is defined as an entity that is headquartered in India which
 1. Was opened **less than 10 years** ago and
 2. Has an annual turnover **less than Rs 100 crore**
- It is an entrepreneurial venture in the early stages of operations, typically created for resolving real-life problems.
- **Unicorn** – It is a term given only to startups who have a valuation of **over \$1 billion**.
- **Decacorn** - Startups that exceed the valuation of **\$10 billion** are grouped as decacorn (super unicorn).

India had become the 3rd largest startup environment in the world and as the 3rd highest number of unicorns in the world next to US & China.

What is the role of startups in the growth of the Indian economy?

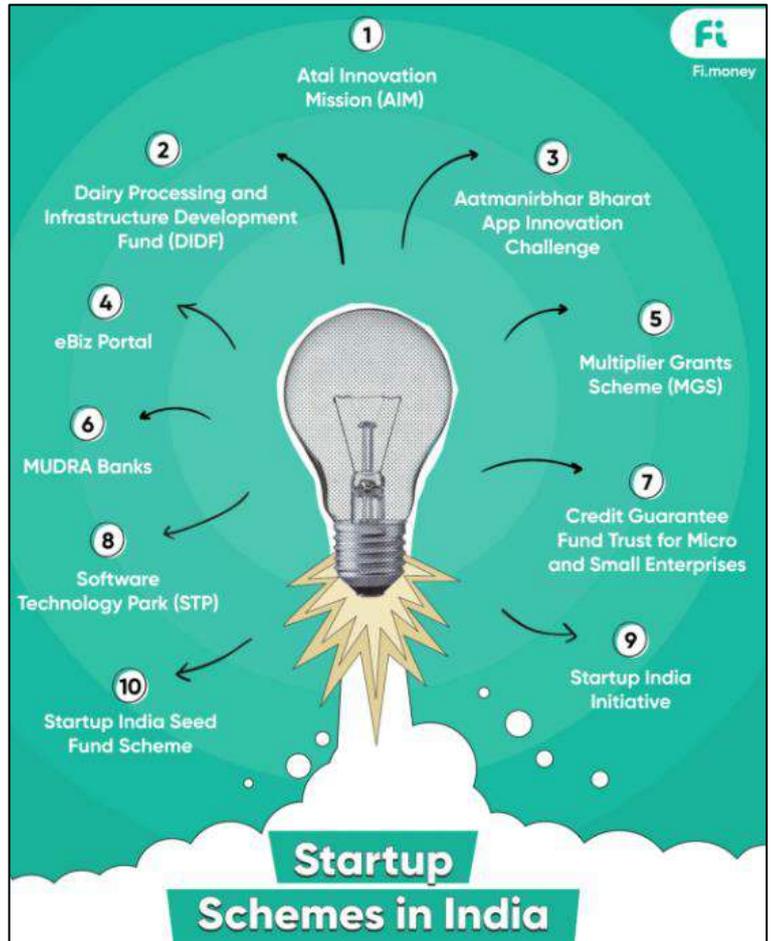
- **Employment creation** – The startups are enabling more jobs than large companies or enterprises thus curbing the unemployment problems.
- **New investments** - Many multinational corporations are now outsourcing their tasks to small businesses in order to focus on their core competencies.
- **Research and Development (R&D)** - Start-ups heavily subsidise R&D as they frequently have to deal with high-tech and knowledge-based services.
- **Better GDP** - It is feasible to increase revenue domestically by promoting & supporting start-up initiatives.
- **Democratizing the technology benefits** - Fintech startups are reaching out to remote areas with their solutions and making financial solutions easily accessible in tier 2 and tier 3 cities.

Why there is shortages in fund-raising?

- Interest rate hikes of global central banks
- Steep correction in valuation of technology stocks
- Increased risk aversion
- Ongoing banking crisis in the US and Europe
- Failure to deliver on their exaggerated growth promises due to Covid-19 pandemic
- Excessive liquidity created during the pandemic
- Change in consumption habits post-Covid
- High borrowing cost impacting profitability, leading to massive lay-offs in this segment
- Global venture capital investors who have suffered large losses in their portfolio are unlikely to provide much funding support

What could be done to address fund-raising?

- **Policy support** - The high-net-worth investors, investment funds and companies who have displayed a willingness to invest in fledgling companies should be channelized.
- **Fiscal and regulatory policies** - Investors need to be encouraged with suitable fiscal and regulatory policies to support the segment in periods when global funding dries up.
- **Abolition of angle tax** - Angel tax, which requires start-ups to pay income tax on capital received at a premium to their fair valuation should be abolished, since it deters fund raising from angel investors.
- **Alternate Investment Funds** - Investment into Alternate Investment Funds which invest in start-ups could be incentivized through a tax concession.
- **Capital gains tax rate** - Paid by resident individual investors on their start-up investment can be lowered.
- **Overseas exchanges** - Indian startups should be allowed to list on overseas exchanges.



1.24 Foreign Portfolio Investors

Why in news?

SEBI floated a consultation paper that proposed additional disclosures from Foreign Portfolio Investors (FPIs).

Who is a Foreign Portfolio Investor (FPI)?

- FPI involves holding financial assets from a country outside of the investor's own.
- FPI holdings can include stocks, ADRs, GDRs, bonds, mutual funds, and exchange traded funds.
- Foreign Portfolio Investors have only passive ownership and investors have no control over ventures or direct ownership of property or a stake in a company.
- Investments of **NRIs don't come under FPI**.

What are the differences between FPI and FDI?

- Both Foreign Direct Investment (FDI) and FPI are common ways for investors to participate in an overseas economy but has few distinct differences.

PROS AND CONS OF FPI	
<ul style="list-style-type: none"> Increases Capital availability Entry and exit is relatively easy Quick return on investment 	<ul style="list-style-type: none"> Volatile No direct control on management Exposure to political risk Low liquidity

	Foreign Direct Investment (FDI)	Foreign Portfolio Investment (FPI)
Definition	Investment made by foreign investors to obtain a substantial interest in the enterprise located in a different country.	Investing in the financial assets of a foreign country, such as stocks or bonds available on an exchange.
Type	Direct Investment	Indirect Investment
Market	Inflows in primary market	Inflows in secondary market
Role of Investors	Active Investor	Passive Investor
Degree of Control	High control	Very low control
Term	Long term investment	Short term investment
Investment is done on	Physical assets of the foreign country	Financial assets of the foreign country
Entry and Exit	Difficult	Relatively easy
Risks Involved	Stable	Volatile

What is the purpose of the proposal?

- To guard against possible circumvention of the requirement pertaining to Minimum Public Shareholding (MPS)
- To prevent the misuse of the FPI route to circumvent the requirements listed Press note 3.
- To identify tangible ownership and curtail incidences of multiple routes being used to acquire ownership
- To keep up with the minimum public shareholding norms and reduce regulatory requirements.
- To enhance transparency, fully identifying objective ownership of an entity in a holding.

What are the proposals made in SEBI’s consultation paper?

- The proposed legislation categorises FPIs into low risk, moderate risk and high risk.
- **High Risk FPIs** - FPIs holding *more than 50%* of their equity asset under management (AUM) in a single corporation or with an overall holding in Indian equity markets of over Rs 25,000 crore.
- High-risk FPIs would have to make additional disclosures under this proposal.
- Existing operational FPIs should disclose within 3 month, failing which the FPI should bring down its AUM below the threshold within the time frame.
- Any high-risk FPI which fail to provide the disclosures wherever required would render the registration of the FPI invalid.
- **Exception** - New FPIs and existing FPIs that are winding down would be allowed to breach the threshold criteria up to a period of 6 months, after which disclosure in mandatory.

1.25 Challenges of Moving from LIBOR

Why in news?

The RBI has set a deadline of **June 30, 2023**, for complete switch-over from LIBOR and some banks and financial institutions (FI) are yet to facilitate an absolute transition.

What is LIBOR?

- London Interbank Offered Rate (LIBOR) is a global benchmark interest rate for unsecured short-term borrowing in the interbank market.
- It combines individual rates at which banks opine they may borrow from each other (for a particular period of time) at the London interbank market.
- It is used as a benchmark to settle trades in futures, options, swaps and other derivative financial instruments in over-the-counter markets and on exchanges globally.

- Further, consumer lending products like mortgages and credit cards, too use it as a benchmark rate.

Why are we moving from LIBOR?

- In India, several banks and financial institutions (FIs) followed LIBOR.
- The **Financial Conduct Authority (FCA)** of UK [ended the Libor](#) settings in 2021, except for certain types of tough legacy contracts which could not be transitioned.
- Owing to the LIBOR scandals and reforms to provide risk-free interest rates, RBI recommended [transitioning from LIBOR](#).

What did the central bank of India do?

- The LIBOR transition will impact a wide range of financial institutions across various sectors of the financial industry.
- These institutions need to change their existing contracts and develop new products based on alternative reference rates.
- The RBI has issued [two circulars](#) giving the road map to the transition and arrangements for transition from LIBOR.
- It established a system of *alternative reference rates* (ARRs) that allows banks to choose rates from a basket of currencies for international financial transactions.
- The RBI continues to monitor the efforts of banks/FIs for ensuring a smooth transition from LIBOR.

Challenges in transition

Alternative

- Different jurisdictions have chosen different rates, such as the SOFR in the US, SONIA in the UK, TONA in Japan and EU-STR in the Euro Zone.

Fallback provisions

- Transitioning these contracts to alternative rates requires addressing the fallback provisions,

Internal Changes

- Making significant adjustments to internal systems, processes, and models.

Technology aspects

- Banks and FIs need to invest in the necessary technology upgrades and ensure smooth integration without disrupting day-to-day operations.

ARR

- The introduction of alternative reference rates (ARRs) also poses challenges of market liquidity and product availability.

Legal challenges

- Contract interpretation, amendment, and litigation arising from the transition process.

Awareness

- Effective communication and engagement with clients and stakeholders by banks and FIs needed to educate their clients about the upcoming changes.

What are the benefits of transition?

- The transition from LIBOR has the potential to reduce the cost of financing in several ways.
- **Risk Premium** - The calculation of alternative reference rates is based on more transparent methodologies which certainly can help reduce the risk premium associated with LIBOR.
- **Pricing** - Introduction of ARRS increases competition for reference rates which lead to more transparent and competitive pricing of financial products.
- This potentially results in lower financing costs for borrowers.
- **Liquidity** - the alternative reference rates increased liquidity can lead to more efficient pricing and tighter spreads in the market, benefiting borrowers.
- **Harmonisation** - The increased harmonisation can help reduce the cost of financing for borrowers accessing international markets.
- The alignment of Indian banks and FIs to international standards promotes consistency and comparability across markets, reducing uncertainty and facilitating cross-border transactions.

Alternates to LIBOR		
Secured Overnight Financing Rate (SOFR)	Mumbai Interbank Forward Offer Rate (MIFOR)	Modified Mumbai Interbank Forward Outright Rate (MMIFOR)
<ul style="list-style-type: none"> • Is a broad measure of the cost of borrowing cash overnight collateralized by Treasury securities. • In 2017 the U.S. Federal Reserve that SOFR as a preferred alternative to LIBOR. 	<ul style="list-style-type: none"> • Is the rate that Indian banks use as a benchmark for setting prices on forward-rate agreements and derivatives. • MIFOR is a mix of the London Interbank Offered Rate and a forward premium derived from Indian forex markets. • RBI issued an advisory in mid-2021 encouraging all national banks to stop using MIFOR for new contracts by the end of 2021 as a result of the plan to phase out LIBOR. 	<ul style="list-style-type: none"> • It would be used to adjust SOFR among other components.

- **SOFR and MMIFOR** - In India *new transactions* were to be undertaken using the SOFR and the Modified Mumbai Interbank Forward Outright Rate (MMIFOR), replacing MIFOR.
- It is based on **observable repo rates**, or the cost of borrowing cash overnight, which is collateralized by U.S. Treasury securities.
- This would make it potentially less prone to market manipulation.

What is the way forward?

- Capacity building of financial institutions such as pension funds, insurance companies, hedge funds, and non-banking institutions needs to be done.
- Supplement the capacity of these institutions to evaluate and select appropriate alternative reference rates that are recommended by the RBI.

1.26 Changes to Liberalised Remittance Scheme (LRS)

Why in news?

The Central Government has announced that it has postponed the imposition of increased 20% TCS (Tax Collected at Source) by 3 months to October 1, 2023.

What is Liberalised Remittance Scheme (LRS)?

- It is a foreign exchange policy initiative introduced by the Reserve Bank of India (RBI) in 2004.
- **Aim** - To simplify and streamline the process of remitting funds outside India.
- Under LRS, resident individuals can freely remit funds up to a certain limit for various permissible transactions involving a current or capital account.
- Prior to LRS, the remittance is controlled by FEMA 1999.

- This scheme helped Indians overcome international fund transfer restrictions as set by the **FEMA (Foreign Exchange Management Act), 1999.**

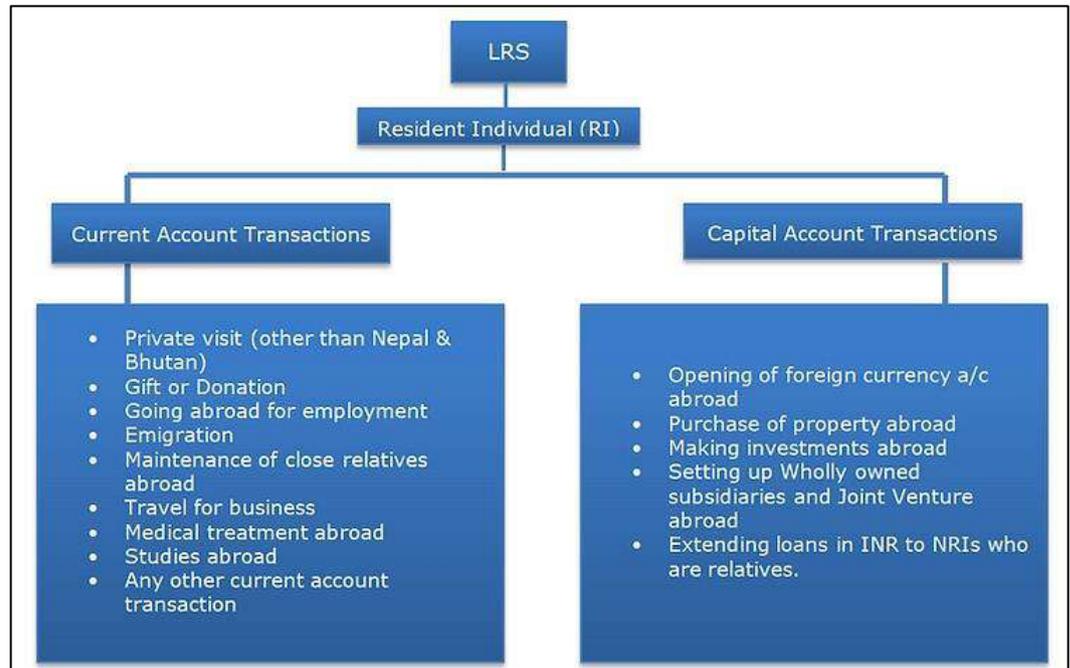
What are the key features of the LRS Scheme?

- **Eligibility-** It is available to all resident individuals, including minors and students.
- The scheme is *not available for* Corporates, Partnership firms, Hindu Undivided Family etc.,
- The eligible citizens must have an Indian bank account, a valid Permanent Account Number (PAN), and a passport.

- **Foreign currency** - The remittances can be made in *any freely convertible foreign currency.*

- **Usage-** They can use the remitted amount for educational, business, personal, or other purposes.

- **Current limit-** The current limit for LRS is **\$250,000** for a given financial year for permissible transactions.



- A resident individual can remit a higher amount after taking prior permission from the RBI.
- **Exception-** Remittances cannot be used for buying lottery tickets, margin trading, real estate etc.
- **Taxation** - Liberalised Remittance Scheme is *taxable through Tax collected at Source (TCS).*
- The tax does not apply to Indian individuals if they furnish a declaration that the purchased goods would be utilised for manufacturing, processing or producing articles or things and not for further sale.

What is TCS and its threshold?

- **TCS** - TCS refers to *tax collected by the seller* of a commodity *at the time of sale.*
- It is over and above the price of the commodity and is required to be *remitted to the government's account.*
- **TCS threshold-** 5% TCS is applicable for remittances exceeding the **limit of Rs 7, 00,000.** other than the purchase of tour program packages.
- **Union Budget 2023 Proposal-** TCS has been increased from 5% to 20% for overseas tour package exceeding the limit of Rs 7, 00,000.
- The same was to apply for payments other than education and medical treatment.
- Purpose- To widen the tax base and to reduce the possibilities of tax avoidance.

What are the new changes?

- **TCS threshold** - The implementation of Union Budget proposal has been delayed for 3 months till October 1, 2023.
- **Credit card** - The government also announced that transactions facilitated using international credit cards while being overseas would not fall under the LRS umbrella.
- Thus *transactions via credit cards when travelling abroad will not attract TCS.*

Why is LRS so significant?

- **Diversification of Investment-** It promotes investing in foreign assets such as stocks, bonds, mutual funds, and real estate.

- **Overseas education-** It enables individuals to remit money for education. It provides the window of opportunity to pursue education in abroad.
- **Medical treatment-**It allows individuals to remit money for medical treatment outside India.
- **Travel-** It enables individuals to remit money for travel-related expenses such as tickets, hotel bookings, and other expenses.
- **Start-ups and business investments-** It enable individuals to invest in foreign businesses, start-ups, and joint ventures thus aiding in the expansion of their businesses globally.
- **Gift and donations-**It enable individuals to gift or donate money to their family members or charitable organisations outside India.

1.27 U.S. Debt Ceiling Crisis

Why in news?

The US government could default on its borrowings, an unprecedented situation that could potentially hit economies worldwide, if Congress doesn't raise the nation's debt ceiling.

What is debt ceiling?

- The debt ceiling, or debt limit, is the total amount the US government is allowed to borrow to finance its expenditure, such as paying salaries and welfare allowances.
- The debt limit was introduced in 1917, when the US entered World War I.
- It was introduced in order to make it easier for the executive to operate without having to turn to Congress every time it wanted to spend.
- It allows the government to borrow as required as long as it kept under the debt limit approved by Congress.
- The debt ceiling has been raised 78 times (49 times under Republicans and 29 times under Democrats) since 1960, with the most recent raising was in 2021.

What is the issue?

- Constitutionally, Congress controls the government's purse strings.
- Currently the limit of debt ceiling is at \$31.4 trillion.
- The Republicans, who have a majority in the House, are refusing to raise it unless the Democrat-run government agrees to their demands, which include a significant cut in spending.
- If the debt ceiling is not raised, the government will be unable to pay its bills and will default on its debt.

What are the demands of Republicans?

- The Republicans are ideologically fiscal conservatives, while Democrats believe the government should spend more on social welfare schemes.
- To agree to raise the debt ceiling, the Republicans have demanded that spending be kept at 2022 levels in the next financial year, and subsequent increases capped at 1% for some years.
- The Democrats say the spending should be kept at 2023 levels.

What happens if the government defaults?

- The US government has never defaulted, and hence there is no exact answer, however, the consequences could be catastrophic.
- The government would no longer have the money to function, and would have to decide who gets salaries, and how much.
- The dollar would weaken, the stock markets would collapse, and millions might lose their jobs.
- Also, the US's credit rating would be downgraded, making future borrowing more expensive.
- The crisis in the US will have wider repercussions.

Has anything similar happened earlier and is there a way out?

- The crisis is similar to what happened in 2011 when Barack Obama was President but the House of Representatives was controlled by Republicans.

- Back then, the crisis ended just hours before the deadline, only after the Obama administration agreed to spending cuts worth more than \$ 900 billion.
- Technically, the US President can sidestep Congress by invoking the 14th Amendment, whose Section Four states that the “validity of the public debt of the United States ... shall not be questioned.”
- But if Biden were to use this option, it could trigger lawsuits, and he has seemed to prefer the Congressional route.

What is the way forward?

- The debt ceiling is a terrible way to try to impose fiscal responsibility.
- However, the US government needs to find ways to reduce the deficit and the national debt.
- The two parties in the congress should arrive at an agreement at the earliest.

1.28 US banking crisis and its impact on India

Why in news?

The recent banking crisis in the US and the resultant global slowdown impacted India.

US banking crisis	
US Banks	Silicon Valley Bank
<ul style="list-style-type: none"> • The massive fiscal and monetary stimulus after COVID led to a huge surge in bank deposits. • Banks invested much of these in government bonds to avoid credit risks. • Meanwhile, the fiscal and monetary stimulus interacted with adverse supply shocks led to the highest global inflation in 50 years. • Consequently, the bond prices fell sharply and the US banks were left with unrealised bond losses. 	<ul style="list-style-type: none"> • Wholesale depositors began to rapidly withdraw deposits to avoid losses, forcing the bank to realise the losses. • The bank created a self-fulfilling deposit run and the central bank came to rescue. • The central bank created expansive liquidity facilities and de facto insured all deposits creating moral hazard for the medium term. • To know more about US bank crises, click here - Silicon Valley Bank crisis, Credit Suisse Crisis

How resilient is the present economy?

- The global economy likely grew at 4% last quarter (2023).
- The pace at which global economy is accelerating in 2023 reflects the resilience of private sector balance sheets in advanced economies.
- Globally, banks are much better regulated and capitalised than they were in 2008.
- The central banks will now have to pursue two objectives to avoid any recession:
 - Contain inflation using interest rate policy while managing financial stability.

A natural hedge is a strategy that seeks to mitigate risk by investing in assets whose performance is negatively correlated through some intrinsic or natural mechanism.

What are the impacts of US bank stress on India?

- **Soft-landing** - A soft landing is a cyclical slowdown in economic growth that avoids recession.

Natural hedges of India

Oil prices	Imports-Exports	Bond Yields
<ul style="list-style-type: none"> • Oil prices are typically inversely correlated with the US dollar Index. • When the dollar index strengthens, oil prices typically soften. • Due to this natural hedge, India gets adversely impacted on the capital account but favourably impacted on the current account. 	<ul style="list-style-type: none"> • If there's a demand shock in the world and global growth slows, India's exports will be hit. • As a commodity importer, India can benefit from improving 'terms of trade' when the commodity prices depress due to slow in global growth. 	<ul style="list-style-type: none"> • Decline in US bond yields in response to the banking crisis, pushed down bond yields around the world, including India. • In India, and other emerging markets, financial conditions eased due to the fears of weaker US growth.

- Soft landing is unlikely in the US because it will necessitate sharp increase in wage inflation without noticeable rise in the unemployment rate.
- At some point the global economy will be forced to slow, to generate the needed disinflation, and that will impact India.
- There are multiple transmission channels from current global events to impact India.
- The channels are exports, commodity prices, capital flows, US bond yields on Indian bond yields, etc.

What is the impact of global slowdown on the Indian exports?

- **Indian Exports** - Software services and other IT-enabled services have shown dynamism.
- Increased digitalisation and work-from-home during the pandemic has increased offshoring and made services previously deemed non-tradeable into tradeable.
- The surge in service exports and the softening of commodity prices has also contributed to the dramatic compression of the current account deficit.
- Thus, exports have been key to India’s recovery and a sharp global slowdown will slow down its recovery.

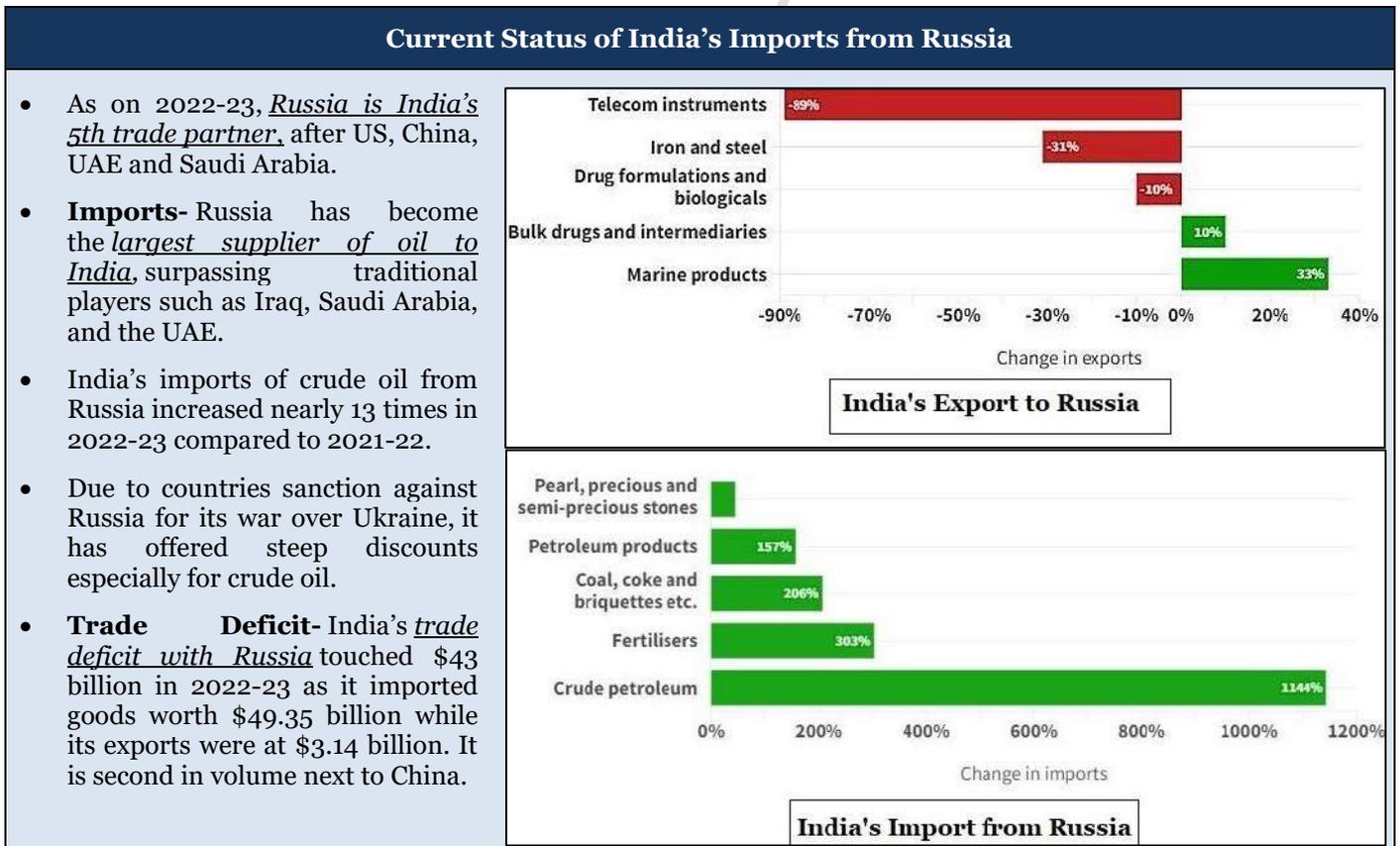
What are policy changes prescribed for India?

- Public investment should be pushed to mitigate slowing exports.
- Crowding in of states and PSU capital expenditures (capex).
- Keeping inflation under control, continuing with fiscal consolidation and building buffers.
- India should keep a very close eye on financial stability.

1.29 India-Russia Payment Crisis

Why in news?

As India continues to import oil from Russia, it is getting tougher for the country to pay for it.



What are the issues with the existing payment methods?

- **SWIFT sanction-** Society for Worldwide Interbank Financial Telecommunication (SWIFT) system is a global secure interbank system.

- U.S., the European Union, and the U.K. have blocked multiple Russian banks from accessing the SWIFT system due to Russia's special military operation in Ukraine.
- **Dollar Payments**- Oil transactions have traditionally been dollar-dependent.
- **Cap on oil price**- Many countries decided to cap the price to a maximum of \$60 per barrel of Russian oil transported through waterways, this makes difficult to pay in dollar.
- **Geopolitical ramifications**- India has strained relationship with china since the border stand-off this will have a geopolitical ramifications for India to pay in Chinese Yuan.

What about Rupee-Rouble trade arrangement?

- It is an alternative payment mechanism to settle dues in rupees instead of dollars or euros.
- The idea was first conceived in 1953 under the Indo-Soviet trade agreement.
- **Payments covered**- Commercial transactions and insurance, freight, port charges, storage and forwarding expenses and bunkering, distribution of films, technical assistance, tours of commercial or cultural nature etc.,
- **Significance**- It will be helpful to overcome challenges in trade with Russia, including managing payments for exporters and importers.
- A rupee payment mechanism could play a pivotal role in deciding whether Indian exporters will get their payments and if trading can be continued with Russia.
- **Issue with Rupee-Rouble trade arrangement**- Rouble's value is not market determined and Rupee is considered volatile by Russia.
- Hence there is challenges with Rupee-Rouble Convertibility.

The Russian rouble or Rouble is the official currency of Russian Federation

What lies ahead?

- **Countering the trade deficit**- There is a need to bridge the trade deficit with Russia by increasing Russian investment in the energy and government bonds.
- **Rupee internationalisation** - Since the dollar is largely considered the global reserve currency, many countries have seen the U.S. sanctions as a way for America to weaponise the dollar.
- This has given rise to countries looking at de-dollarisation which means the replacement of the U.S. dollar with other currencies as the global reserve currency.
- India too, has recently released a roadmap for the [internationalisation of the Indian rupee](#) to create broader acceptance.

Daily average share for rupee in the global foreign exchange market is 1.6%, while India's share of global goods trade is 2%.

1.30 Gold Rush by Central Banks

Why in news?

The RBI has been increasing its gold reserve as part of the diversification process and a precaution to growing global financial uncertainty.

Status of RBI gold reserve

- As of financial year 2023, the RBI have 794.64 metric tons of gold an increase of nearly 5 % financial year 2022.
- Of total 794.64 metric tons of gold, 437.22 tons of gold is held overseas in safe custody with the Bank of England and the Bank of International Settlements (BIS) and 301.10 tons of gold is held domestically.
- As on March 31, 2023 the country's total foreign exchange reserves stood at USD 578.449 billion, and gold reserves were pegged at USD 45.2 billion.
- Central banks across the world are increasing its gold reserve due to the increasing global uncertainty.

Why RBI is increasing the gold in foreign exchange reserve?

- **Long term benefits** - Since gold is safe and secure and liquid assets it has long term benefits.
- **Diversification** - RBI is diversifying its foreign exchange reserve because of the growing global uncertainty.

- **Negative rates** - To overcome the negative rates in the past.
- **Dollar** - Since dollar has been weakening gold can be good alternate.
- **Transparency** - Since gold have standard international price which is transparent.
- **Low confidence in Swiss financial centers** - Because of the demise of Credit Suisse and the total loss of its AT1 bonds.

Why gold is an important component in foreign exchange reserve?

- **Commodity-linked currencies** - Gold has performed even better when expressed in terms of commodity-linked currencies.
- **Increasing value of gold** - The rate of the gold has been **increasing more** than the US dollar.
- **Weak global financial system** - The financial system is expected to face several crisis because of more volatility.
- **Foundation for the rupee** - Gold reserves coupled with a strong economy, balanced current account deficit and good balance of payment lay the foundation for the rupee in long te

Bank of International Settlements (BIS)
<ul style="list-style-type: none"> • BIS was established in 1930. • BIS is owned by 63 central banks including RBI that account for 95% of the GDP. • BIS's head office is in Basel, Switzerland and it has two representative offices in Hong Kong and Mexico City. • The mission of BIS is to support central banks' pursuit of monetary and financial stability through international cooperation, and to act as a bank for central banks. • Basel Committee on Banking Supervision of BIS provides the Basel norms.

1.31 World Trade Organization's Information Technology Agreement (ITA)

Why in news?

India lost the WTO dispute on customs duties on mobile phones and other IT products due to the IT Pact.

What is WTO's IT agreement (ITA)?

- ITA was concluded by 29 participants at the Singapore ministerial conference in December 1996 by WTO.
- The main proponents of the ITA included the European Union (EU), Hong Kong, Japan, Korea, Singapore, Thailand and the US.
- Number of participants increased to 82 including India which represents 97% of the world trade in IT products.
- The participants are committed to completely eliminating tariffs on IT products.
- At the Nairobi ministerial conference (2015) over 50 members concluded the expansion of the agreement which now covers an additional 201 products valued at USD 1.3 trillion per year.

Pros & Cons of India's membership in ITA	
Pros	Cons
<ul style="list-style-type: none"> • Reduced customs duties for the IT products. • Strengthening of the global information technology infrastructure would be generally beneficial. • The competitiveness of the IT hardware manufacturers has increased. 	<ul style="list-style-type: none"> • The real gainer from that agreement has been China which raised its global market share from 2% to 14% between 2000-2011. • Countries with strong technology and manufacturing base stood to benefit from the IT agreement which India did not. • IT hardware - Took a massive hit and Trade in Value Added (TiVA) was declined.

What is the way forward?

- India in the future talks with the free trade agreements should be to choose an option that preserves the policy flexibility of the government to support its domestic producers to the maximum possible extent.
- India negotiators should demand the necessary information to take a correct decision to avoid any mistakes.
- Indian negotiators should demand necessary policy tools through trade agreements for supporting domestic producers, especially in new and emerging areas.

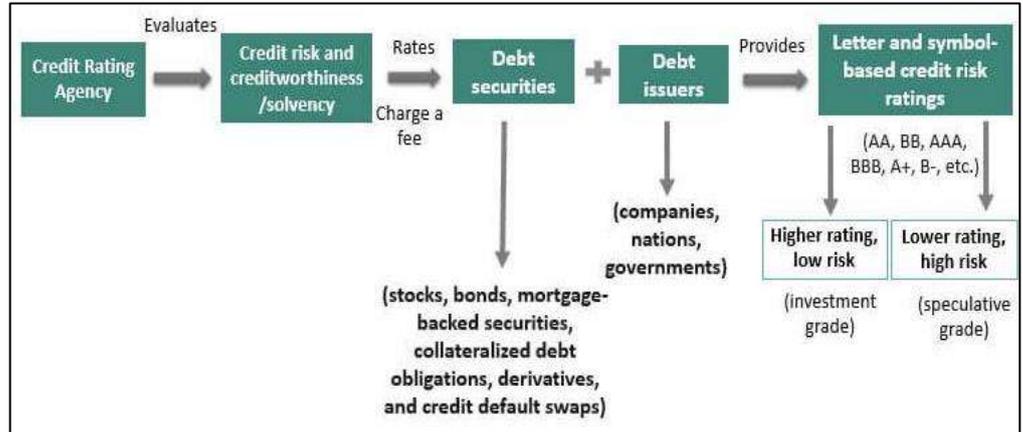
1.32 Global Credit Rating Agencies

Why in news?

Recently Fitch, a global rating agency accorded “BBB” ratings to India’s sovereign rating.

What is credit rating agency?

- A credit rating agency is an agency that assess the creditworthiness of organisation, individual or entity and assign ratings to it.
- In India, CRAs are regulated by SEBI (Credit Rating Agencies) Regulations, 1999 of the Securities and Exchange Board of India Act, 1992.
- The global credit rating industry is highly concentrated, with 3 agencies - Moody's, Standard & Poor's, and Fitch.



What is sovereign credit rating?

- A sovereign credit rating is an independent assessment of the creditworthiness of a country or sovereign entity.
- By allowing external credit rating agencies to review its economy, a country shows that it is willing to make its financial information public to investors.
- The factors that determine the sovereign credit rating of a country include:
 - Per capita income; GDP growth; Rate of inflation; External debt; Economic development; History of defaults
- A country with high credit ratings can access funds easily from the international bond market and also secure foreign direct investment.

What is the sovereign credit rating of India?

- **India’s Rating** - All three global rating agencies accorded lowest investment grade rating in India.
- Rating agency Fitch affirmed India's sovereign rating at "BBB-" with a stable outlook on robust growth and resilient external finances.
- **BBB ratings** – It indicates that expectations of default risk are currently low.
- The capacity for payment of financial commitments is considered adequate, but adverse business or economic conditions are more likely to impair this capacity.
- **Reasons for low rating** - India is expected to face headwinds from elevated inflation, high-interest rates and subdued global demand.
- Other concerns include low labour force participation rates and an uneven reform implementation.
- The fiscal consolidation path, under which the fiscal deficit is to be brought down to 4.5% of GDP by 2025-26, remains challenging.
- Public finance remains weak while structural indicators are lagging.

No	S&P	Moody's	Fitch	Meaning and Color
1	AAA	Aaa	AAA	Prime
2	AA+	Aa1	AA+	High Grade
3	AA	Aa2	AA	
4	AA-	Aa3	AA	
5	A+	A1	A+	Upper Medium Grade
6	A	A2	A	
7	A-	A3	A-	Lower Medium Grade
8	BBB+	Baa1	BBB+	
9	BBB	Baa2	BBB	
10	BBB-	Baa3	BBB-	Non Investment Grade Speculative
11	BB+	Ba1	BB+	
12	BB	Ba2	BB	
13	BB-	Ba3	BB-	Highly Speculative
14	B+	B1	B+	
15	B	B2	B	
16	B-	B3	B-	Substantial Risks
17	CCC+	Caa1	CCC+	
18	CCC	Caa2	CCC	Extremely Speculative

What are the positive signs of growth in India?

- **Low forex risk** - Since all debt is exclusively in rupees and even participation of FPIs is in rupee bonds the forex risk is very low.

- So, forex situation in India remains strong.
- **Financial growth** - The projected financial growth is 7% for the year 2023 which is quite impressive compared with rest of the countries.
- **India's response during COVID** - The approach was more through the reform and policy route than fiscal deficits in the form of payouts, which was followed by developed countries.
- **Banking system** – It has as rebounded well to pandemic period levels indicating it can provide funds that enable the economy to move on to a higher growth path.
- **RBI** - Ensured a smoother path to normalcy compared with central banks of other nations in after math of the COVID (RBI moved the interest rates without any significant impact on growth)
- **Rupee-Dollar** - Even though the dollar appreciated, the rupee always remained at the median level of depreciation compared with dollar and other currencies.
- **Quality of government spending** - Budget has increased the share of capital expenditure from around 12-13 % pre-pandemic to 22 % for FY24.
- **Rupee trade agreement with Russia** - The strategy to go-domestic is a unique model even though may be slow and time taking.
- **Digitization** - The digitization drive has brought about **structural changes** in the economy making systems more efficient.

What lies ahead?

- The rating methodologies need to adapt with the changing times.
- Global credit rating agencies have to do away with the fixed mindset policy where it is believed that emerging markets can never really move up the scale.

1.33 Reforming Multilateral Banks

Why in news?

There is a need to strengthen and to implement structural changes on multilateral development banks to cope up with the complexities of 21st century.

What are Multilateral Development Banks (MDB)?

- **MDB** - A multilateral development bank (MDB) is an international **financial institution chartered by two or more countries** for the purpose of encouraging economic development in poorer nations.

- It consist of member nations from both developed and developing countries.
- MDBs originated in the aftermath of World War II to rebuild war-ravaged nations and stabilize the global financial system.
- **Aim** - To promote inclusive growth and reduce inequalities.
 - To eliminate poverty
 - To foster shared prosperity
- **Source of funds** - MDBs raise funds through capital contributions from member countries, borrowing funds from capital markets, and using funds received via loan repayments.

Types of Multilateral Development Banks	
International Development Banks	Regional Development Banks
<ul style="list-style-type: none"> • World Bank • International Bank for Reconstruction and Development (IBRD) • International Finance Corporation (IFC) • International Development Association (IDA) 	<ul style="list-style-type: none"> • European Investment Bank (EIB) • Asian Development Bank (ADB) • New Development Bank (NDB) • Eurasian Development Bank (EDB) • Islamic Development Bank (IsDB) • Asian Infrastructure Investment Bank (AIIB)

- Since MDBs are not organizations associated with specific countries, they are subject to international law.

While the International Monetary Fund (IMF) and MDBs share similar objectives of promoting global economic stability and development, it is not considered as a MDB as it primarily focuses on macroeconomic stability and provides financial assistance to member countries facing balance of payments problems.

Why are MDBs so significant?

- **Concessional financing** - While commercial banks seek to make profits, the goal of MDBs is to issue grants and low-cost loans to middle and low income countries.
- **Development goals** - These banks prioritize development goals such as poverty reduction, infrastructure development, education, healthcare, and environmental sustainability.
- **Technical assistance** - MDBs also offer technical assistance and risk management advisory to member countries, in addition to financial support.
- **Maximization of impact** - They also collaborate with other organizations and mobilize private sector investment to maximize their impact.
- **Stabilization of global economy** - They are seen as an international pillar to stabilize the global economy.
- **Policy advice and reforms** - MDBs offer policy advice to member countries, helping them formulate and implement sound development policies and reforms.

What are the challenges associated with MDBs?

- The new challenge is to broaden the mandate and vision to address the challenges of transboundary issues.
- It also includes the financial crunch due to pandemic and other issues.
- In recent times, Climate change has occupied the forefront place.
- Shared prosperity at intra and inter-country levels has also worsened in recent times.

What reforms are needed for MDBs?

- **Financing** – There is a need to optimize the current balance sheet and create higher leverage from existing fund. There is a need to mobilise private capital.
- It is imperative to broaden the mandate of MDBs. Transparency in capital mobilization must be ensured.
- They need to fix annual targets and judge performances by the outcomes secured in this altered framework of accountability.
- **Structural changes** – There is a need to create incentive structure.
- **Opportunity for India** – For India, reforming MDBs would mean advocating the voice of the Global South.
- India under G20 presidency created an expert group to take a holistic approach on a wide range of issues and outline a pragmatic implementable programme on strengthening MDBs.

The World Bank Group estimates that the average annual spending needed to address global challenges of climate change, conflict, and pandemics is \$2.4 trillion per year for developing countries between 2023 and 2030.

1.34 Unprecedented WTO Dispute Settlement method

Why in news?

The U.S and India decided to end their six long-standing trade disputes at the World Trade Organization (WTO) through deals, a move which is unprecedented.

What is the issue with WTO's dispute settlement system?

- WTO's dispute settlement system (DSS) is called its 'crown jewel'.
- The dispute settlement system (DSS) is a two-tiered system where the appellate body is the second tier.
- The appellate body hears appeals from WTO panels.
- The appellate body, from 1995-2019, has upheld the international rule of law by holding powerful countries accountable for international law breaches.

World Trade Organisation (WTO)

- The World Trade Organization (WTO) is the only international organization that deals with the rules of trade between countries.
- **Establishment** - It was created in 1995 superseding the 1947 General Agreement on Tariffs and Trade (GATT).
- **Members** - The WTO is run by its 164 members representing 98% of world trade.
- **Decision making** - All decisions are taken through consensus and any member can exercise a veto.

- **Issue** - The WTO Appellate Body has been redundant since 2019.
- There is a continued impasse in the appointment of 'judges' to the appellate body.
- Disputes filed into the 'void' will not be considered for adoption leaving the appealed cases unresolved.
- In June 2022, at the Geneva ministerial conference, the members signed a deal on resurrecting the WTO's dispute settlement system (DSS) by 2024.

What are the cases settled between India and US?

- The WTO member-countries can adopt a statement that the appellate body rulings do not create precedents.
- India and U.S. have reached a deal on six separate disputes.
 1. Three cases settled as part of the deal are before the defunct Appellate Body.
 2. The other three could have potentially been 'appealed into the void'.
- Settling disputes in all six cases shows a pragmatic approach on the part of two strong trading partners.
- Amending domestic laws to effect compliance with international treaty obligations is a matter of great political sensitivity, especially in the U.S.
- Both U.S and India have accepted each other's domestic challenges in dispute compliance and realised the importance of burying differences.
- **2019 complaint** - India challenged against the controversial tariffs imposed under the Section 232 of the U.S. Trade Expansion Act, 1962.
- The U.S. had imposed an additional duty of 25% on steel and 10% on aluminium, triggering a series of WTO challenges and unilateral trade responses.
- India considered these as safeguard measures and imposed retaliatory measures on 28 U.S products which the U.S. considered excessive.
- The U.S. will receive and consider requests for exclusions from Section 232 measures with approval rates of 70% for steel products and 80% for aluminium products from India.
- In return, India would remove the retaliatory additional duties on certain U.S. agricultural imports.
- India is only removing the retaliatory duties on the 8 products for which 'most favoured nation' (MFN) rate is applied.

What are the other cases solved?

- **India's National Solar Mission** - A challenge of the domestic content requirements under India's National Solar Mission was also resolved.
- Disagreements persisted regarding India's compliance with the WTO treaty obligations, with the U.S. seeking authorisation from the WTO's Dispute Settlement Body for trade retaliation.
- **Special Economic Zone (SEZ)** - Certain corporate tax deductions provided under the SEZ scheme faced an uncertain future.
- India resisted to appeal to the Appellate body and had voluntarily removed some controversial schemes.
- India also initiated a comprehensive process to reform its SEZ law.
- **India's contest** - India challenged certain sub-federal programmes implemented in the U.S. in the renewable energy sector and won the case.

According to Article 3.6 of the Understanding on Rules and Procedures Governing the Settlement of Disputes of WTO, parties can reach a mutually agreed solution to the matter raised in the dispute.

What lies ahead?

- **Indo-U.S.** - The decision to end these disputes seeks to script a new chapter in India-U.S. trade relations.
- **Sets precedence** - The dispute deal also sets a template for other WTO members to emulate.
- **Fills the void** - The void created by the appellate body can be filled through such mutual agreements between the contenders.
- **De-judicialisation** - This may also add to the larger plan of the U.S to de-judicialisation multilateral organisations.

1.35 A New Palette for Creative Economy

Why in news?

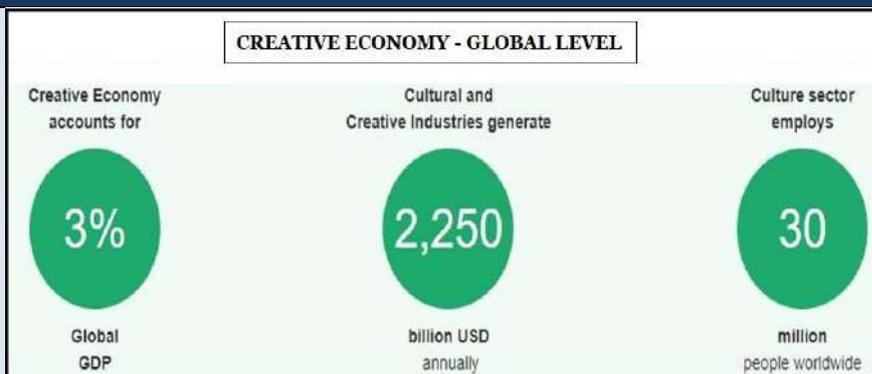
There is a need to implement a collaborative model to meet the challenges faced by creative economy.

What is creative economy?

- Creative economy is an evolving concept which builds on the interplay between human creativity and ideas and intellectual property, knowledge and technology.
- Also called as Orange economy, it is a knowledge based economic activity.
- Creative industries include film, television, publishing, museums, music, arts, computer programming, crafts, architecture and design.
- They are considered as an important source of commercial and cultural value.

Status of Creative Economy

- The creative economy is one of the world's most rapidly growing sectors, contributing 3% of the global GDP.
- According to EXIM Bank study, Creative economy in India accounts for 121 billion of exports in 2019.
- India ranks 6th globally outside USA with respect to top international box office market by revenue.



What is the significance of creative economy?

- **Preservation of art** - Artists and artisans play a vital role in preserving traditional art forms and contribute immensely to the cultural economy.
- **Creative supply chains** - It will make a country or region more attractive destination for investment in film, TV series and further increase growth in supply sectors like music.
- **Shared IP** -It will create major revenues across multiple creative industries from Pokemon to Harry Potter.
- **Creative technology** -There is increasing overlap between digital and creative industries, which is further enhanced with Artificial intelligence, VFX.
- **Regional development** - It will likely play more important role in a greater range of regions over time.
- **Policy for Skill Enhancement**- There will technical skill policy development to improve the education system to support the creative economy which is increasing in demand.
- **Global competitiveness** - This is further promoted by increase in incentives and rewards to the countries which performs well in this industry.
- It helps in the creation of jobs, economic growth, tourism, exports, and overall societal development.

What are the challenges faced by the artisans in India?

- **Appointments** – As there is no systematic or rotational mechanism in place for selection of artists, it creates inequality in representation.
- The selection process is often random or based on subjective criteria, which makes the artists unable to gain from sponsored platforms.
- **Poor support**-There are no serious efforts by private or public institutions to promote contemporary artists as brands.
- **Crime** - It includes art theft, copyright infringement, forgery, fraud, and illicit trafficking.
- **Lack of audit**- There is no institutional infrastructure, expertise and technology to verify the original artwork. This gap leads to injustice towards genuine artists.
- **Other Challenges**- Unaccounted money preserved through artworks, dissemination of disinformation about cultural history, etc.

Efforts were taken in this regard		
UNESCO	UNCTAD -United Nations Conference on Trade and Development	United Nations General Assembly
<ul style="list-style-type: none"> • MONDIACULT 2022- It is a World Conference on Cultural Policies and Sustainable Development. • Creative Cities Network- It is created in 2004 which covers 7 creative fields • In India 6 cities has been selected • Srinagar – Crafts and Folk art category was the last addition (2021). 	<ul style="list-style-type: none"> • Creative Economy Program- It is initiative of UNCTAD which generates economic information through a trade lens, to understand past trends and project into the future. • Creative Economy Outlook 2022 - It is published by UNCTAD which provides latest data and trends on fast growing creative economy sector. • Bridgetown Covenant- It is the outcome of the Creative Industries and Trade Digitalization Forum and calls UNCTAD to place greater emphasis on societal and developmental benefits. 	<ul style="list-style-type: none"> • UNGA recognises <u>2021 as International Year of Creative Economy for Sustainable Development.</u>

How to address the challenges faced by the creative economy?

- **Robust security architecture**- It is possible by deploying advanced technology for authentication and tracking which would foster healthy creative economy.
- **Regular audits**- There must be regular audits of acquired artworks to enhance trust and preserve the collection's integrity.
- An institutional record of incoming and outgoing artworks with a verified identification mark is required.
- **Enhancing India's soft power** - It can be done through a capacity-building centre which would create an ecosystem of innovative technology-based start-ups in the arts and crafts sector.
- **Fulfilling the artists' needs** – Artists' needs must be bridged by training, professional development, market access, and participation in larger communities and networks.
- **Use of ICT** - Data analytics should be used to foster creative ecosystems that contribute to a sustainable world.
- **Public-Private Partnership**- PPP is required to empower artists, bridge industry gaps, and contribute to the overall development of the creative economy.

What lies ahead for India?

- To develop the creative economy to realize its full potential, Indian policy makers would like to
 1. Increase the recognition of Indian culture globally
 2. Facilitate human capital development among its youth
 3. Address the bottlenecks in the intellectual property framework
 4. Improve access to finance
 5. Streamline the process of policy making by establishing one intermediary organization
- India must also leverage its G20 Presidency to put creative economy concretely on the global agenda.

2. AGRICULTURE

2.1 India's First National Water-Body Census

Why in news?

The Jal Shakti ministry has released the report of India's first water- body census, which provides a comprehensive database of ponds, tanks, lakes and reservoirs in the country.

What is the need for water-body census?

- To get a more accurate picture of the status of India's water.

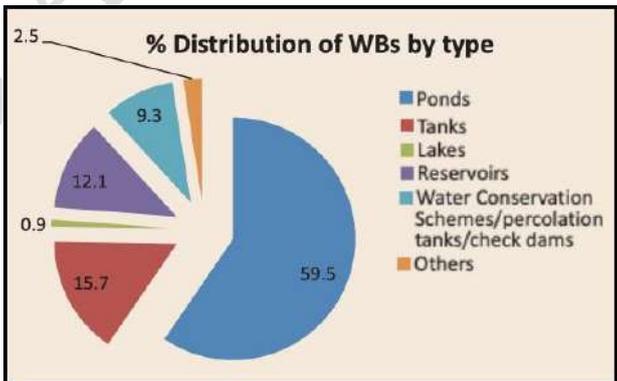
- To formulate policies to address ground water crisis and biodiversity loss.
- Water bodies contribute to food and water security and livelihoods by recharging ground water.
- Water bodies are the sources of irrigation and livestock.
- Water bodies have an important role in supporting biodiversity.
- Water bodies are increasingly under threat from pollution, encroachment, urbanization, and drying up.

The country's water resources have become extremely polluted, with 70% of surface water found to be "unfit" for human consumption.

What are the salient features of the census?

- **Objective** - To develop a national database for all water bodies by collecting information on all important aspects of the subject including their size, condition, status of encroachments, use, storage capacity, status of filling up of storage.
- **Water bodies** - Are structures where water from ice-melts, streams, springs, rain or drainage from residential or other areas is accumulated.
- Storage of water diverted from a stream, river is also included.
- The definition **excludes** oceans, rivers, waterfalls, and swimming pools, covered water tanks made by individuals, factories and temporary water bodies.
- **Water bodies** - India has 2.42 million water bodies, out of which **97.1% are in rural areas** and 2.9% in urban areas.
- **Non-functional** - 83.7% are 'in use' and the remaining 16.3% are non-functional on account of drying up, silting and construction activities and so on.
- **Private entities** - 55.2% are owned by private entities and 44.8% are under public ownership.
- In the wetter states like Kerala, West Bengal and North Eastern states **more than three-quarters** of the water bodies are privately owned.
- **Encroachment** - Only 1.6% water bodies out of all the enumerated bodies have been encroached out of which 95.4% are in rural areas and remaining 4.6% in urban areas.
- Mid-sized water bodies are largely panchayat-owned.
- In drier states, the water bodies are primarily used for irrigation and groundwater recharge.

- Maharashtra State is the leading state for water conservation schemes.
- West Bengal has highest number of ponds and reservoirs.
- Andhra Pradesh has highest number of tanks.
- Tamil Nadu has highest number of lakes



What are the shortcomings of the census?

- **Lack of categorization** - The water bodies which were abandoned were had no categories such as industrial pollution, construction, and salinity.
- **Lack of focus** - No focus to conserve water bodies instead focuses on human use.
- **Lack of clarity in definition** - Glossary of the census defines a pond as a smaller water body than a tank, while "water conservation structures" might include check dams and percolation tanks.
- **Lack of standardization across states** - Some states like Gujarat don't show any water bodies not being in use, whereas Karnataka reports almost 80% of its water bodies as being in a state of disuse.

India-Water Resources Information System (WRIS)

- Provides a single window solution for all water resources data and information in a standardized national GIS framework.
- Funded by the **Central Water Commission**.
- Initiated through a Memorandum of Understanding signed on December 2008 between
 - Central Water Commission (CWC), Ministry of Jal Shakti and the Indian Space Research Organization (ISRO), Department of Space.
- Under National Hydrology Project, a central sector scheme.

2.2 Drip Irrigation

Why in news?

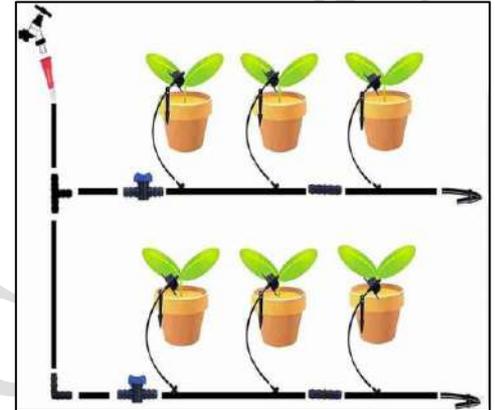
Israel has presented a drip irrigation system for Children's Park near India Gate for conservation of water and electricity.

What is drip irrigation?

- Drip irrigation involves dripping water onto the soil at very low rates (2-20 liters/hour) from a system of small diameter plastic pipes fitted with outlets called emitters or drippers.
- Drip irrigation provides water directly to the root zone of the crop through a network of pipes/emitters.
- Drip irrigation differs from surface and sprinkler irrigation, which involves wetting the whole soil profile.

What are the advantages of drip irrigation?

- Water loss is completely prevented
- Conserve electricity, time and ground water
- Minimize crop failure during summer
- The profit margin of the farmers can be increased
- The crop yield can be increased up to 230%
- Fertilizer use efficiency increases by 30%
- Crop grows consistently, healthier and matures fast
- Helps crops growth during even in periods of water scarcity and load-shedding



What is the need of the hour?

- The lands suitable for drip irrigation which is around 270 lakh is applicable needs to be brought into the ambit.
- Drip irrigation should be made mandatory for water intensive crops to reduce the risk of ground water crisis.
- Measures should be taken to gradually bring sugarcane cultivation entirely under drip with the support of sugarcane mills.
- The government should guarantee interest-free bank loans and immediate electricity connection for pump sets to farmers who agree to cultivate only through drip irrigation.

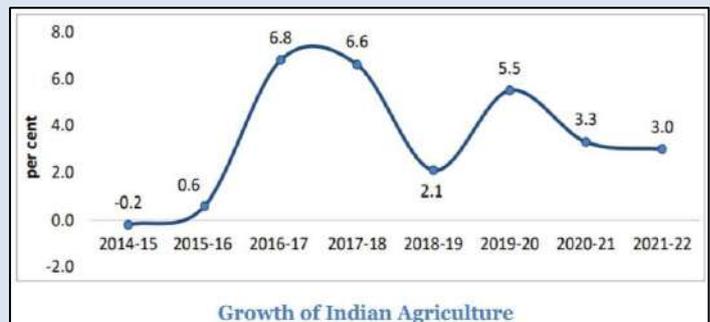
2.3 Economic Viability of Agriculture

Why in news?

Policymakers have been striving hard to make Indian agriculture economically viable as majority of the farmers want to quit agriculture.

Status of agriculture sector in India

- **Contribution to India's GVA** -18.3% (2022-23)
- **Population involved** - 54.6% of the total workforce (Census 2011)
- **Growth** - 3% in 2021-22 compared to 3.3% in 2020-21
- In recent years, India has also rapidly emerged as the net exporter of agricultural products.
- During 2021-22, agricultural exports reached an all-time high of US\$ 50.2 billion.



What can be done to make agriculture an economically viable one?

- **Digitalization of agriculture** - Agri start-ups have been helping in putting the 'farmer first' in supplying inputs directly through apps/call centres/channel partners.

- Farmers with smart phone can access digitalized agri-services for agri-inputs, farm advisory, and marketing of agri-produce.
- **Integrated farming** - Integrated farming system (IFS) is a sustainable agricultural system that integrates different components such as crop production, livestock, fish, poultry, tree, etc. that benefit each other.
- It is based on the concept that 'there is no waste' and 'waste'.
- **Family labour** is the most important component of IFS, which makes it commercially viable and environmentally sustainable.
- **Climate smart agriculture** – Soil position in Punjab is unhealthy as 246 kg of fertilisers are used per hectare compared to the national average of 135 kg.
- It is imperative to shift to eco-friendly agri-inputs such as **Nano Urea** which is cost-effective, ease in logistics and enhances crop yields substantially.
- **Adopting best farm practices** – Though Israel does not have conducive climate for agriculture, water resources and land area, it is a major exporter of farm-produce and a global leader in agricultural technologies.
- **Co-operative principles** based on social equality, co-operation and mutual aid in generating agricultural output can be adopted from Israel.
- **Discouraging informal credit** - Besides easing access to formal credit, farmers need to be counselled on financial prudence to prevent borrowing from informal sources such as money lenders, traders and landlords.
- **Leveraging Collectives** - Convergence of SHGs, **Farmers Producer Organisations (FPOs)** and Co-operatives will lead to better bargaining power of farmers.
- **Development of agri-value chains** - Development of agri-export clusters may be encouraged besides managing the risks of monsoon and market.

Issues faced by farmers
<ul style="list-style-type: none"> • Lack of infrastructure • Lack of access to credit • Lack of insurance • Uncertain water rights and supply • Lack of remunerative income • Poor price discovery • Land fragmentation • Erratic monsoon • Uncertain nature

2.4 Agriculture Commodity Value Chains

Why in news?

Since agricultural commodity value chains has global significance, the sector is need of government inventions to make it sustainable.

What is an agricultural commodity of global significance?

- **Agricultural commodity of global significance** – They are the commodity crops that are primarily grown *to be sold on international markets*.
- They are defined based on the level of their orientation towards *international demand and supply* in the form of exports. Example - Soybean, cocoa, coffee, tea, rubber, palm oil, and cotton
- India is one of the leaders of global agricultural commodity trade both as major consumer and producer.
- **Agricultural commodity value chain** - It refers to the entire process involved in the production, processing, distribution and consumption of agricultural commodities.

Impact on global sustainability

Deforestation

- Agricultural production can lead to deforestation, as trees are cleared to make way for crops and livestock.

Biodiversity loss

- Conversion of forests to cultivable farms can have a number of negative environmental impacts, including climate change and biodiversity loss.

Water pollution

- Agricultural production can lead to freshwater depletion and water pollution, as fertilizers and pesticides run off into waterways.

Soil degradation

- Agricultural production can also lead to soil degradation as the soil is depleted of nutrients and organic matter.

- It encompasses all the stages and actors involved in bringing agricultural products *from the farm to the end consumer*.

How agriculture commodity value chains can be sustainable?

- **Considering the producer attributes** - For commodity production led by agri-businesses with a global footprint, sector-wide sustainability commitments and standards are needed.
- **Low-cost certification** - Effective and low-cost certification could improve practices throughout the value chain, simultaneously delivering price premiums to producers.
- **Regional efforts** - Regionally, some efforts have led to climate, biodiversity, and livelihood benefits while preserving the ecological heritage in production landscapes.
 - For example, evidence suggests that the introduction of biodiversity-friendly coffee in Karnataka has mitigated human-animal conflicts in the region to a significant extent.
- **Government policies** - Strong governance mechanisms and policies can support the value chains, either by providing subsidies, market access, and infrastructural support.
- Targeted regulation may be used to incentivise agri-businesses to report and reduce the environmental consequences of their supply chain.
- **Working conditions and labour rights** - The marginalized labors must be provided with adequate safety nets in the form of rewards, farm-level flexibility, and robust insurance mechanisms.
- **Understanding the global demand** - India needs to expand its understanding to include commodities that are actively imported, such as oilseeds, whose production is both for domestic and international markets.

Agricultural and Processed Food Products Export Development Authority (APEDA) is the apex body responsible for export trade promotion.

2.5 Issues in the Food Storage Plan

Why in news?

The Union government has announced '*World's Largest Grain Storage Plan in Cooperative Sector*'.

What is the new initiative?

- **IMC** - An Inter-Ministerial Committee (IMC) will be constituted under the Chairmanship of Minister of Cooperation and the 3 concerned ministers as its members.
- The IMC converges *8 ongoing schemes of three ministries* - Minister of Agriculture and Farmers Welfare, Minister of Consumer Affairs, Food and Public Distribution, Minister of Food Processing Industries.
- The plan entails setting up various types of agri-infrastructure, including warehouse, custom hiring center, processing units, etc. at the level of PACS, thus transforming them into multipurpose societies.
- The initiative also aims to create additional decentralised grain storage at the *block level*.
- **Investments** - The cooperative sector will manage the public investments.
- The new initiative tries to address two of the most important objectives of farm laws -
 - Strengthening/expanding the market infrastructure.
 - Ensuring remunerative prices to farmers.

The value of food losses (agriculture, horticulture, milk, meat and fish) are above Rs. 1,40,000 crore

What are the important aspects that need to be considered?

- Reducing post-harvest losses should be a key objective of the new storage infrastructure.
- Strengthening the infrastructure in the existing market yards.
- Creating storage facilities within the market yards, wherever possible.
- Providing safe and secure market yards, especially protecting stocks from natural calamities.

India has the storage capacity for only one-eighth of its annual perishable produce.

What are the issues?

- **Governance** - Coordination and cooperation between the States and the Centre is required to strengthen storage facilities.

- **Coops' shortfalls** - Elite capture, bureaucratic/political interference, poor marketing are few problems associated with agriculture co-operatives.
- **Overlap** - Farmer Producer Organisations (**FPOs**) are also involved in post-harvest handling of the produce and are promoted to address the limitations of co-operative societies.
- Multiplicity of institutions with cross-cutting objectives are likely to dilute their effectiveness.
- **Maintenance** - Capital maintenance expenditure (Capex) is rarely incorporated into annual budgets making managing and maintaining is a bigger challenge.
- **Elite Farmers** - Elite capture is rampant in co-operatives. Thus small and marginal farmers lose on gaining access to competitive markets and getting remunerative prices.

What should be done?

- Modernising the existing storage infrastructure should be a priority.
- Judicious planning and estimation of storage requirements for different products across the regions.
- There is need for creating adequate storage facilities for horticultural crops, given their increasing production.
- Create storage infrastructure for perishable commodities like fruits, vegetables, milk, meat, fish, etc.
- Processing the perishables can increase the longevity of the food but modern technologies are required for ensuring high quality processing.

2.6 GM Mustard

Why in news?

A determined battle by environmentalists in the Supreme Court of India against genetically modified (GM) herbicide-tolerant (HT) mustard is all that stands between GM food and Indian farmers and consumers.

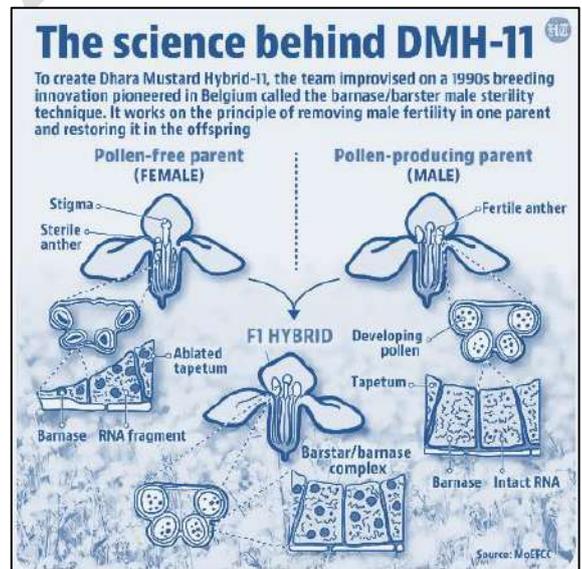
What are GM crops?

- A crop which has a gene artificially inserted into it from another species to give some desired properties (pest resistant, herbicide tolerant, etc.) is known as GM crop.
- Soya bean, maize, cotton, and canola are the most widely grown GM crops around the world.
- **Bt cotton** - It is the only GM crop that is allowed in India.
- It has two alien genes from the soil bacterium *Bacillus thuringiensis* (Bt) that allows the crop to develop a protein toxic to the pest pink bollworm.
- **GM Mustard** - It is the first GM food crop that India has permitted for commercial release.
- It is a product of crossing two plants containing alien 'barnase' and 'barstar' genes derived from a soil bacterium.

For More Details about GEAC's Approval for GM-Mustard - [Click here](#).

What are the regulatory and approval authority for GM crops in India?

- Environment Protection Act, 1986 (EPA)
- Biological Diversity Act, 2002
- Plant Quarantine Order, 2003
- GM policy under Foreign Trade Policy
- Food Safety and Standards Act, 2006



Genetic Engineering Appraisal Committee (GEAC)

- GEAC is responsible for appraisal of proposals relating to the release of GM organisms and products into the environment.
- Functions under *Ministry of Environment, Forest & Climate Change*
- Operates as per the Rules, 1989, under Environment Protection Act, 1986.
- It applies to large scale use of hazardous microorganisms and recombinants in research and industrial production from the environmental angle.

- Drugs and Cosmetics Rule (8th Amendment), 1988

What is the issue around GM Mustard?

- GM Mustard is the first genetically modified food crop permitted for commercial release thus it requires attention towards environmental, agricultural and public health.
- The government is pushing ahead with GM mustard disregarding both science and the law.
- The full biosafety database of GM mustard is not placed in the public domain.
- It has not adequately responded to criticisms that already available non-GM mustard hybrids have better yields than GM mustard.
- There is growing evidence of long-term ecological and health risks of HT crops.
- The government has argued that GM mustard should not be considered HT at all in the Supreme Court hearing.

Mandate of Ministries/Departments	
Ministry of Environment, Forest and Climate Change	<ul style="list-style-type: none"> • Primarily responsible for conservation and protection of environment, ensuring environmental and human health safety before release of GMOs / LMOs. • Nodal agency for implementing Rules, 1989 and the Cartagena Protocol on Biosafety
Department of Biotechnology (Ministry of Science & Technology)	<ul style="list-style-type: none"> • Nodal department for promoting biotechnology programs • Provides scientific support in implementation of biosafety regulations • Provide services in areas of research, infrastructure, generation of human resource
Ministry of Agriculture	<ul style="list-style-type: none"> • Policies aimed at agriculture growth. • Indian Council of Agricultural Research (ICAR) responsible for monitoring agronomic benefits of GM technology. • Monitoring post-release performance of GM crops.
Ministry of Health and Family Welfare	<ul style="list-style-type: none"> • Policies aimed at protecting and monitoring human health. • Food Safety and Standards Authority of India responsible for regulating genetically engineered foods.
Ministry of Commerce and Industries	<ul style="list-style-type: none"> • Enhance trade with other countries through export/import policies. • Nodal agency for implementing DGFT notification on GMOs
Central Board of Excise and Customs, Department of Revenue, Ministry of Finance	<ul style="list-style-type: none"> • Enforcement of regulation pertaining to transboundary movement of GMOs/LMOs at point of entry

What are the reports on GM crops?

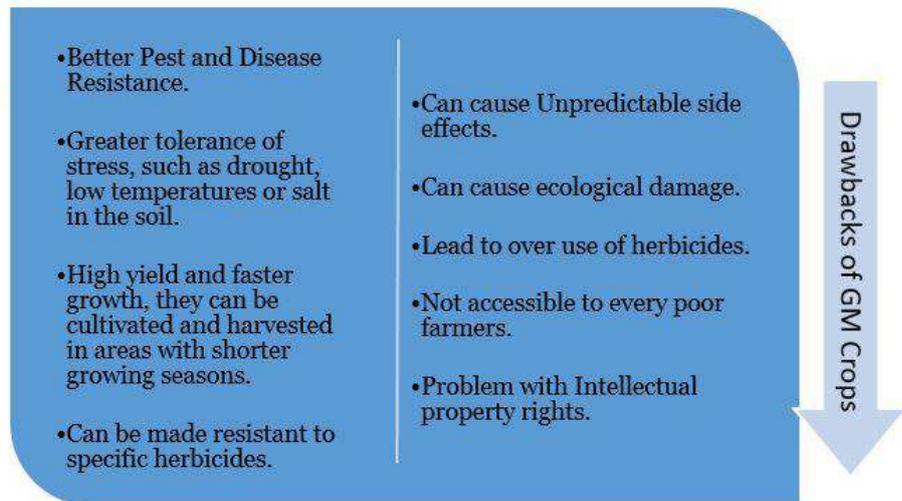
- Two Standing Committees of the Parliament independently and comprehensively examined GM crops and food.
- The 2 reports concerning GM foods are by
 1. The Standing Committee on Agriculture in 2012
 2. The Standing Committee on Science and Technology, Environment and Forests in 2017.

HT crop - A crop that can withstand herbicides. (HT - Herbicide)

- **Report takeaways** - The two committees unanimously highlighted major weaknesses in the regulatory system, and called for utmost caution before releasing GM food.
- **REC Report** - The Supreme Court also appointed a Technical Expert Committee (TEC) in the public interest litigations.
- The TEC warned of serious harm to the environment, rural livelihoods and sustainable agriculture if they were released.

What is the way forward?

- If the Supreme Court allows GM mustard to go through, it will likely pave the way for the release of other HT crops such as cotton, rice, and maize.



- The government should address the science-based concerns of GM crops.
- It should also comprehensively strengthen regulation before allowing GM food.

2.7 FL 2027 patent case: Delhi HC Vs PepsiCo

Why in news?

The Delhi High Court upheld an order by the Protection of Plant Varieties and Farmers' Rights Authority (PPVFRA), revoking the registration of patent for a potato variety (FL-2027) to PepsiCo India Holdings Pvt. Ltd.

What is potato plant variety FL-2027?

- FL 2027 (commercial name FC-5) is a potato variety with high dry matter and low sugar content better suited for making chips.
- It was developed in 1996 by a US breeder employed in PepsiCo Inc.
- This processing-grade variety is used in potato chips sold under its Lay's brand.

PepsiCo established its first potato chip plant in India in 1989.

What is the rights of PepsiCo over FL 2027 in India?

- PepsiCo India Holdings (PIH), the subsidiary of PepsiCo Inc., was granted a certificate of registration for FL 2027 in 2016.
- The validity period was 6 years from the date of registration and extendable up to 15 years.
- During the validity period nobody else could commercially produce, sell, market, distribute, import or export it without the breeder's authorisation.
- Farmers in India cultivate these potato varieties under a contract and has a buyback agreement with PIH. The company supplies the FC5 seed variety to a group of farmers who grow the potatoes exclusively for PepsiCo and sell them back at a fixed price.
- **Controversy** - In 2019, [PepsiCo sued some Indian farmers](#) for cultivating the FC5 potato variety, accusing growers of infringing its patent. Within months, [PepsiCo withdrew lawsuits](#) against farmers.

Protection of Plant Varieties and Farmers Rights Act, 2001

- The Act provides an effective framework for the protection of plant varieties, the rights of farmers and plant breeders.
- It encourages the development of various plant varieties in India.
- It recognises the rights of breeders, researchers & farmers.
- It also facilitates the mushrooming of the Indian seed industry to ensure the availability of high-quality seeds and planting materials to farmers.
- Protection of Plant Varieties and Farmers' Rights Authority (PPVFRA) was established in 2005.
- It functions under the Ministry of Agriculture & Farmers Welfare.

What is the case about?

- Protection of Plant Varieties and Farmers' Rights Authority (PPVFRA) had granted registration for patent for potato variety FL 2027.
- **Revoke** - PPVFRA revoked the same in 2021 based the Protection of Plant Varieties and Farmers Rights Act, 2001 (PPV&FR). It also rejected PepsiCo India's application for renewal of its registration.
- **Delhi HC** - PepsiCo challenged both the order and the letter before the Delhi High Court.
- The court upheld the PPVFRA's decision of revoking the IP protection rights of PepsiCo over FL 2027.

Why did PPVFRA revoke the registration?

- In relation to **Section 34(a)** of PPV&FR (incorrect info furnished), PPVFRA revoked the protection granted to a breeder.
- **Incorrect Category** - PepsiCo had sought the registration of FL 2027 as a "new variety" in its application. A *new variety* had to conform to the criterion of novelty.
- FL 2027 could satisfy only the criteria of distinctiveness, uniformity and stability (*DUS*) and eligible to be only granted registration as an "extant variety".
- **Incorrect Info** - In that the company had given the date of its commercialisation in India as December 17, **2009**. (more than one year before registration)
- The variety had already been commercialised in 2002 in Chile leading to furnishing of incorrect information by the applicant.

Novelty criteria - The propagated or harvested material from the variety should not to have been sold in India earlier than one year before the date of filing the application for registration.

2.8 Crop Diversification in Trans-Gangetic Plain

Why in news?

States like Punjab and Haryana are unable to get out from the paddy-wheat cycle.

Status of agriculture in Punjab and Haryana

- Punjab is the food bowl of India. With 1.53% of the country's area, it contributed 29% of rice and 38% of wheat in central food grains of the nation.
- Punjab is the 3rd largest farming crop producing state in India. Currently 77 lakh acres of the agricultural land is under paddy cultivation in Punjab.
- Haryana is regarded as the bread basket and rice bowl of India, contributing 45% of rice and 65% of wheat to the central pool and more than 5% to total food production of the country.
- Haryana is self-sufficient in food production and the second largest contributor to India's central pool of food grains.

AREA UNDER CROPS IN PUNJAB (PERCENT OF GCA)

Crop	Percentage of GCA
Wheat	44.96%
Rice	39.67%
Cotton	3.44%
Maize	1.51%
Sugarcane	1.21%
Vegetables	1.53%
Mustard	0.36%
Fruits fresh	0.80%
Tur	0.03%
Gram	0.02%
Others	6.47%

TE 2019-20

Why paddy-wheat cycle is prevalent in Punjab and Haryana?

- Green revolution-** It was initiated in 1967 by M.S.Swaminathan to ensure food security in India. Both the states were successful.
- Level of profits earned** – It is noted that no other crops were profitable like paddy and wheat which are profit maximisers for farmer.
- Stable income-** Unlike other states and other crops, Punjab's rice and wheat earn stable and reasonably rising incomes each year attributable to the government's Minimum Support Price (MSP).
- Lack of awareness-** The small and marginal farmers have inadequate knowledge about cultivating other crops which makes them difficult to find buyers for selling it in better prices.
- Availability of services** - Availability of cheap power, water and easy access to information and services encourages farmers to undergo monoculture practice.

In 2018-19, paddy was purchased for Rs.75, 887 per hectare whereas gram was purchased for Rs.9, 175 per hectare.

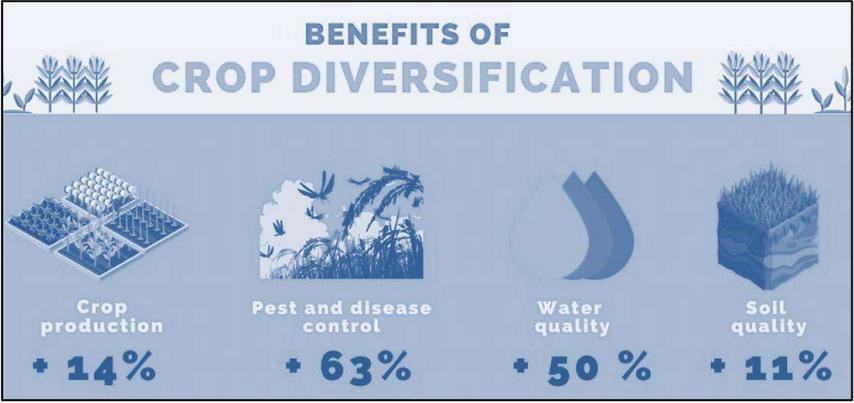
Why is crop diversification so significant?

- Groundwater conservation** - Encouraging farmers to grow maize, bajra over water-guzzling crops like paddy will lead to groundwater conservation.
 - As per a recent UN report, in Punjab, the amount of groundwater withdrawn in certain regions exceeds natural recharge rates.

- Increased productivity** - Crop diversification is a strategy applied to grow more diverse crops from shrinking land resources with an increase in productivity in the same arable land.

- Soil enrichment-** Crop diversification increases the soil health in the nutrient deficient rice and wheat regions.

- Increase resource use efficiency-** Breaking the monocropping pattern by the introduction of diverse crops and cropping patterns helps in the resource-use efficiency.



- **Revival of traditional agriculture**- This method ensures crop diversity which is more stable and pro-nature.
- **Reduction of pest & diseases**- It helps effectively in pest and diseases management, reduces the quantity of weeds.
- **Reduction in crop failure** - It allows farmers to employ biological cycles to conserve the resource base and reduce the risk of crop failures.
- **Increased income** - It boosts the land use efficiency and enhance the net returns by reducing the input cost.
- **Food and nutrition security**- It has sound capacity for achieving the goal of nutritional security by widening the food basket like cultivating millets, cereals etc.,

What are the challenges in crop diversification?

- **Lack of awareness** - Many farmers are unaware of the concept of crop diversification due to large scale illiteracy among them.
- **Lack of training** - Only few scientists are working for alternative crop research and there is a lack of trained human resources in crop diversification.
- **Poor government support**- Government encourages cultivation of rice and wheat as they would ensure food security.
- **Infrastructural deficit**- Lack of proper storage facilities, Post-harvest management and few food processing industries decrease the value chain.
- **Low investment**- Low investment in research and development activities to enhance crop diversification is another issue.
- **Monetary factor**- The level of compensation associated with other crops is less compared with Paddy and wheat

In the Garhwal Himalayan region of India, Barahnaja is a crop diversification system for cultivating 12 crops in a year.

Steps taken to Promote Crop Diversification

- **Johl Committee** - It recommended for shifting at least 20% of the net cropped area from dominant crops like paddy and wheat in Punjab to other crops.
- **Ashok Dalwai Committee (Committee on doubling the farmers' income)** - It recommended shifting some areas from staple cereals to high-value produce so that it can lead to a sizable increase in the returns for farmers.
- **Crop Diversification Programme (2013-2014)** - It was launched by the Central Government as a sub-component under *Rashtriya Krishi Vikas Yojana (RKVY)* to diversify 5% of the paddy cultivation area in Uttar Pradesh, Haryana, and Punjab.
- **Punjab's scheme** - In the 2023 budget, the Punjab government allocated ₹1,000 crore for implementing a *special scheme on crop diversification*.
- **National Food Security Mission (NFSM)** - It is launched in 2013 to supplement the state government to enhance the diversified production of crops such as pulses, coarse cereals, and nutri cereals.
- **Mission for Integrated Development of Horticulture (MIDH)** - It is a scheme for holistic growth and development of Horticulture sector.
- It covers vegetables, fruits, roots and tuber crops, aromatic plants, flowers, spices, bamboo, coconut, cashew and cocoa.

What lies ahead?

- There is a need
 - To enhance the focus on R&D to work in alternative crop development like maize and soya bean.
 - To expand the investment in human resources.
 - To create federations like 'Punjab Maize Federation' or 'Punjab Soya bean Federation' to institutionalise the development and progress of different alternative crops.
 - To fill the gaps in the value chain by improving food processing industry, create favourable business environment like offer tax holidays etc.,

2.9 Threats of Plasticulture

Why in news?

The agriculture food system is increasingly becoming dependent on plastics resulting in more plastic pollution.

What is plasticulture?

- Plasticulture is a term used to represent the application of plastics in the agricultural sector.
- The proliferation of plasticulture endangers soil, biodiversity and human health.
- In the farming sector, plastics are used to pack seeds and fertilisers in single-use plastic sachets, sacks and plastic containers.
- **Other plastic products** used in agriculture are - seedling trays, mulching film, greenhouse film, protective nets, drip irrigation tapes and irrigation pipes.
- Polyethylene, polypropylene, expanded polystyrene, polyvinyl chloride (PVC) and polyethylene terephthalate are few main polymers found in them.

Agricultural value chains used 12.5 million tonnes of plastic products globally in 2019, reported the Food and Agricultural Organization.

What are the threats posed by plasticulture?

- The application of plastics in the agriculture sector is hailed to contribute towards the 'Second Green Revolution' in the country.
- **Microplastics** - The plasticulture has led to microplastics entering every living organism on the planet.
- According to the FAO report, soils are known to contain larger quantities of microplastics than oceans.
- **Soil porosity** - With time the additives and chemicals embedded in mulch films can gradually diminish soil porosity and hinder air circulation.
- **Microbial activity** - It also has the capacity to alter microbial communities, thereby reducing farmland fertility.
- **Poison plastic** - PVC releases toxic chlorine-based chemicals and is a known carcinogen.
- PVCs or low-density polyethylene are primarily used in the plastic mulch films and also in irrigation pipes and drip tapes.
- **Leaching** - Carcinogenic chemicals (phthalate acid esters) from plastic films have high potential of leaching into farm soil.

Just 1 kg of thin mulching sheets is enough to cover and contaminate as much as 700 square feet of agricultural land.

What are the challenges in reducing plasticulture?

- **Plastics industry** - Constantly promotes its own studies on how plastics boost yields, save water, reduce fertilisers, and cut labour.
- The industry maintains a deafening silence on its negative impacts on soil and environment.
- Furthermore, it has a strong lobby to influence the government.
- **Rules** - The Centre banned single-use carry bags with less than 120 microns, but it provided a 50% subsidy for using single-use mulching sheets as thin as 15 microns.
- **Government initiatives** - Plastics are being promoted by the industries through several government bodies like
 1. In 2001, to promote the use of plastics, Ministry of Agriculture constituted National Committee on Plasticulture Applications in Horticulture (NCPAH).
 2. This was renamed as National Committee on Precision Agriculture & Horticulture.
 3. Currently, 22 Precision Farming Development Centres have been established to promote the use of plastics in horticulture.
- **Petrochemical industry** - Growth in the petrochemical industry will also boost plasticulture practices in the country.
- The demand for chemicals and petrochemicals in India is expected to reach US\$ 1 trillion by 2040.

Around 99% of plastic is produced from fossil fuels by refining oil, natural gas, or coal.

- **Plastic Waste Management** - Management of agricultural plastic waste is close to non-existent and have become immortal and omnipresent.
- Most 'agro plastics' have a limited lifetime (less than a year) hence, farmers manage their agropastics in two ways: Burning or burying.
- When plastics are **burned**, they emit hazardous substances such as dioxins and furans, which cause cancer.
- **Burying** of plastics releases microplastics which impact human health when agricultural produce is consumed.

About 67% of the people in villages preferred to burn household plastic waste, according to the findings of a survey released in 2022.

What is the way forward?

- An outright **ban** on non-essential agri plastics.
- Countries like India have pioneered sustainable agricultural practices using locally available and **eco-friendly materials**, we should make use of it.
- A new '**Extended Legislature Responsibility**' clause could be invoked.

2.10 Precision Farming

Why in news?

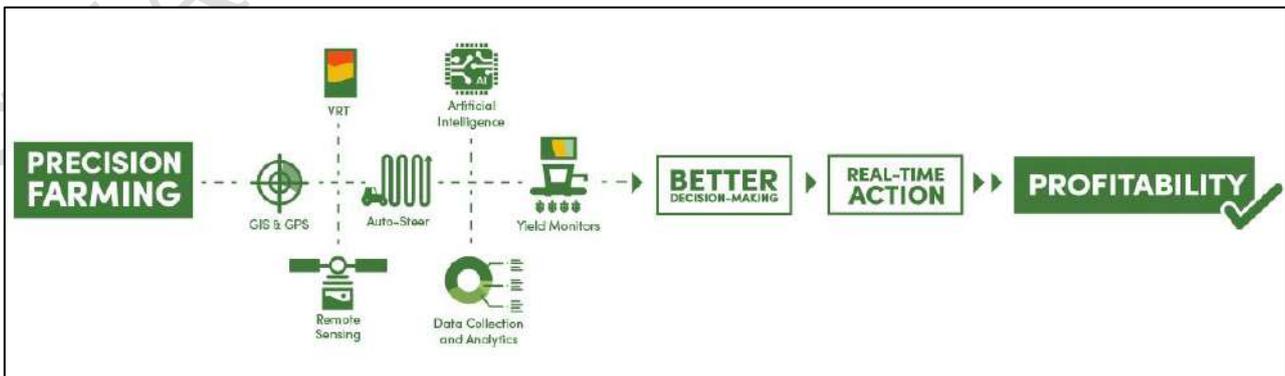
India's food requirement is likely to go up from the present level of 330 million tonne (MT) to more than 500 MT by 2050. India needs to meet the growing demand for food amidst shrinking land size.

What is 'Precision farming'?

- **Precision farming** is a site-specific crop management concept.
- It is based on observing, measuring and responding to inter- and intra-field variability in crops.
- This involves leveraging digital tools such as **AI, Machine Learning, and IoT** to optimise crop yield and quality while minimising costs and resources.
- It is also referred to as precision agriculture, satellite agriculture, and site-specific crop management (SSCM).

How Precision farming happens?

- The following things are needed to increase the efficiency of the input resources
 - Quality estimation of the seeds to be cropped
 - Well-prepared soil
 - Precise seeding advisory
- **Farming Stage** - Based on the soil health analytics, the amount and type of micro/macro nutrients is decided and added to the soil.
- IoT enabled soil sensors combined with remotely sensed data through drones/satellites and fast processing determines what the soil needs.
- This information is either send as a notification to the farmer's phone or through a central server.



What are the benefits of precision farming?

- In order to meet the growing demand for food amidst shrinking land size, precision farming is a promising solution avoiding crop failure.

- **Harvesting stage** - Any errors at this stage can result in crop failure.
- *Crop surveillance* is the only way that a farmer can ensure a timely harvest, especially when dealing with *seasonal crops*.
- It also helps in understanding and planning for the next farming season.
- Effective inspection of the field with infrared cameras and based on their real-time information improves crop surveillance.
- *Data-based harvesting* decisions are the next important step that can increase the efficiency of farming decisions.
- IoT and analytical tools can identify the parameters for harvesting in real-time.
- Farmers can estimate when the *nutritional content* is highest in the crop through digital tools and determine the correct time of harvesting.
- For example, the harvesting of sugarcane crop can be done based on sugar content in the plant and not by its size.
- **Post-harvest stage** - Digital tools helps farmers with price, storage, transportation and logistics information.
- Precision technology can play a useful role in '*traceability in supply chain*', particularly in exports.

What are the issues in adapting to precision farming?

- There is a slow uptake of digital agriculture due to various data collection and analytics hindrances.
- **Data collection** - The prominence of *segregated smallholder* farms in the country, which makes data gathering a complicated activity.
- **Lack of centralised Repository** - Data of different geographical locations, weather, soil types, crop types, and other parameters are needed to make a viable advanced technology-based model.
- At present, there isn't a centralised repository of different varieties of data stacks to be used in agriculture.
- **Cadastral data** - To improve analytics, Cadastral data with administrative boundaries and geo-coded soil data must be made available through public sources.
- At present, only few States have GIS maps of cadastral boundaries which limits the potential of wide scale implementations of digital solutions.
- **Disparate data** - Rich data sets like soil health card on micro-nutrients, are disparate and not interoperable, limiting analytics and value creation.
- **Affordability** - technological interventions used in precision farming is unaffordable for Indian farmers.

What is the way forward?

- **Farm Digitization** - Scaling up of digital agriculture in India by bringing digitisation to the farm.
- **Effective partnership** - Learnings can be drawn from several successful examples of partnerships between stakeholders within India and around the globe.
- **Digital Infrastructure** - Development of digital public infrastructure for farmers covering all areas from input to output.
- **Accessibility** - Government subsidising the cost of technology to enable them move towards digital technology.
- **Carbon trade** - Creation of carbon credits for the farmers would encourage the adoption of precision agriculture.

2.11 Sugar Subsidies at WTO

Why in news?

India is in negotiations with Brazil to resolve a long-standing dispute about sugar subsidy at the World Trade Organisation (WTO).

What is WTO?

- The [World Trade Organization](#) is the only international organization that deals with the rules of trade between countries.
- **Establishment**- In 1995 superseding the 1947 *General Agreement on Tariffs and Trade (GATT)*.

- **Members**- The WTO is run by its 164 members representing 98% of world trade.
- **Decision making**- Unlike other organisations, such as the IMF or World Bank, WTO does not delegate power to a board of directors or an organizational chief.
- All decisions are taken through *consensus* and any member can exercise a veto.

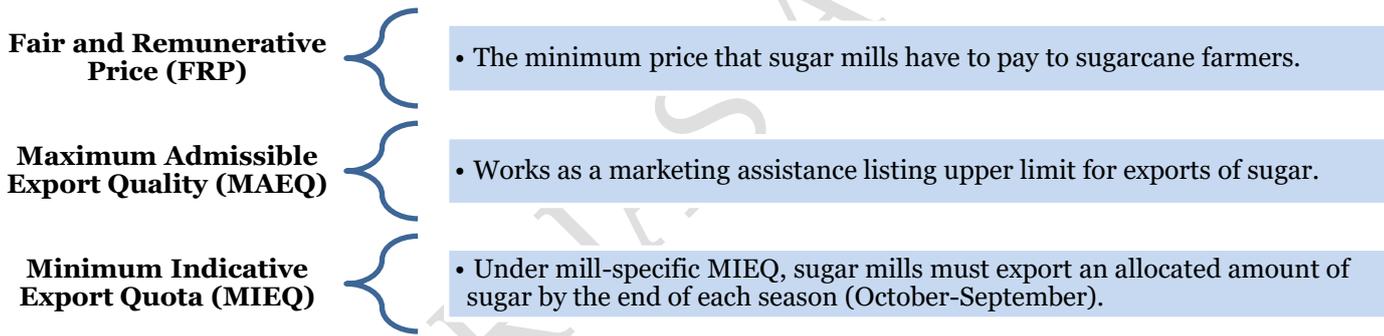
How disputes are settled in World Trade Organisation (WTO)?

- The bilateral consultation is the first step to resolve a dispute as for the proceedings in the WTO.
- The sides when unable to resolve the matter through consultation, can approach the *Dispute Settlement Panel*.
- The panel’s report can be challenged before an *Appellate Body* whose decision will be *final*.
- However, the body is unable to review cases at present given *ongoing vacancies*.
- India is in bilateral talks with Brazil to resolve the long-standing sugar dispute at WTO.

What is the dispute about?

- In 2019, Brazil had submitted a complaint against India in WTO alleging that India’s according of sugar subsidies was inconsistent with its trade rules.
- **Support measures** - The complainant argued against the
 - Minimum prices of sugarcane and sugar
 - Fair and remunerative prices (FRP)
 - Specific states enforcing higher minimum prices
 - Minimum Indicative Export Quota (MIEQ)

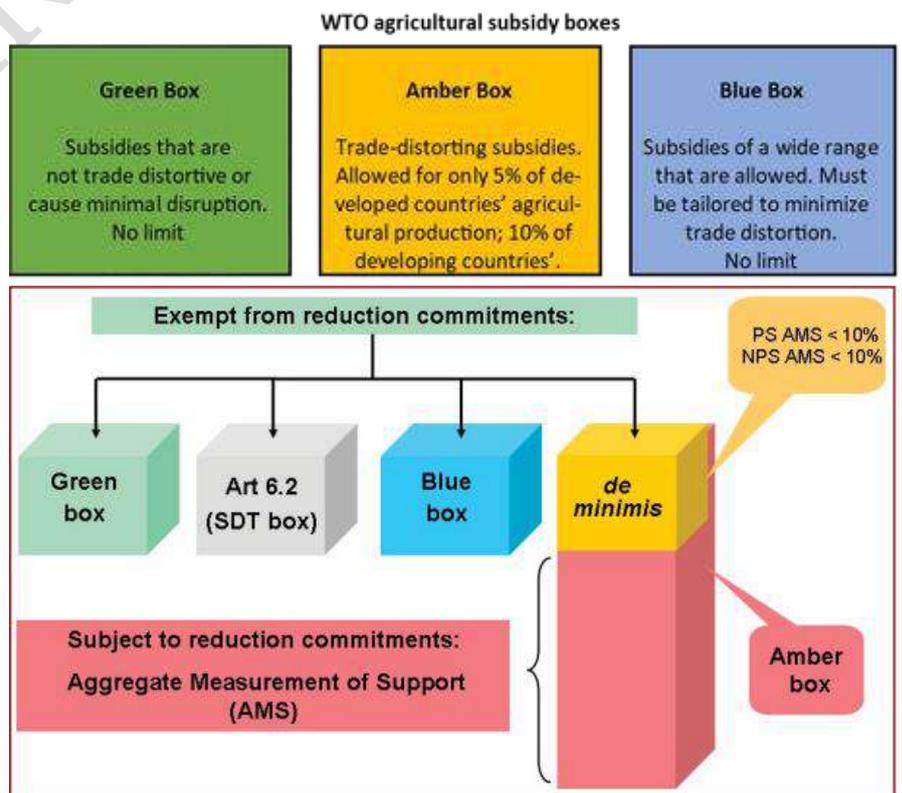
India is the 2nd-largest exporter of sugar in the world behind Brazil.



- **Reason** - Brazil, Australia and Guatemala criticized that India's support measures to sugarcane producers exceed the de Minimis level of **10% of the total value of sugarcane production**.
- The countries argued that the sugar subsidies incentivised Indian sugarcane farmers which led to increased domestic production of sugarcane and sugar.
- It contended that with production exceeding domestic demand resulting in increased sugar stocks the government intervention facilitated lowered prices for the commodity in the global market.

What did the WTO say?

- WTO constituted a panel to study the allegations in October 2019,



which submitted its report in December 2021.

- The WTO panel report concluded that India was providing 'lump sum assistance' for expenses emanating on account of sugar towards maximum admissible export quality (MAEQ).
- The panel stated that the support measures of India are inconsistent with WTO trade rules under Article 7.2 (b) of the Agreements on Agriculture (AoA).
- The WTO asked India to withdraw its exports subsidies within 120 days from the circulation of the report.

What is India's defence?

- **India's Stand** - The Indian government stated the dispute panel's findings are unreasonable and not supported by the WTO rules
- The report also evaded key issues which it was obliged to determine.
- India held that the schemes are meant to support sugarcane producers and exports and are well within its obligations under the WTO agreements.
- **Appeal** - In January 2022, [India appealed](#) against the panel's ruling at the WTO's appellate body stating that the panel 'grossly errs' in holding that the MAEQ were of the 'same essence' as other alleged export subsidies.
- Further, it contended that FRP and state-advised prices do not constitute 'applied administrative prices'.

Article 7.2 (b) of Agreement on Agriculture - Members cannot provide support in excess of the de Minimis standards.

Sugar Production in India - Last Year and Ongoing Season

- In Sugar Season (Oct-Sep) 2021-22, India emerged as the world's **largest producer and consumer** of sugar.
- India had exported 11 million tonnes in the last year where the production stood at 35.9 million tonnes.
- For the ongoing sugar season, the production is estimated to be 32.8 million tonnes.
- India had allowed exports of 6.1 million tonnes for the ongoing season exhausting the quota.

3. ENVIRONMENT

3.1 The 1.5 degree Celsius Target

Why in news?

The World Meteorological Organization (WMO) released two decadal prediction reports in which it says, the average global temperature will exceed the critical point of 1.5 degree Celsius by 2027.

What does the World Meteorological Organisation's recent reports say?

- The World Meteorological Organization (WMO) released two reports titled '[Global Annual to Decadal Climate Update 2023-2027](#)' and '[State of Global Climate 2022](#).'
- **Predictions** - In 2022, the annual mean global surface temperature was 1.15 degrees above the baseline temperature of pre-industrial levels (1850-1900).
- The global surface temperature will be 1.1-1.8 degree Celsius higher than the baseline temperature between 2023 and 2027
- This average global temperature will exceed 1.5 degrees by 2027.

What is the 1.5 degree Celsius target?

- Countries agreed to limit the global average warming to below 2 degree Celsius, in 2010 at the Cancun COP16 to UNFCCC.
- The Paris Agreement (2015) also pledged to limit the average temperature rise to below 2 degree and actively aimed for 1.5 degrees.
- The 2 degree target was unaccepted by small island countries as it compromised their survival and the 1.5 degree seemed ambitious.
- After the 2018 IPCC report, the target moved to 1.5 degree.

Why is the 1.5 degree target critical?

- In 2018, the IPCC released a report on the impact of global warming when temperatures reaches 1.5 degree Celsius above the baseline temperature of pre-industrial levels.

- The report compared the effects of 2 degree temperature rise and 1.5 degree temperature rise.

- The 2 degree temperature rise witnessed mostly irreversible changes.

- Also, the temperature rise is not uniform across the planet and the regional differences and their vulnerability has been taken into account.

CLIMATE IMPACTS	Rise of 1.5°C	Rise of 2°C
Arctic: Sea ice-free summer	Once per century	Once per decade
Sea level rise: Exposure to flooding in 2100	31-69 million people worldwide	32-80 million people worldwide
Extreme heat: Exposure at least once every five years	About 14% of global population	About 37% of global population
Severe drought: Increase in urban population	+350 million people worldwide	+411 million people worldwide
Status of coral reefs	70-90% lost	99% lost
Plants and animals: Species losing more than half of their range	6% of insects, 8% of plants, 4% of vertebrates	18% of insects, 16% of plants, 8% of vertebrates

- For example, '**polar amplification**' happens at Arctic where warming is greater than the global average.
- For the above factors climate action must limit the average global warming to 1.5 degree.

Why are we missing targets?

- The developed countries are expected to assume more responsibility and implement climate action due to the historic reasons.
- The Climate Performance Index over the years has shown the major polluters have made little progress in climate action.
- The pandemic has pushed the world into a socio-economic crisis.
- The Ukraine conflict has aggravated the situation and pushing in an energy crisis threatening climate goals.

Global Impacts	Impacts on India
<ul style="list-style-type: none"> Climate risks and hazards impact human population and the ecosystem depending on exposure, vulnerability, and adaptive capacity. The Horn of Africa has been witnessing extreme drought conditions since 2020, while the western African countries are seeing floods and heavy rainfall. The cryosphere is shrinking, and there is a mass loss of glaciers in High-mountain Asia, Western North America, and South America. 	<ul style="list-style-type: none"> India has been increasingly facing the effect of climate change. February 2023 was recorded as the hottest month since record-keeping began in 1901. In 2022, India witnessed extreme weather events for 80% of the days.

What are India's climate action?

- Being an emerging economy, India is attempting to balance its development needs with ongoing climate action at all levels.
- India introduced initiatives like green bonds and Green Hydrogen Mission at domestic level.
- At international level, India is spearheading International Solar Alliance and Coalition for Disaster Resilient Infrastructure against climate change.

3.2 Key Takeaways from Bonn Climate Meet

Why in news?

The Bonn climate change conference that finished last week was built up as an opportunity for course correction, however, it underperformed.

What is the background of the issue?

- A massive and immediate scale-up in climate action is essential to keep alive any realistic chance of meeting the **1.5 degree or 2 degree Celsius targets**.

- Developed and developing countries bickered on issues old and new, and could not even agree on the agenda of one of the meetings till the penultimate day.

What is the tussle between developing and developed countries?

- A bulk of the accumulated greenhouse gas emissions, the reason for global warming, have come from a group of about 40 rich and industrialised countries.
- Such countries are referred to as Annex I countries under the 1992 UN Framework Convention on Climate Change, or UNFCCC.
- This historical responsibility has been the basis for the differentiated burden-sharing on developed and developing countries in the climate change framework.
- **View of developed countries** - Australia issued a statement which downplayed the historical responsibility of the developed countries in causing global warming.
- It argued the emissions happened when there was little understanding on the harm caused by greenhouse gases.
- It pointed out that since 1992, about 57% of the carbon dioxide emissions and 70% of the incremental warming since 1992 due to emissions from carbon dioxide, methane and sulphur dioxide had come from non-Annex I countries.
- Australia said that developed countries would take lead in climate action, however, it did not believe there was an unambiguous debt owed by the developed countries for past actions.
- US said bridging the adequacy gap was not the sole responsibility of the developed nations and that it would not agree to references to pre-2020 commitments in the GST.
- Erasure of historical responsibility is the most sensitive red line for developing countries.

Global Stock Take (GST)	
	<ul style="list-style-type: none">• GST – Mandated by the <u>2015 Paris Agreement</u>, GST is an exercise aimed at assessing the progress in the fight against climate change.• The GST helps in deciding ways and means to enhance global action to bridge the adequacy gap.• The <u>Paris Agreement</u> says GST must be conducted <u>every 5 years, starting in 2023</u>.• The actual meat in GST would come in at COP28, the year-ending climate conference, held in Dubai.• The discussions just produced a short framework on the elements to be included in the stocktake exercise.

Why the money matters?

- Apart from GST, another mechanism was set up at COP26 in Glasgow in 2021 for climate action.
- **Mitigation Work Programme (MWP)**, is a temporary emergency exercise focused only on increasing emission cuts.
- The Intergovernmental Panel on Climate Change (IPCC) says global emissions have to come down by 43% from 2019 levels by 2030 to keep alive hopes of meeting the 1.5 degree target.
- **Monetary aid** – Most developing countries, including India, have said they would be able to act more if international support in the form of money and technology transfer was made available.
- **Tech transfer** – Developed countries are under an obligation to support the implementation of climate action plans of developing countries through money and tech transfers.
- However, money has been in perennial short supply and more funds are needed for all kinds of other purposes, the total estimated to be running in several trillions of dollars every year.

3.3 The Summit for a New Global Financing Pact

Why in news?

The Summit for a 'New Global Financing Pact' was held in Paris, France to discuss the repercussions of the climate, energy, health and economic crises, particularly in the most vulnerable countries and its financing.

What is the Pact Summit about?

- **Genesis** - The Summit for a New Global Financing Pact was announced at the 27th Conference of Parties (COP27) to the United Nations Framework Convention on Climate Change (UNFCCC).
- The Summit for a New Global Financing Pact is also known as '**Pact Summit**' in short.

- The summit was spearheaded by the French President Emmanuel Macron highlighting the need for a new financial pact with the most vulnerable countries.
- The summit was precipitated as a follow-up to the Bridgetown Initiative tabled by Barbados.
- **Pact Summit** - It is an attempt to collectively rethink the global financial architecture of international solidarity and climate action by proposing concrete solutions to create a fairer, more effective and more responsive global financial system.

Bridgetown Initiative - A package of proposals to get more money flowing from developed to developing countries for climate and development.

What is the need for such summit?

- Poor and vulnerable countries battle 'a cocktail of interconnected crises' such as poverty, debt, inflation triggered due to the Russia-Ukraine conflict, and increasing climate impacts.
- Countries of Global South are in a debt crisis.
- Developing countries are facing pressure to decarbonise their economies without adequate climate finance flowing in.
- African countries are facing an unprecedented funding squeeze.

What happened at the Summit?

- Several leaders from the developing world, as well as European nations attended the Summit.
- The Summit took on the monumental task of addressing the lack of money flowing to poor and vulnerable countries.
- **Working Groups** - The Summit convened 4 Working Groups on the following topics prior to the summit:
 1. Ensuring more fiscal space for the most-affected countries.
 2. Financing the private sector in low-income economies.
 3. Increasing investment in green infrastructures in emerging and developing markets.
 4. Developing innovative solutions to provide additional resources in support of countries vulnerable to climate change.
- Some announcements were unveiled at the summit to address the trust erosion issue between the Global North and South.

A third of developing countries and two thirds of low-income countries face high risks of excessive debt.

What was announced at the summit?

- **Multilateral Development Banks (MDBs)** - A contentious MDB Vision Statement document did not get full consensus.
- An additional lending capacity of \$200 billion would be unlocked by MDBs for emerging economies.
- **World Bank** - It announced **disaster clauses** for debt deals to suspend debt payment in the case of extreme weather events as advocated by Bridgetown Agenda.
- It also unveiled a '**Private Sector Investment Lab**' with the aim to develop and rapidly scale solutions that address the barriers in private sector investments.
- **Special Drawing Rights** - The '**recycling**' of SDRs from rich countries to poor countries or MDBs, has been proposed as means to expand the amount of concessional finance to developing countries.
- **A new JETP** - A new 2.5 billion Euro JETP deal was announced for Senegal, with a consortium of countries comprising of Germany, France, Canada, the EU and the U.K.
- It aims to increase the share of renewable energy in installed capacity to 40% of Senegal's electricity mix by 2030.
- **Polluter taxes** - Many groups supported a tax on shipping emissions accelerating the momentum on polluter taxes.
- **Carbon markets** - The EU unveiled a call to action on '**Paris Aligned Carbon Markets**' with
- It has the goal of covering at least 60% of global emissions with carbon pricing mechanisms (4% now) and allocating a proportion of the revenues to climate finance.

What are the challenges ahead?

- **Proven solutions** - European leaders to pitched Carbon pricing as a serious suggestion, which is one of the tool in a package of many.
- Developed countries should acknowledge the urgency and scale of financial need and come up with scalable solutions.
- **Responsibility** - There is also a fundamental refusal to own who should be responsible between developed country governments and multilateral institutions.
- **MDBs** - Developed countries focused on MDB reform which will increase the pressure on MDBs' resources manifold.
- Developed countries want to squeeze more out of existing MDB resources while simultaneously adding on climate as a part of their mandate.
- **Private capital** - The Global North showed an overwhelming emphasis on derisking private capital, shifting the onus of finance to the private sector.
- The private sector money even though can be unlocked, cannot replace long-term development money.
- **Debt** - Debt cancellation, concessional financing and grants, polluter taxes and the consideration that poverty eradication efforts cannot be side lined for climate goals

3.4 Impact of climate change on water bodies

Why in news?

Climate change has severe effects on waterbodies causing decline in freshwater supply, environment degradation and deterioration of water quality for humans and livestock.

What are the importance of water bodies or lakes?

- **Water supply** - Lakes are a major source of freshwater for drinking, irrigation, and industrial use.
- **Recreation** - Lakes are popular for swimming, boating, fishing, and other recreational activities.
- **Employment** - The fishing and tourism industries that rely on lakes provide jobs for millions of people around the world.
- **Water quality** - Lakes help to filter and clean water which helps to protect human health and the environment.
- **Climate regulator** - Lakes help to regulate the climate by storing heat and releasing it slowly.
- This helps to moderate temperatures and reduce the risk of extreme weather events.
- **Biodiversity** - Lakes are home to a wide variety of plants and animals, which play an important role in the ecosystem.
- **Flood prevention** - Lakes can help to prevent flooding by storing excess water during heavy rains.
- **Erosion control** - Lakes can help to control erosion by slowing down the flow of water and depositing sediment.
- **Hydroelectric Power Generation** - Some lakes, especially those formed by dams, are utilized for hydroelectric power generation.
- **Carbon Sink and Nutrient Cycling** - Lakes are significant components of the global carbon cycle.
- They can act as carbon sinks, sequestering carbon dioxide from the atmosphere.
- They play a role in nutrient cycling, influencing the distribution and cycling of important elements like nitrogen.



- **Cultural and Spiritual Significance** - Many lakes hold cultural and spiritual significance for indigenous communities and local populations.

What are the effects of the climate changes on water bodies?

- **World’s largest lakes and reservoirs** - Have shrunk more than 50% over the 3 decades.
 - From these water bodies, approximately 600 cubic km of water was lost between 1992 and 2020 which is equivalent to the total water used in the United States for the entire year of 2015.
- **Sedimentation** - Main cause of the decline in the water storage for more than half of the reservoirs located in peninsular India.
- Sedimentation has a larger impact than hydro climate variability such as droughts and recovery from droughts.
 - Among the worst affected natural lakes in the country is Ladakh’s Tso Moriri.
- **Water consumption** - Unsustainable water consumption in the world’s large lake have led to the decreased water levels.
- **Arctic lakes** - Shrunk as a result of a combination of changes in precipitation, runoff, temperature, and PET, which are likely a concurrent result of natural variability and climate change.
- **Humid tropics and high altitudes** - Natural lakes located in humid tropics and high altitudes are also experiencing water shortages.
- **Human activities** - Such as unsustainable consumption of water and increasing temperature and potential evapotranspiration (Loss of water due to both evaporation and transpiration) have led to reduced water levels.

Sedimentation is the process of particles such as sand and stones settling to the bottom of a body of water.

What are the consequences of shrinking lakes?

- Nearly one-quarter of the global population in 2023 will be affected as their livelihood depends on lakes.
- Affects hydroelectricity generation as lakes are important source of hydroelectricity.
- Freshwater decline and environmental degradation.
- Disrupts the water and carbon cycles.
- Reduce the environmental capacity to absorb CO2 & increase C emissions as lakes are hotspots of carbon cycling.

3.5 Conservation of Small Rivers

Why in news?

Government of India has taken steps for conservation of water and rejuvenation of small rivers.

What initiatives were taken to conserve small rivers?

- **Jal Shakti Abhiyan (JSA)** – It was launched in 2019 to promote water conservation and water resource management.

JSA Series	Theme	Focus
2023	Source Sustainability for Drinking Water	Special focus on 150 Water Stressed Districts (WSDs) of the country

• **Five-fold intervention-**

- Rainwater harvesting & water conservation
- Enumerating, geo-tagging & making inventory of all water bodies;
- Preparation of scientific plans for water conservation
- Setting up Jal Shakti Kendras in all districts
- Intensive afforestation
- Awareness generation.
- **Amrit Sarovar Mission-** It was launched in 2022, aimed at developing and rejuvenating 75 water bodies in each district of the country as a part of celebration of Azadi ka Amrit Mahotsav.

- **Namami Gange programme**-It was launched in 2014 for integrated rejuvenation of National River Ganga.
- Its tributaries and large numbers of smaller tributaries have been mapped along with their catchment area/watershed and wetlands.
- A GIS based inventory of small rivers has also been created with additional district wise information.

- **National River Conservation Plan (NRCP)** – It is the Centrally Sponsored Scheme implemented for abatement of pollution in identified stretches of rivers in the country, excluding those in Ganga basin.
- It provides financial and technical assistance to the States/Union Territories (UTs) on cost sharing basis.

Best Practices
<ul style="list-style-type: none"> • Vidharbha Farmers Livelihood Project- Sustaining farmers livelihoods through integrated watershed management and conservation of natural resources. • Drought proofing in Maharashtra- The Government of Maharashtra rolled out the “<i>Gaalmukt Dharan and Gaalyukt Shivar</i>” (<i>GDGS</i>) <i>scheme</i> to de-silt the waterbodies using excavating machines. The resultant silt was given to farmers free of cost. • Low cost irrigation in Andhra Pradesh- The objective is to produce more crop per drop using judicious water irrigation practices.

- **Small River Rejuvenation & Conservation plan**- In this, 19 rivers have been identified & successfully taken up by Uttar Pradesh government.
 - Example- River Manorama, River Varuna, River Tedi etc.,
- **Mission Water Conservation**- It is launched to develop actionable framework for gainful utilization of funds.
- It strives to ensure synergies in [Mahatma Gandhi National Rural Employment Guarantee Scheme](#) (MGNREGS), Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) etc.,
- **Mass awareness programs**- To promote water conservation initiatives including rain water harvesting and artificial recharge to ground water various.
- **National Water Awards**- It is constituted under Ministry of Jal Shakthi to recognize the efforts of people and organizations working in water conservation.
- **Weekly Water Heroes Contest**- The objective of the contest is to promote value of water, in general, and for supporting country-wide efforts on water conservation and sustainable development of water resources.

3.6 Land Restoration

Why in news?

The United Nations Convention to Combat Desertification (UNCCD) has released the Global Land Outlook report highlighting the depletion of finite land resources and the need to urgently restore the world’s land.

Why land restoration is important?

- **Land restoration** - Defined as the continuum of activities that avoid, reduce, and reverse land degradation with the explicit objective of meeting human needs and improving biodiversity.
- **Solves interconnected crisis** - Land acts as an operative link between biodiversity loss and climate change which can solve various interconnected climate crisis.
- **Equitable and sustainable future** - Effective land [restoration](#), coupled with efforts to meet future needs is essential to recover from the current crises.
- It is also essential to move towards an equitable and sustainable future.
- **Economic benefits** - Each dollar invested in land restoration activities has also been estimated to return between \$7 and \$30 in economic benefits in future.
- **Sustainable Development Goals** - According to U.N. General Assembly, achieving ‘**land degradation neutrality**’ is an effective way to accelerate progress towards achieving Sustainable Development Goals by 2030.

UNCCD defines ‘land degradation neutrality’ as “a state whereby the amount and quality of land resources necessary to support ecosystem functions and services and enhance food security remain stable or increase within specified temporal and spatial scales and ecosystems”.

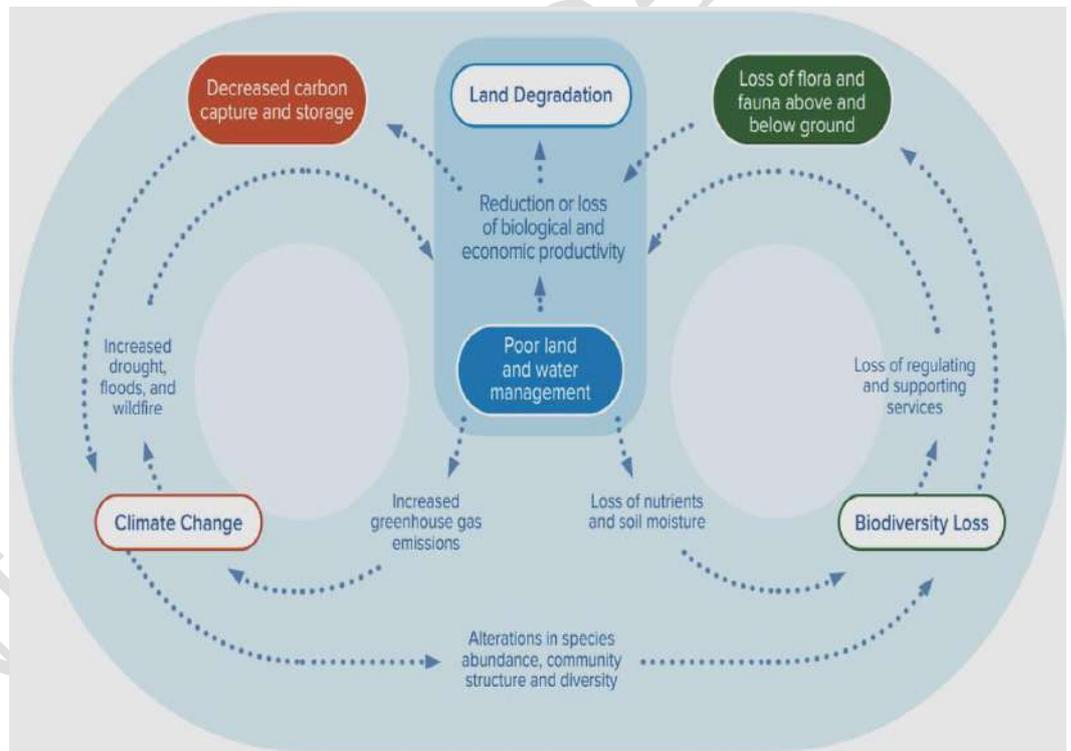
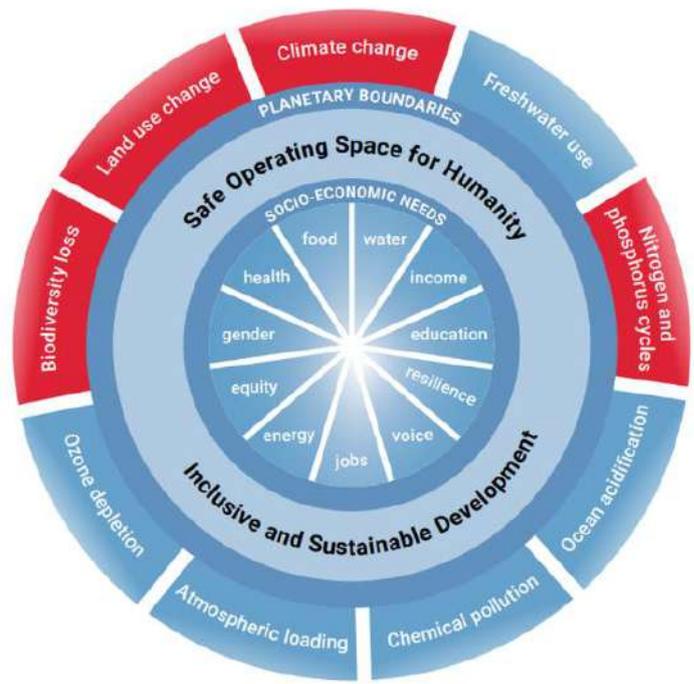
- **Sustainable food production** - Sustainable land use planning and productivity within our agricultural practices will be the key to switch to sustainability in global food systems.
- **Global warming** - Land and ecosystem restoration will help slow global warming.
- **Reduce disaster** - Land and ecosystem restoration will reduce the scale and frequency of disasters like droughts, floods and so on.
- **Planetary boundaries** - Restoration of lands can stop the breach of planetary boundaries.

What are the impacts of land degradation?

- Global warming and environmental degradation.
- Rise in poverty, hunger, inequality and zoonotic disease transmission.
- Loss of forest land.
- Soil and water degradation.
- Fractures the supply chains that connects the suppliers and producers.
- Great risk to global food security.

What are the ways to restore land?

- **Sustainable management** - Adopting sustainable land and water management practices.
- **Livelihoods** - Improving livelihoods and preparing for future challenges with the eventual goal of sustaining all life forms on the planet.



- **Integrated land use planning** - Identifying the best combination of land uses which is both sustainable to meet the needs of the stakeholders as well as preserve the land resources is an efficient way to address land degradation.
- **Regenerative agricultural practices** - Like terrace farming and rainwater harvesting should be followed.
- **Inclusive and responsible governance** - Is crucial to facilitate the shift to sustainable land use and management practices.
- **Cost-effective approach** - A best way to restore the lands and global hotspots which can maximize the economic benefits of the land.
- **Others** - Revitalizing soil, watersheds, and other elements of natural ecosystems.

Planetary Boundaries

- Planetary boundaries are the thresholds of environmental limits that define a “safe operating space for humanity”
- The 9 planetary boundaries are Biodiversity loss; Land-use change; Climate change; Nitrogen & phosphorus (geochemical) cycle, Freshwater use; Ocean acidification; Chemical pollution; Atmospheric loading; Ozone depletion
- Of these 9 planetary boundaries, climate change, biodiversity loss, land-use change, and geochemical cycles have already been exceeded.

United Nations Convention to Combat Desertification (UNCCD)

- UNCCD is the global voice for land that promote practices that avoid, reduce and reverse land degradation.
- UNCCD is the driving force behind Sustainable Development Goal 15 and Land Degradation Neutrality.
- It works to engage governments, international organizations, scientists, farmers, private enterprise and local communities
 - To promote sustainable practices and shared knowledge that help improve land productivity and create a more resilient future.
- *Global Land Outlook report* is published by UNCCD.

3.7 Green Deposits

Why in news?

RBI has unveiled a framework for banks and NBFCs to accept green deposits that are meant for investing in eco-friendly climate projects.

What are green deposits?

- A green deposit is a fixed-term deposit for investors looking to invest their surplus cash reserves in *environmentally friendly projects*.
- It indicates the increased awareness of the importance of *ESG (Environmental, social and governance)* and sustainable investing.
- Many lenders like HSBC and HDFC have launched green deposits in India *for corporates as well as individuals*.
- Common themes for green deposits are renewable energy, clean transportation, pollution prevention and control, green building, sustainable water, wastewater management, and others.

What is the RBI framework about?

- **Aim** - To prevent *greenwashing*, which refers to making misleading claims about the positive environmental impact of an activity.
- **Deposits** - As per the RBI framework, banks will offer the deposits as cumulative/ non-cumulative deposits.
- On maturity, the green deposits would be renewed or withdrawn at the choice of the depositor.
- The green deposits shall be denominated in **rupees only**.
- **Application** - The framework applies to all scheduled commercial banks and

Challenges of green deposit

Flaws in design

- Flaws in design leads to limitation of the range in the green projects that the banks can invest.

Reality being different

- Green investment products are often just a way to make investors feel good about themselves and that these investments don't really do much good to the environment.

Project sustainability

- It is not sure whether the banks invested in the green projects will be sustainable.

Lack of awareness

- Lack of awareness among the bank staffs leads to delay in the process of obtaining green deposits.

Lower interest rate

- The investor seeks only for high return deposits and doesn't care about being green.

small finance banks (except for regional rural banks and local area banks) and non-banking finance companies (including housing finance companies).

- **Investors** - Both corporate and individual customers can invest in green deposits.
- Banks and NBFCs shall put in place a comprehensive board-approved policy on green deposits, and a copy of the policy shall also be made available on their websites.
- **Sectors eligible to receive green deposits** – The sustainable and eligible sectors include renewable energy, waste management, clean transportation, energy efficiency, and afforestation.
- Banks will be barred from investing green deposits in business projects involving fossil fuels, nuclear power, tobacco, etc.
- **Review** - The allocation of funds raised through green deposits during a financial year shall be subject to an independent Third-Party Verification (TPV) on an annual basis.
- **Impact assessment by lenders** - Lenders must annually assess the impact associated with the funds lent for or invested in green finance activities and submit a review report before their Board.
- **Penalty** - There are no penal provisions when the bank doesn't utilise the deposits.

How are green deposits different from normal deposits?

- **Projects** - Normal deposits cannot be allocated for specific projects, whereas green deposits are carved out specifically towards green financing.
- **Interest rate on green deposits** – It is at the prerogative of the lender and currently the rates on these deposits aren't significantly different from regular deposits.

3.8 Green Credit Programme (GCP)

Why in news?

The Union Ministry of Environment, Forests and Climate Change has notified draft rules for 'Green Credit Programme'.

What is Green Credit?

- 'Green credit' is a singular unit of an incentive provided for a specified activity, delivering a positive impact on the environment.
- It can be earned by individuals, farmer-producer organisations (FPO), industries, rural and urban local bodies, among other stakeholders for their environment positive actions.
- **Programme** - The Green Credit Programme (GCP) launched, was first announced in the **2023-24 budget** under Mission LIFE.
- The Ministry of Environment issued the draft '*Green Credit Programme Implementation Rules 2023*' under the Environment Protection Act of 1986.

How will the program be implemented?

- The Green Credit Programme (GCP) aims to leverage a competitive market-based approach and incentivise voluntary environmental actions of various stakeholders.

- The environment ministry has identified 8 select activities for which green credit can be earned.

Tree plantation-based green credit	Water-based green credit	Sustainable agriculture-based green credit	Waste management-based green credit
Air pollution reduction-based green credit	Eco mark based green credit	Mangrove conservation and restoration-based green credit	Sustainable building and infrastructure-based green credit

- Thresholds and benchmarks will be developed for each green credit activity under the programme.

- **Trade Market** - The green credits will be tradable and be made available for trading on a domestic market platform.

- The Trading Service Provider accredited by the GCP administrator will establish the trading platform for the exchange of Green Credit Certificates.
- **Implementation** - A steering committee headed by the environment secretary.
- It also approve its rules and regulations and make recommendations to the central government for issuance of Green Credit Certificate.
- The steering committee will not only approve procedures for institutionalising the GCP.
- **Administrator** - The Indian Council of Forestry Research and Education (ICFRE)
- The institute will develop guidelines, processes and procedures for implementation of the programme.

What are the advantages of GCP?

- It accounts for and incentivise individual and community actions, besides corporate and businesses.
- The environmental activity generating Green Credits under Green Credit Programme (GCP) may have climate co-benefits such as reduction or removal of carbon emissions.
- Such activity may accrue both green credits as well as carbon credits which may be sold under Green Credit market or carbon market respectively.
- Helps to realise the vision of 'Mission LiFE' through pro-planet people and entities.
- The GCP will encourage private sector industries and companies as well as other entities to meet their existing obligations, stemming from other legal frameworks.

What are the concerns around GCP?

- There is a strong risk of greenwashing through such market based mechanisms.
- It also raises serious questions about how rigour of monitoring will be maintained.

3.9 Ethanol Blending in India

Why in news?

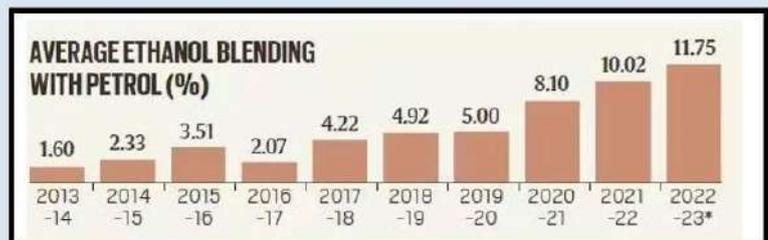
India in 'G20 Energy Ministers' 2023, has rolled out 20% ethanol-blended petrol in 2023 and aims to cover the entire country by 2025.

What is ethanol blended petrol?

- Ethyl alcohol or Ethanol (C_2H_5OH) is a biofuel that is naturally made by fermenting sugar.
- It is basically 99.9% pure alcohol that can be blended with petrol.
- While it is mostly derived by extracting sugar from sugarcane, other organic matter like foodgrains can also be used for their production.

Status of Ethanol Production in India

- India is the world's 3rd largest energy consuming nation and a significant part of India's energy requirement is met through oil imports.
- Ethanol production capacity increased more than 2.5 times and no. of distilleries increased by 66% in 8 years.
- Most of the ethanol production in India comes from B Heavy Molasses.
- Ethanol Industry is expected to grow by 500%.
- India has doubled ethanol blending with petrol to 10% in the last two years.
- Ethanol blending will reach 12% in 2023 and meet the target of 25% by 2025.



What are the advantages?

- **Energy security**- It will reduce the import bill and save Rs 30,000 crore of foreign exchange per year and lower the carbon emissions.

- **Farmers' income-** As the ethanol feedstock is diversified (rice, maize, jowar etc.,) it will increase farmers' income.
- **Employment generation-** With new technology and ethanol production there will more employment opportunities created.
- **Sustainability-** Ethanol can be procured even from the damaged foodgrain and vegetable waste, so that it does not compromise on food security.
- **Fuel India-** Uttar Pradesh and Bihar would "fuel India" in future as Punjab, Haryana, Maharashtra feeds India.
- **By-products-** The new molasses-based distilleries gives around 28% of potash that can be used as fertilizer and the by-product can be sold as animal feed.

Ashok Dalwai committee recommends for doubling farmers income by farm diversification.

Uttar Pradesh is a major sugarcane producer, Bihar is the major maize producer.

What are the issues with ethanol blending?

- **Availability of sufficient feedstock-** The ethanol production via food grains which is the staple crop of India may pose a challenge to the food security.
- **Regional disparity-** There are some states which produce ethanol more than the requirement for blending within the State.
- **Climate Change-** Weather related events like flood, drought pose significant challenge on food grains.
- **Low energy content-** The energy content of ethanol is low (almost 35%) than that of petrol. Thus, vehicles running on ethanol have poor mileage.
- **Engine stalling-** This is due to phase separation as ethanol has high affinity for water, it gets separated from petrol when it comes in contact with water.

Steps Taken to Promote Ethanol Blending in India

- **Nodal agency-** Department of Food and Public distribution is the nodal agency for promotion of fuel grade ethanol producing distilleries in the country.
- **Ethanol procurement-** Government has allowed ethanol procurement from sugar cane based raw materials, surplus rice and maize from Food Corporation of India.
- **Ethanol Blended Petrol Program-** It was launched in 2003 with the aim to promote the use of renewable fuels.
- Started with 5% blending, it has set a target of 10% ethanol blending by 2022 and 20% blending (E20) by 2030 which was now shifted to 2025-26.
- **National Policy on Bio fuels** – It was launched in 2018 which prescribes as indicative target of 5% blending of biodiesel in diesel by 2030.
- **Differential pricing-** The Government fixed higher prices for ethanol produced from B-heavy molasses and whole sugarcane syrup to compensate mills for revenues foregone from reduced/nil production of sugar.
- **GST-** Goods & Service Tax (GST) on ethanol meant for EBP Programme has been reduced from 18% to 5%.
- **Interest Subvention Scheme-** It is for enhancement and augmentation of the ethanol production capacity which would help in year round production.
- **Roadmap for ethanol blending in India 2020-25-** It is released by Niti Aayog which recommends measures for ethanol blending in India.

What lies ahead?

- **Feedstock diversification-** Ethanol yields from grains are actually higher than from molasses.
 - For example, 1 tonne of rice yields around 450-480 litres of ethanol.
- **Ethanol production capacity-** There should be uniform availability of ethanol blends in the country.
- **Infrastructure-** Oil Marketing Companies will need to prepare for the projected requirement of ethanol storage, handling, blending and dispensing infrastructure.
- **Single window clearances-** Faster regulatory clearances are the need of the hour.
- **Ethanol compatible vehicles** - Higher ethanol compatible vehicles need to be produced through incentives.

3.10 Total Ban on Diesel Vehicles in India

Why in news?

A government panel has recommended to ban all the diesel four wheelers by 2027.

Why did the panel recommend to ban diesel vehicles?

- **Greenhouse gas emissions** - To achieve the stated aim to reduce the greenhouse gas emissions by 40% to mitigate climate change.
- **Net zero goal** - To produce 40% of its electricity from renewables as part of its 2070 net zero goal.
- **Oxides of nitrogen (NOx)** - The higher compression ratio of diesel engines increase emissions of oxides of nitrogen (NOx).
- **Volkswagen emissions scandal** - Led to an increase in the negative perception against diesel across markets, including India.



What is the importance of the diesel vehicles?

- Diesel engines have higher fuel economy than petro engine.
- Diesel engines do not use high-voltage spark ignition (spark plugs), and thus use less fuel per kilometer.
- Diesel engines have higher compression ratios, making it the fuel of choice for heavy vehicles.
- Diesel engines offer more torque (rotational or turning force) and are less likely to get stalled.

What will be the consequences if there is a total ban?

- **Affects transportation** - Around 87% of diesel fuel sales are in the transport segment, with trucks and buses accounting for about 68%.
- **Affects the state's GDP** - Uttar Pradesh, Maharashtra, and Haryana makes 40% of the diesel sold in India.
- **Affects the auto manufactures** - The auto manufactures have heavily invested in transition their diesel fleet from BS-IV to BS-VI emission norms.
- **Low availability of alternates** - The commercial vehicle segment have not explored much of the alternatives such as electric vehicles which would cause serious disruptions in the segment.

A panel formed by the Ministry of Petroleum and Natural Gas has recommended a ban on the use of diesel-powered 4-wheeler vehicles by 2027 in cities with a population of more than 1 million.

What is the way forward?

- According to Energy Transition Advisory Committee report LNG has the potential to replace both diesel and CNG in heavy-duty vehicles and thereby reduce GHG emissions.
- The diesel should be phased out, rather than proposing a complete ban to avoid any serious disruptions.
- Railways and gas-powered trucks could be used for the movement of cargo.
- Indian should built underground gas storage to meet any unforeseen demand of energy in the future.

3.11 Issues with Green Hydrogen

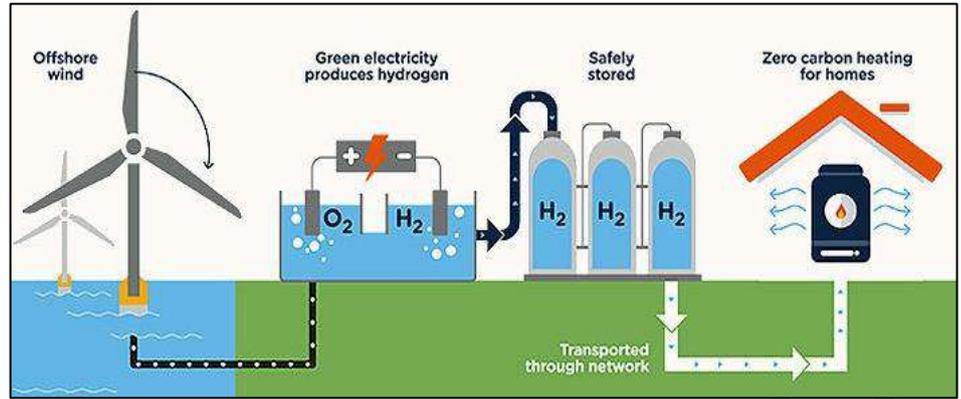
Why in news?

Recently, Government has announced an Rs 17,490 crore Green Hydrogen Package.

What is Green Hydrogen?

- Hydrogen is an abundant, cheap and clean-burning which is described as the fuel of the future.

- It is produced using **electrolysis of water** with electricity generated by **renewable energy**.
- The carbon intensity ultimately depends on the carbon neutrality of the source of electricity (i.e., the more renewable energy there is in the electricity fuel mix, the "greener" the hydrogen produced).



What is the need for Green hydrogen?

- **Energy dense** - It stores the energy in dense chemical form which is suitable for energy intensive applications like aircraft or automobile fuel.
- **Energy carrier** - It acts as an energy carrier which is crucial to achieve deep decarbonisation of hard to abate sectors.
- **Decarbonising Transport**- It powers fuel cells in vehicles, trucks, and ships.
- **Dealing with Climate Change** - It can replace coke in steel-making, facilitating the production of green steel. These applications don't emit carbon dioxide.
- Green hydrogen will aid contribute to India's Panchamrit to deal with the challenge of climate change

Panchamrit	
By 2030 , India will	<ul style="list-style-type: none">• Reach its non-fossil energy capacity to 500 GW• Meet 50% of its energy requirements from renewable energy• Reduce the total projected carbon emissions by 1 billion tonnes• Reduce the carbon intensity of its economy by less than 45%.
By the year 2070 , India will achieve the target of Net Zero .	

What are the challenges associated with green hydrogen production?

- **Cost**- High overall costs of the system including capital, operational, maintenance, and running costs.
- Electrolysers are expensive as they are yet to be standardised and mass-produced.
- Green steel cost exceeds 40-60% of regular steel.
- **Efficiency**- One-third of energy is lost in production.
- **Drinking water supply**- Primary raw material is clean water which puts pressure on the municipal water supply.
- Low user acceptance and social awareness.
- **Volatility** - Loss of 70 % of hydrogen during production to end use.
- Hydrogen is very light and hence leaks at each stage, from production to end-use.
- **Supply chain efficiency**- The low density of hydrogen necessitates compression, which increases costs.
- Transportation requires specialised infrastructure due to hydrogen's flammability and corrosiveness.
- Energy losses can occur at various stages.
- **Safety concern**- Storage tanks must be designed to handle high pressure and low temperatures.
- Hydrogen is **highly flammable and corrosive** and needs special containers to withstand high pressure and wear & tear.

National Green Hydrogen Mission was launched in 2023 to make India a hub for production and export of Green Hydrogen.

What are the options that lie ahead for India?

- **Investment**- Capital must be invested in R&D like stabilising grid power rather than incentives.
- **Reduce import bill**- Hefty bills due to over reliance on export of oil must be reduced.
- **Cost optimisation**- Cost can be optimised by combining use of grid power, grey and blue hydrogen.
- **PPP**- Government can explore different financing options to make it viable like public-private partnership.

- **Policy push**- Policy push on both demand and supply side can address high cost and infrastructure bottlenecks
- **Regulations** - Proper standards and regulations are required for quicker adoption of green hydrogen economy.

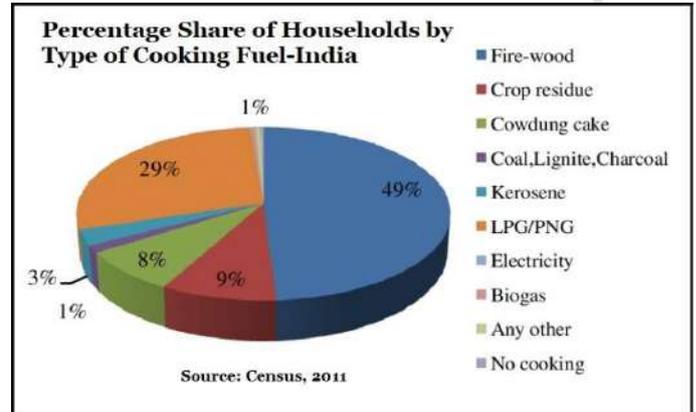
3.12 Clean Cooking Fuel in India

Why in news?

In the recently conducted India Energy Week exhibition the Indian oil has launched Surya Nutan which could be the sustainable solution for clean cooking fuel.

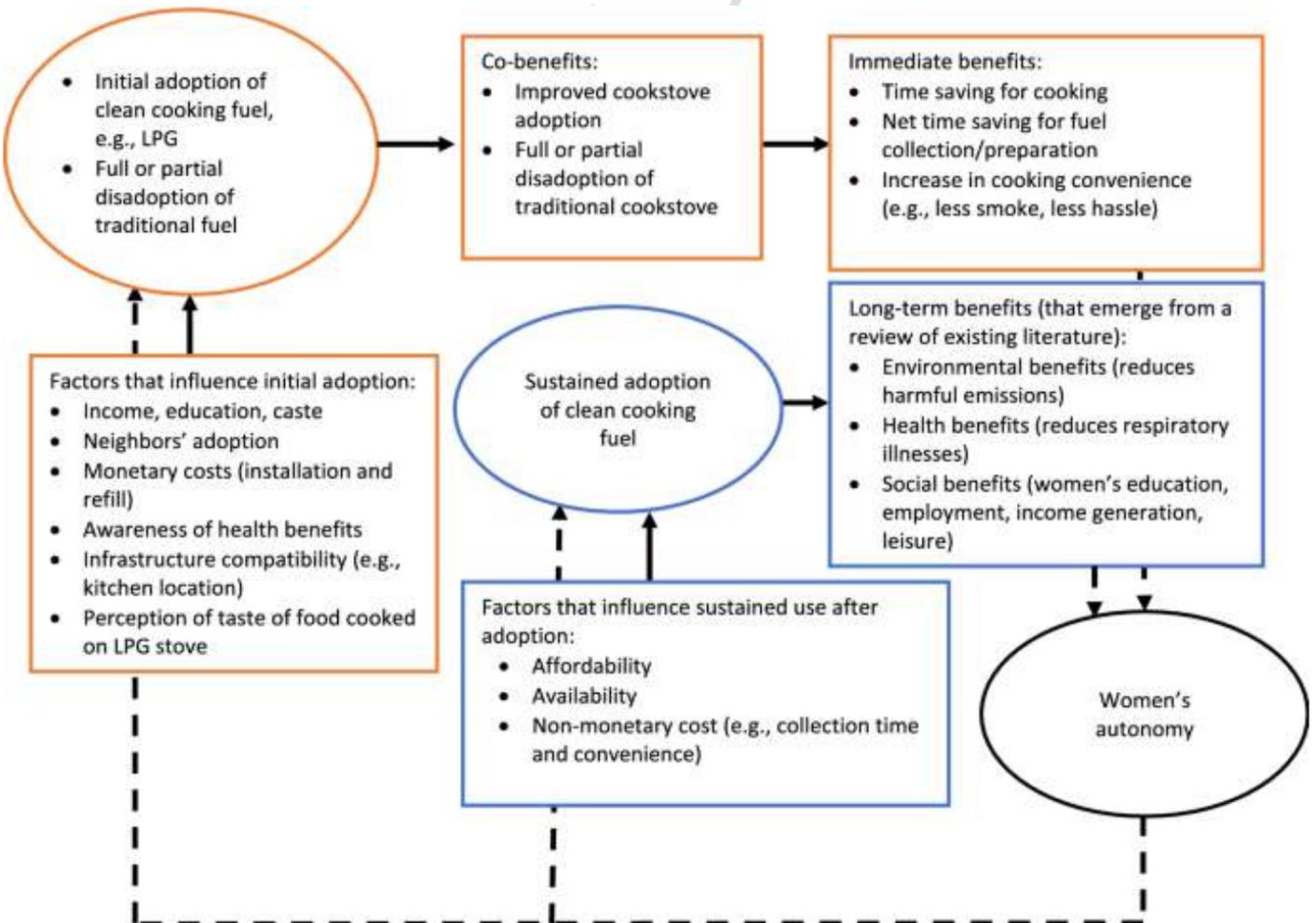
What is clean cooking fuel?

- Clean fuels and technologies are those that attain the fine particulate matter (PM2.5) and carbon monoxide (CO) levels recommended in the WHO global air quality guidelines (2021).
- Modern and clean cooking fuels are fuels with very low levels of polluting emissions when burned. Examples include biogas, LPG, electricity, ethanol, natural gas, and solar power (BLEENS).
- Pellets used in specialised biomass stoves can also be a clean fuel.



What is the need for clean cooking fuel?

- Provides energy access to poor people of the country.
- Reduces health issues and premature deaths.
- Helps India achieve its net zero targets by reducing carbon emissions.
- Boost GDP by reducing the economic burden resulting from the use of unsustainable fuels.



What are the challenges to India's clean cooking transition?

- **Cylinder refill being costly** - Over 50 % of the households that received new LPG cylinders did not choose to refill due to high costs of refill.
- **Cylinder distribution networks** - Lack of access to the cylinder distribution networks especially in rural India.
- **Lack of choice** - The government only promotes LPG cylinder leaving out the alternatives such as electric cooking (e-cooking), especially [solar](#) photovoltaic (PV) connected e-cooking.

Measures taken for Clean Cooking Fuel

- **Rajiv Gandhi Gram LPG Vitruk Yojana (RGGLV)** - Launched in 2009 to provide clean cooking fuel.
- **Pradhan Mantri Ujjwala Yojana (PMUY)** - It aimed to replace solid and other biomass-based polluting cooking fuels used in urban and rural households in India with Liquefied Petroleum Gas (LPG). Launched in 2016 and replaced the RGGLV scheme.
- **Piped natural gas (PNG)** - The government has been actively promoting PNG, which is a more economically viable fuel than LNG.
- **Go Electric campaign** - It encourages the use of electric vehicles and electric cooking.
- **Energy Efficiency Services Limited** - Working towards better utilization of renewable [energy](#) in cooking sector.
- **Surya Nutan** - It is an indigenous, stationary, rechargeable and kitchen-based indoor solar cooking platform. Developed by **Indian Oil Corporation** and Union Ministry of Petroleum and Natural Gas. Works in hybrid mode, using both solar energy as well as an auxiliary energy source.
- **The Energy Sector Management Assistance Programme (ESMAP)** - It announced clean cooking fund for assistance through technical support and investments in developing nations. The programme is by World Bank. In India, this programme is being developed through the Modern Energy Cooking Services programme.

What are the impacts of unclean fuels?

- The air quality index will further be worsen.
- Cause adverse long-term health impacts.
- Impact GDP due to sickness and loss of productivity.
- Wooden fuel leads to deforestation.

3.13 Plastic Pollution: A Glossary of Related Terms

Why in news?

The year 2023 celebrates the 50th anniversary of World Environment Day on June 5th.

What is World Environment Day?

- World Environment Day has been held annually on June 5, since 1973 by the United Nations Environment Programme (UNEP).
- The date '**June 5**' was chosen by UN General Assembly at the 1972 Stockholm Conference on the Human Environment.
- The year 2023 World Environment Day marks its 50th Anniversary.
- This year's theme focuses on solutions to plastic pollution under the campaign **#BeatPlasticPollution**.
- World Environment Day 2023 is hosted by Côte d'Ivoire (a Western African country) in partnership with Netherlands.

Plastic Pollution

- The world is being inundated by [plastic](#) and [plastic pollution](#) is one of the gravest threats to the planet.
- According to UN data, more than 400 million tonnes of plastic is produced every year worldwide, half of which is single-use plastic.
- Out of which less than 10% is recycled and an estimated 19-23 million tonnes end up in water bodies.
- Plastic clogs our landfills (Land pollution), leaches into the ocean (water pollution) and is combusted into toxic smoke (Air pollution).

What are the terms related to Plastic Pollution?

- **Plastics** - Derived from the Greek word *plastikos*, meaning capable of being *shaped or moulded*.
- It refers to a wide range of synthetic or semi-synthetic materials that use polymers as a main ingredient with their plasticity.
- Most modern plastics are derived from fossil fuel-based chemicals like natural gas or petroleum.
- Recently, variants made from renewable materials, such as corn or cotton derivatives have also emerged.
- **Commodity plastics** - These refer to the 6 major polymer types which constitute around 70% of global plastic production.
- Each of the 6 types has different properties.
- They can be identified by their *resin identification code (RIC)* denoted by symbols found on plastic products.
- **Resin Identification Code** - RIC shows the consumer which type of plastic resin was used to make the chosen product.
- The symbol looks similar to recycle symbol but it explicitly does not mean the product can be recycled.
- The RIC is strictly an identifier of the type of plastic and doesn't address the recycled content or recyclability of the container.
- The adverse environmental impact of plastic is primarily due to its slow decomposition rate in natural ecosystems.
- **Decomposition rate** - It refers to the rate at which a material breaks down into its constituent parts through chemical processes.
- Plastics crumble into smaller particles but do not break down into simpler substances resulting in microplastics.
- **Microplastics** - Officially defined as plastics *less than 5 millimetres in diameter* and categorised into two.
 - **Primary microplastics** are tiny particles designed for commercial use, such as in cosmetics or textiles.
 - **Secondary microplastics** are particles that are a product of the breakdown of larger plastic items. They are formed due to exposure to environmental factors such as sun radiation or ocean waves.
- They do not break down into simpler particles but find their way across the world including the food chain.
- **Toxins** - Microplastics contain a number of toxic chemicals such as BPA which pose severe risks to human health.
- BPA or **Bisphenol A** is used to harden the plastic, contaminates food and drinks.
- **Great Pacific Garbage Patch** - It is the largest collection of plastics and microplastics in the *North Pacific Ocean* and is also known as the *trash vortex*.
- It is located between California and Japan, and formed due to converging ocean currents.
- The GPGP comprises majorly of **single-use plastics**.
- **Single-use plastics** - A term which refers to any plastic items which are either designed to be used one time by the consumer before they are thrown away or recycled or used in this way.
- Many countries, including **India**, have passed legislation to either ban or severely restrict their use.

3.14 Deep Sea Mining

Why in news?

The International Seabed Authority (ISA) is preparing to resume negotiations that could open the international seabed for mining, including for materials critical for the green energy transition.

What is Deep Sea Mining?

- **Deep sea mining** involves removing mineral deposits and metals from the ocean's seabed.
- **Types** - There are 3 types of such mining:
 1. Taking deposit-rich **polymetallic nodules** off the ocean floor
 2. Mining massive seafloor sulphide deposits

3. Stripping cobalt crusts from rock

- These nodules, deposits and crusts contain materials, such as nickel, rare earths, cobalt and more.
- **Significance** - These minerals are needed for batteries and also for everyday technology like mobiles and computers.
- These are strategically important resources as onshore reserves are depleted and demand continues to rise.
- **Mining technology** - Vacuum materials from seafloor using massive pumps, AI-based technology to teach deep sea robots to pluck nodules off the floor, advanced machinery to mine underwater, etc. are being considered.

How is deep sea mining regulated now?

- The [high seas](#) and the international ocean floor are governed by the United Nations Convention on the Law of the Seas (UNCLOS).
- It is considered to apply to states disregard of signing and ratification.
- Under the treaty, the seabed and its mineral resources are considered the '**common heritage of mankind**'.
- They must be managed in a way that protects the interests of humanity through the sharing of economic benefits, support for marine scientific research, and protecting marine environments.
- **License** - More than 30 exploration licenses have been issued so far by ISA.
- The Clarion-Clipperton Fracture Zone between Hawaii and Mexico is the most focused area of exploration.

Why is there pressure on the ISA to establish regulations now?

- In 2021 the Pacific island nation of Nauru applied to the ISA to exploit minerals in a specified deep sea area that triggered a clause of the U.N. treaty.
- **Two-year rule** - The clause requires the ISA to complete regulations governing deep sea exploitation by July 2023 (2 years from date of application).
- If ISA fails to approve a set of rules and regulations by July 9, Nauru can submit an application to conduct the mining without any governing regulations.
- Other countries and private companies can start applying for provisional licenses.

What are the environmental concerns?

- The full extent of implications for deep sea ecosystems is unclear. But scientists have warned that biodiversity loss due to mining is inevitable and potentially irreversible.
- **Damage from mining** - Can include noise, vibration and light pollution.
- There is a possibility for leaks and spills of fuels and other chemicals used in the mining process.
- **Sediment plumes** from the some mining processes are a major concern as it can harm filter feeding species like corals and sponges.
- **Need for regulation** - Without any environmental protocols, the damages & their implications might be huge.

International Seabed Authority

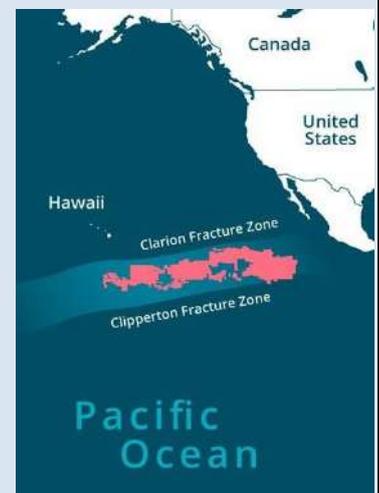
- An autonomous UN body established in 1994 under the 1982 United Nations Convention on the Law of the Sea (UNCLOS)
- International Seabed Authority (ISA) regulates the world's ocean floor and control all mineral-resources-related activities in the area
- **Headquarters** - Kingston, Jamaica
- **Members** - 168 Members which includes 167 Member States and the European Union

United Nations Convention on the Law of the Sea

- UNCLOS is an international agreement adopted in 1982.
- It lays down a comprehensive law and order in the world's oceans and seas establishing rules governing all uses of the oceans and their resources.
- India ratified UNCLOS in 1995.

The Clarion-Clipperton Zone (CCZ)

- It spans between Hawaii and Mexico, an abyssal plain as wide as the continental United States and punctuated by seamounts.
- Lying atop the muddy bottom or embedded just beneath it are trillions of potato-size polymetallic nodules.
- These rocklike deposits contain nickel, manganese, copper, zinc, cobalt, etc.



- Countries including France, Germany and several Pacific Island nations have officially called for a ban, pause or moratorium on deep sea mining at least until environmental safeguards are in place.
 - **Against** - Some companies such as Google, Samsung, BMW and others have backed the WWF's call to pledge to avoid using deep sea mined minerals.
 - **For** - Many countries view deep sea minerals as a strategic source to energy transition.
 - Countries such as Norway, are also proposing to open their waters to mining.

Emissions Trading System (ETS)

In 2005, the EU adopted the Emissions Trading System (ETS), a market-based mechanism that aims at reducing greenhouse gas (GHG) emissions by allowing bodies emitting GHG to buy and sell these emissions amongst themselves.

What next?

- The earliest mining under ISA regulations could begin is 2026.
- Applications for mining must be considered and environmental impact assessments need to be carried out.
- The ISA's *Legal and Technical Commission* is about to discuss the yet-to-be mining code draft.

Related Topic - [Deep Ocean Mission](#)

3.15 Carbon Border Adjustment Mechanism (CBAM)

Why in news?

The talks on the Carbon Border Adjustment Mechanism (CBAM) at the WTO's dispute settlement body has brought to the forefront the inter-linkages between trade and the environment.

What is CBAM?

- The [Carbon Border Adjustment Mechanism](#) (CBAM) is an initiative of *European Union (EU)* to prevent carbon leakage from extremely carbon intensive imports.
- Under CBAM, *duties will be imposed* on imported goods based on the carbon expended in producing them.
- Under the CBAM, imports of certain carbon-intensive products, will have to bear the same economic costs borne by EU producers under the ETS.
 - Cement, electricity, iron & steel, fertilizers, aluminium, and hydrogen are few carbon-intensive sectors to be covered under CBAM.
- The price to be paid will be linked to the *weekly average of the emissions* priced under the ETS.
- However, where a carbon price has been explicitly paid for the imported products in their country of origin, a reduction can be claimed.

Carbon Border Tax Mechanism (CBAM)

Level playing field

- CBAM aims to create a level playing field for EU and non EU manufacturers to reduce carbon footprints.

Carbon leakage

- CBAM was introduced to address the carbon leakage.

Tariff on carbon intensive import products

- CBAM plans to impose a tariff on a set of carbon-intensive imports, which will have to be paid by EU importers and companies who export such goods to EU countries.

Carbon intensive import products

- Includes iron and steel, cement, fertilizers, aluminum and electricity.

High tax on developing countries

- The highest tax under CBAM is on developing countries like India.

Green hydrogen

- The tax is zero if steel is made using green hydrogen as fuel and a reducing agent.

Why EU wants CBAM?

- The EU has stringent emission control mechanisms like *Emissions Trading System (ETS)* for its domestic industries.
- The EU's concern is that emissions embedded in products imported from other countries is not be priced in a similar way and would put its industries at a disadvantage.

- To tackle this, the impacted industries had so far been receiving free allowances or permits under the ETS.
- The EU also apprehends the phenomenon of '*carbon leakage*' due to the application of ETS.
- European firms operating in carbon-intensive sectors might possibly shift to those countries that have less stringent GHG emission norms. CBAM is aimed at levelling the playing field for the EU industries.

Why CBAM is not in line with WTO principles?

- Non-discrimination is a cornerstone principle of WTO law. Countries are required to accord equal treatment
 - To 'like' products irrespective of their country of origin (*MFN treatment*) and
 - To treat foreign-made 'like' products as they treat domestic ones (*national treatment principle*).
- **Inconsistency** - The CBAM violates WTO law for discriminating between EU and foreign products covered by CBAM based on the embedded emissions.
- Also the question of whether carbon-intensive products to which the CBAM applies are 'like' arises.
- The CBAM does not consider 'implicit' carbon borne by products originating in certain countries.
- **Way out** - The discrimination of CBAM could be justified under the *General Exceptions clause given in Article XX of the General Agreement on Tariffs and Trade (GATT)*.
- Under Article XX, measures taken by countries that otherwise violate GATT obligations are permitted if,
 - They fall under one of the listed policy grounds, and
 - They satisfy the requirements of the introductory clause of Article XX, known as the chapeau.
- CBAM would fall under the 'conservation of exhaustible natural resources', one of the listed policy grounds in Article XX.

What are the impacts on India?

- India has criticized CBAM as being *protectionist and discriminatory* policy.
- **High CBAM** - The share for many Indian exports covered under CBAM going to the EU is high.
- **Less market share** - Indian firms risk losing market share to EU-based producers or those in other more carbon-efficient nations.
- **Affects exports** - CBT will affect substantial exports as the EU is an important trade partner for India.
- **Expensive** - Even though a product from India may be cheaper than an American product tax plus product price will make Indian products more expensive.
- **Trade divisions** - CBT will lead to sharper trade diversion and more trade among developed countries.

What is the way forward?

- Many Indian steel firms use electric furnace, a more carbon-efficient process, so India must use its strength to avoid the carbon tax.
- CBTM may force many European steel firms to shut down will provide an opportunity for Indian steel firms to increase its market share.
- The manufacturing process needs to be transformed to sustainable being climate friendly.

3.16 Banning Short-Haul Domestic Flights

Why in news?

France became the first country in the world to impose a ban on short-haul domestic flights.

Why did the French ban short-haul domestic flights?

- France brought in a new law that bans air travel to destinations that can be covered by up to 2 and a half hour journey by train.

Short-haul flights

Medium-haul flights

Long-haul flights

• Flight lasting anywhere from *30 minutes to 3 hours*

• Flights lasting between *3-6 hours*.

• Flights that extend *beyond 6 hours*

- France banned short domestic flights in favour of train services and to reduce aviation emissions.

- The trend of using private planes has been increasing rapidly in the Europe.
- France, the Netherlands, Austria and Ireland are urging the European Union to strengthen regulations to discourage travel by private jets.

What are the issues with aviation emissions?

- The emissions from planes flying within the boundaries of a country are attributed to that country. But emissions from airlines making international flights are not attributable to any country.
- No country has any responsibility to curtail these emissions.
- These emissions are not covered under the Paris Agreement.

Emission status of the Aviation Industry

- Air transport, globally, accounts for about 2% of global CO₂ emissions every year, and less than 2% of greenhouse gas emissions.
- According to UN Climate Change, if the non-CO₂ emissions, like water vapour, are accounted for, the airline industry would be responsible for causing almost 5% of historical global warming.
- A European transport campaign group has estimated that private jets were 5 to 14 times more polluting, per passenger, than commercial planes, and 50 times more polluting than trains.

Is there any offset mechanism so far?

- In 2016, the International Civil Aviation Organisation (ICAO) introduced an offset mechanism called Carbon Offsetting and Reduction Scheme for International Aviation ([CORSIA](#)).
- The offset plan CORSIA is supposed to run from 2021 to 2035.
- CORSIA does not deal with total emissions and only seeks to offset emissions that are over and above 2020 levels.
- The mechanism ensures that the excess emission is compensated for by the airline industry through investment in carbon saving projects elsewhere.

What are the other methods to reduce carbon emissions?

- Biofuels and hydrogen fuel cells have been tried as alternate fuels.
- Solar powered planes have also made trips.
- Unlike road or rail travel, aviation does not have viable technology alternatives for shifting to cleaner fuels.
- These alternative fuels for flying large commercial airliners is still unviable.

3.17 Arctic Sea Ice

Why in news?

A recent study says that the loss of Arctic sea ice is inevitable in the decades ahead, even if the world sharply reduces carbon emissions.

What is Arctic sea ice?

- They are the massive sheets of ice that pad the Arctic region.
- During winter, the sea ice envelops most of the Arctic Ocean and in summer, due to longer periods of exposure to sunlight, a portion of it melts.
- Sea ice normally melts and is at its thinnest in mid-September and the ice reaches its zenith in March.

What is happening to Arctic sea ice?

- The Arctic sea ice is decreasing as acknowledged in several reports of the Intergovernmental Panel on Climate Change (IPCC).
- **Ice-free arctic** - If the global emissions drive temperature beyond 4.5°C, then the Arctic is ice-free by 2081-2100. Under this assumption, the world will see its first 'sea-ice free summer' before 2050.
- **Polar jet streams** - They are currents of air that form when warm and cold air meet.

- The diminished sea ice while warming the Arctic also leads to a weakening of the polar jet streams.
- **Western disturbances** - This weakening has been linked to rising temperatures and heatwaves in Europe as well as unseasonal showers in northwest India.



What does the new study say?

- As much as 90% of the ice-melting was due to human-instigated, or anthropogenic factors and the rest of it (10%) is caused by natural variability.
- The new study corrected for the existing climate models and the ice-free summer is inevitable.
- But reducing carbon emissions might better able to adapt to **climate 'tipping points.'**
- **Above 4.5°C** - It turned out that there were also likely to be **ice-free Augusts and Octobers by 2080** in the emission scenarios where temperatures rose above 4.5°C.
- **Below 2°C** - Even if the temperature-rise was restricted to say 1.5°C or 2°C, as envisaged in the Paris Agreement, there is no scenario under which the Arctic sea ice can be saved in summer.

The rate of arctic ice loss has been nearly 13% every year, ever since satellites began to monitor arctic.

Why is the Arctic Sea ice important?

- Arctic sea ice play a major role in influencing global climate and the rise and fall in Arctic sea temperatures.
- **Albedo effect** - Sea ice is light-coloured and therefore has more albedo. Thus sea ice plays a vital role in keeping **Polar Regions cool** and maintaining the **earth's energy balance**.
- **Natural barrier** - Sea ice also keeps the air cool by forming a barrier between the cold air above and the relatively warmer water below.
- **Feedback Loop** - As the amount of sea ice decreases, the Arctic region's cooling effect is reduced leading to '**feedback loop**'.
- More absorption of solar energy causes ocean warming, which leads to more loss of sea ice and further warming.
- **Biodiversity** - Changes in sea ice can affect biodiversity such as polar bears and walrus.
- These mammals rely on the presence of sea ice for hunting, breeding, and migrating.
- **Arctic lifestyle** - The reduction in ice cover also affects the traditional hunting lifestyle of indigenous Arctic populations such as the **Yup'ik, Iñupiat, and Inuit**.
- **New pathways** - Reduced ice can open commercial and economic opportunities provoking global competition.
- Reduced ice opens up **shipping lanes** and increases **access to natural resources** in the Arctic region.

3.18 South Asia: Climate Migration Hotspot

Why in news?

The World Development Report on Migrants, Refugees, and Societies states, migration will become a necessity to cope with global economic imbalances, diverging demographic trends, and climate change.

What is climate migration?

- Climate migration, a **subcategory of environmental migration** refers to the migration of people by obligation or by choice, either temporarily or permanently, within a State or across an international border due to sudden or progressive climate change.
- It occurs due to extreme weather events, including floods, heat waves, droughts, and wildfires, as well as slower-moving climate challenges such as rising seas and intensifying water stress.

- South Asia is the world’s most impacted area of climate displacement hotspots including the Hindu Kush-Himalaya region, coastal areas, island nations, and deltaic and semi-arid regions of South Asia.

Why South Asia is the climate migration hotspot?

- High population density, poverty, and inadequate infrastructure are the major reasons for the exacerbated situation.
- Climatic reasons like cyclones and earthquakes are prone to this region.
- By 2050, nearly 216 million South Asians could be displaced due to climatic reasons.
- Already, over 9 million internal displacements happened in 2020 in South Asia, making it the region with highest number of new displacements due to climate change.

Affected by	Countries
Sea level rise & coastal floods	Bangladesh, India, Pakistan, and Sri Lanka
Glacial melt & temperature rise	Bhutan, Afghanistan and Nepal
Threat of submersion	Small island nations like Maldives

What are the impacts of Climate displacements?

- **Migration** - Poor economic capabilities reduce the adaptive capacity of communities to climate change events and promote migration.
- **Livelihood** - Climate displacement results in job losses, food insecurity, and an overall overcrowding of resources.
- **Social & Economic Costs** - It creates further migration and incurring other social and economic costs.
 - **Economic costs** - Loss of skilled labour and reduced productivity.
 - **Social costs** - Breakdown of social networks and communities, mental health issues, social unrest, and conflict.
- **Resource crunch** - Climate migration multiplies existing threats like overcrowding and conflicts over resources sharing
- **Over burden on cities** - The rural-urban migration forced by the failure of agriculture, overburdens the cities which already operates at full capacity.
- **Increase in violence** - Climate vulnerability and violence are correlated which could be seen in the conflicted areas.

In 2020, cyclone Amphan alone displaced five million people across South Asia.

In 2015, Nepal’s Gorkha earthquake displaced 2.6 million people, and left over 6 lakh homeless.

Over 7.9 million people were displaced by the floods in Pakistan, in 2022.

What should South Asian countries do?

- **Adaptation** - Improve resistance and resilience by introducing sustainable solutions.
- Structural gaps need to be corrected such as making coastal areas resistant and strengthening infrastructure.
- **Comprehensive Policies** - South Asian countries needs comprehensive policies to address climate displacement.
- Governments in the region must develop targeted policies that address the specific needs of climate-displaced communities.
- Policies should also focus on providing alternative livelihood opportunities and social protection programmes.
- **Support** - Adequate international aid to be given to meet the needs of affected communities.

South Asia would have an estimated 50 million climate refugees by 2050.

What are the implications of COP27 on climate displacement?

- COP27 identified ‘displacement’, ‘relocation’, and ‘migration’ as some of the concern areas which would be addressed through ‘loss and damage’ financing.
- The ‘[loss and damage](#)’ framework was developed at [COP27](#) of UNFCCC, aimed at supporting most impacted countries and viewed as an integral part of climate justice.
- The amount of funding required, and the designation of funders are not determined and remains a concern.
- The climate migrants and climate refugees are yet to find their voice in the global platform.

3.19 Economic Impact due to Climate Change

Why in news?

The RBI's report on currency and finance has separate chapter about explaining the macroeconomic effects of climate change in India.

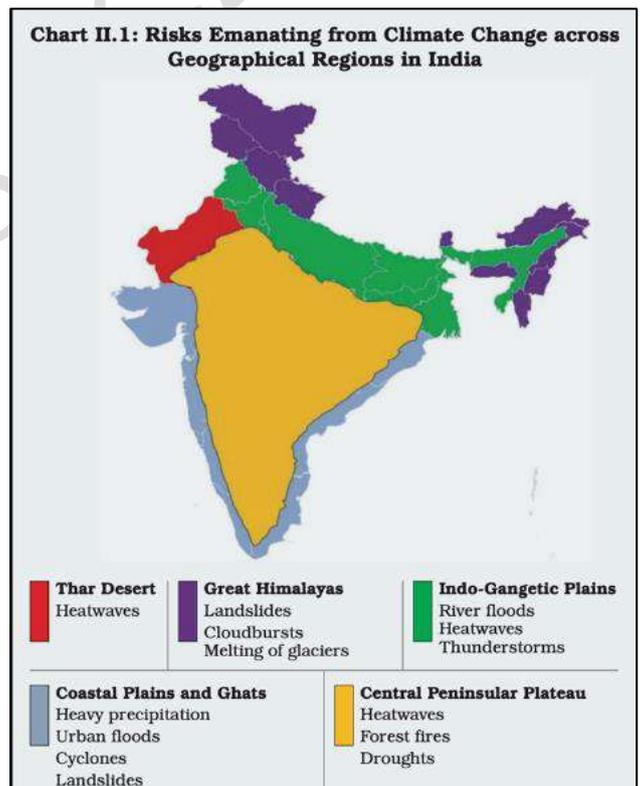
What is economic cost of climate change?

- **Difficult to estimate** - As it depends on a number of factors, including the severity of climate change, the rate of climate change, and the ability of societies to adapt to climate change.
- **Highest in developing countries** - Study by IPCC found that the economic cost of climate change would be highest in developing countries.
- The economic cost of climate change would be highest in developing countries and those that are heavily dependent on agriculture and tourism.
- **Supply and demand of economy** - Climate change can affect both the supply side (productive potential) and the demand side of the economy.
- **Diverse topography** - India is vulnerable to climate change due to its diverse topography, which exposes different regions to varying temperature and precipitation patterns.
- **Extreme weather events** - Floods, droughts, and heat waves, are becoming more frequent and intense due to climate change causing damage to property and infrastructure, and are disrupting the economic activity.
- **Health problems** - Heat-related illnesses, respiratory problems, and waterborne diseases are costing India billions of dollars in healthcare costs.
- **Agriculture** - Rising temperatures and changes in rainfall patterns makes it difficult to grow crops leading to food shortages and higher food prices.
- **Tourism** - [Rising sea levels](#) are threatening coastal resorts, and extreme weather events are making it more difficult for people to travel costing India billions of dollars in lost tourism revenue.

According to Global Climate Risk Index, 2021 India ranks 7th among countries most affected in 2019 by climate change.

What are the ways to mitigate climate change?

- Promote sustainable farming practices that reduce greenhouse gas emissions.
- Implement effective waste management strategies such as recycling, composting, and reducing landfill waste.
- Enact and enforce policies that support climate-friendly practices.
- Invest in R&D of clean technologies and innovations to reduce emissions and mitigate climate change.
- Collaborate with other countries to address global climate challenges.



4. SCIENCE & TECHNOLOGY

4.1 India's Science and Technology Sector

Why in news?

The year 2022 marks the 25 years since we started celebrating the National Technology Day (May 11).

What is so special about May 11?

- On May 11, 1998 3 special technologies were launched which includes

1. **Operation Shakti** (Pokhran-II nuclear tests)
2. Successful test firing of **Trishul missile**
3. First test flight of the indigenously developed aircraft **Hansa**

TRISHUL - Short range low-level surface-to-air missile.

HANSA-New Generation (HANSA-NG) - India's 1st indigenous flying trainer is the revamped version of the original, developed in 1993.

What is the journey of India's nuclear program?

- **Homi Bhabha** - India's nuclear programme can be traced to the work of physicist Homi J Bhabha.
- In 1945, Tata Institute of Fundamental Research, India's first research institution dedicated to the study of nuclear physics was opened in Bombay.
- **DAE** - In 1954, the Department of Atomic Energy (DAE) was founded, with Bhabha as director.
- **NPT** - In 1968, the Non-Proliferation Treaty (NPT) came into existence.
- The treaty defines nuclear-weapon states as those that have built and tested a nuclear explosive device before January 1, 1967 (The US, USSR, the UK, France and China) and effectively disallows any other state from acquiring nuclear weapons.
- India is one of the few *non-signatories of NPT*.
- **Vikram Sarabhai** - Bhabha's successor at the DAE, Vikram Sarabhai, had worked to significantly broaden India's nuclear technology
- **Pokhran-I** - On May 18, 1974, India carried out its first nuclear test at the Pokhran test site.
- Pokhran-I, codenamed **Operation Smiling Buddha**, would be billed as a "peaceful nuclear explosion", with "few military implications".
- **Missile development** - In 1983, the Defence Research and Development Organisation's (DRDO) funding was increased and Dr APJ Abdul Kalam was put in charge of India's missile programme.
- **CTBT** - India also *did not sign the Comprehensive Test Ban Treaty (CTBT)* that was finalised in 1996.
- **Pokhran-II** - In 1998, India responded to Pakistan's launch of Ghauri missile with **Operation Shakti** (Pokhran-II).
- Indian Government declared itself as a state possessing nuclear weapons following Pokhran-II.

Major initiatives in the S&T sector

Atal Innovation Mission (AIM)

- Established by NITI Aayog, it fosters a robust entrepreneurial landscape in India.

Council of Scientific & Industrial Research (CSIR)

- Plays a crucial role in supporting not only industrial R&D for established industries but also startups and MSMEs.

The National Institute of Ocean Technology (NIOT)

- An *autonomous body under the Ministry of Earth Sciences*.

The Department of Atomic Energy (DAE)

- Committed to deploying atomic power for improving life quality and fostering national development.

The Indian Space Research Organization (ISRO)

- Space science data from missions like Chandrayaan and Mangalyaan is used for hackathons and workshops.

Achievements	Challenges
<ul style="list-style-type: none"> • India as a pharmaceutical hub of the world • Democratisation of financial transactions by digital payment gateways • Mapping of subsurface water channels for sustainable use of water 	<ul style="list-style-type: none"> • Lack of urban infrastructure and planning • Low diversification of agricultural produce • Inadequate investments in research and development

What is the way ahead?

- Scientists, innovators, and entrepreneurs should be encouraged to pursue their endeavours to create a brighter future for India. There is a need to unleash the immense potential India holds in various fields, from atomic energy to space exploration and biotechnology.

4.2 All about Chandrayaan-3

Why in news?

The Indian Space Research Organization (ISRO) is preparing to launch Chandrayaan-3 on July 14, 2023.

What is Chandrayaan-3 Mission?

- Chandrayaan-3 is India's 3rd lunar mission and a follow-on to the [unsuccessful Chandrayaan-2](#).
- It will demonstrate India's end-to-end capability in safe landing and roving on the lunar surface.
- **Objective**
 1. To demonstrate safe and soft landing on the lunar surface
 2. To demonstrate rover roving on the moon and
 3. To conduct in-situ (on-site) scientific experiments.
- It also aims to develop and demonstrate new technologies required for interplanetary missions.

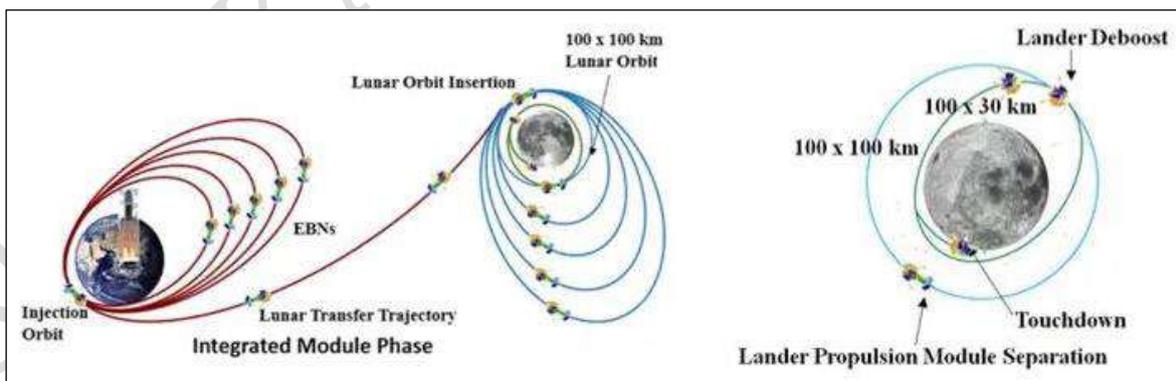
The success of the mission will make Chandrayaan-3, the world's 1st mission to soft-land near the lunar South Pole and India 4th country to soft-land on the moon.

How will the mission work?

- Chandrayaan-3 was launched by **LVM3** from Satish Dhawan Space Centre, Sriharikota.
- The spacecraft is a composite of 3 modules.
 1. A Propulsion module (PM): Life - 3-6 months
 2. An indigenous Lander module (LM) - **Vikram**
 3. A Rover - **Praayan**
- **Timeframe** - 1 month to reach the moon

Launch Vehicle Mark-III (LVM3)

- **3-stage** medium-lift launch vehicle developed by ISRO.
- Earlier known as 'GSLV Mk-III', it is the most powerful rocket in the ISRO's stable.
- Includes 2 solid boosters, the core liquid fuel-based stage, and the cryogenic upper stage which uses cryogenic engine (**CE20**).
- Can carry a payload of up to 8,000 kgs to a low-Earth orbit (LEO) and about 4,000 kgs to geostationary transfer orbit (GTO).
- Also used in launching Chandrayaan 2.



- **Slingshot Manoeuvre** - The Chandrayaan-3, like Chandrayaan-2, will circle the Earth 5-6 times, then sling off to the Moon.
- This manoeuvre uses Earth's gravity to impart velocity to the spacecraft thereby reducing the fuel used.
- **Lunar Orbit** - The module enters lunar orbit and the reverse will happen.
- Loop-by-loop the spacecraft will get closer to the moon until it reaches a circular path 100 km above the moon's surface before the lander separates.
- **On the Moon** - The lander will soft land at a specified lunar site (lunar South Pole) and deploy the rover.

- The rover will explore the lunar terrain for 14 Earth days (1 lunar day) and will carry out in-situ chemical analysis of the lunar surface.

SHOOTING FOR THE MOON: 2019, 2023

CHANDRAYAAN-2

COMPONENTS
Orbiter, Lander, Rover

EXPERIMENTS ON BOARD
■ 8 on Orbiter, 4 on Lander, 2 on Rover

WEIGHT

Orbiter	2,379 kg
Lander	1,471 kg
Rover	27 kg (trows 500 m)
Payload total	3,850 kg

MISSION LIFE
ORBITER: Planned 1 year, estimated 7 years
LANDER, ROVER: 11 lunar day

LANDING SITE
70.9 degree S 22.7 degree E; high plain between two craters, Manzinus C and Simpelius N

DAYS TO MOON

Around Earth	23 days
Towards Moon	7 days
Around Moon	13 days

Lander separation, de-boasting, powered descent: 5 days

TOTAL: 48 DAYS

LANDER
5 thrusters; was to land in a 500 m X 500 m space; was using pictures taken thru and there to assess landing site

CHANDRAYAAN-3

COMPONENTS
Propulsion module, Lander, Rover

EXPERIMENTS ON BOARD
■ Same experiments on Lander and Rover as Chandrayaan-2
■ New experimental payload added to propulsion module

WEIGHT

Propulsion module	2,145 kg
Lander	1,749.86 kg (including rover)
Rover	26 kg
Payload total	3,900 kg

MISSION LIFE
PROPULSION MODULE: 3 to 6 months
LANDER, ROVER: 1 lunar day

LANDING SITE
69.36 degree S, 32.34 degree E; slightly off the site for Chandrayaan-2

DAYS TO MOON
42 DAYS; SOONER THAN CHANDRAYAAN-2

LANDER
4 thrusters; stronger legs; built with redundancies for more scenarios, using data already generated by the C2 orbiter. Additional solar panels.

Isro's LVM3 carrying Chandrayaan-3 being moved to the launch pad ahead of its launch, at the Satish Dhawan Space Station, in Sriharikota. (PTI)

What are the payloads carried by Chandrayaan-3?

- Propulsion Module payload:** It has one scientific payload - Spectro-polarimetry of Habitable Planet Earth (SHAPE), which will be operated post separation of the lander module.
- SHAPE is to study the spectral and Polari metric measurements of Earth from the lunar orbit and also will look for smaller planets that might be habitable in the reflected light.
- Lander Module payloads:**
 - ChaSTE** (Chandra's Surface Thermophysical Experiment) - To measure the thermal conductivity and temperature;
 - ILSA** (Instrument for Lunar Seismic Activity) - For measuring the seismicity around the landing site;
 - LP** (**Langmuir Probe**) - To estimate the plasma density and its variations.

- **Rover payloads:** Has 2 payloads for deriving the elemental composition in the vicinity of landing site.
 1. Alpha Particle X-ray Spectrometer (APXS)
 2. Laser Induced Breakdown Spectroscope (LIBS)

How different is Chandrayaan-3 from Chandrayaan-2?

- ISRO has designed Chandrayaan-3 with a **failure-based approach**.
- Based on lessons learned from Chandrayaan-2, Chandrayaan-3 was upgraded such as -
 1. The lander incorporates enhanced features to ensure a successful landing by overcoming obstacles.
 2. The rover is equipped with **hazard detection and avoidance systems**, ensuring a safe traversal of the moon's surface.
- **Orbiter** - Chandrayaan-3 will **not carry an orbiter** but it will use data from the Chandrayaan-2 orbiter.
- **Landing site** - The site is at around **70 degree S** near the Southern pole of the moon.
- It has been fed with **high resolution pictures** captured by the Chandrayaan-2 orbiter and does not depend only on pictures clicked during descent to determine landing.
- The landing area has also been **expanded** from a patch of 500mx500m to a broad 4kmx2.4km area.
- **Weight** - Due to the modifications made for a safe landing, the weight of the payload is slightly more than the previous mission.
- **More fuel** - Travel longer distances to the landing site or an alternate landing site, if needed.

How significant is the Chandrayaan-3 mission?

- It represents ISRO's commitment to expanding our understanding of the moon and beyond.
- ISRO aims to mitigate risks and ensure a successful mission, by taking a failure-based approach in its design.
- The mission's success will solidify India's position as a prominent player in the realm of space exploration.
- It has enormous promise for the future of space travel and interplanetary missions.
- The data from this is likely to benefit NASA's Artemis program, as India has signed NASA's [Artemis Accord](#).

4.3 Role of Moon in the Development of Life on Earth

Why in news?

Moon, the only natural satellite of Earth played vital role in the geology of Earth and evolution of life.

What is the Earth's Moon and how did it form?

- **Moon** - It is the Earth's most constant companion, which orbits at a mean distance of about 384,400 km.
- The Earth and Moon are tidally locked. Their rotations are so in sync we only see one side of the Moon.
- Humans didn't see the lunar far side until a Soviet spacecraft flew past in 1959.
- The Moon has a solid, rocky surface cratered and pitted from impacts by asteroids, meteorites and comets.
- It is approximately **1/4th the size** of Earth in terms of diameter.
- In surface area, the Moon covers about **1/16th of Earth's total surface area** & roughly has **1.2% of Earth's mass**.
- The moon's gravitational force is only about **16.6 % of Earth's gravity** which means a person would weigh 6 times less on the moon than they do on Earth.

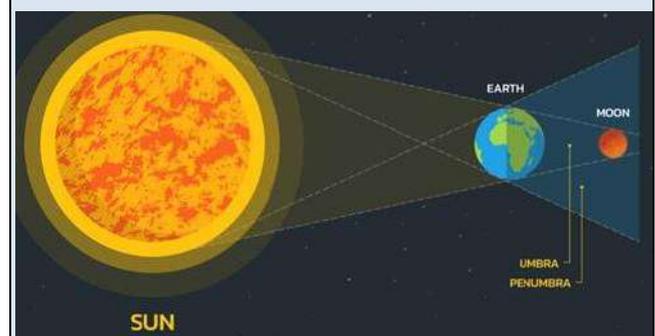
Lunar Eclipse

The lunar eclipse of the Moon is caused by Earth which completely blocks the direct Sun rays which reach the Moon, with the only light reflected from the lunar surface being refracted by Earth's atmosphere.

Types

Total lunar eclipse- It occurs when the Moon and Sun are on opposite sides of Earth.

Partial lunar eclipse- It happens when only part of Earth's shadow covers the Moon.



- Moon takes 27 days to revolve around Earth, its lunar cycle (from one new moon to other new moon) is 29.5 days.
- **Formation** - Moon was formed when a Mars-sized object (**Theia**) smashed into the Earth about **4.5 billion years ago**. This enormous collision spun out a **cloud of debris** that evolved into the moon.
- As per research, Theia came from outer solar system that collided with the Earth.

What is the role of Moon in the development of life on Earth?

- **Effect of tides on evolution** - Tides resulting from the gravitational force of the moon affect **animal life in the intertidal zone** (where the ocean meets the land between high and low tides).
- Big tidal ranges have been responsible for forcing bony fish into shallow pools on land, prompting the evolution of weight-bearing limbs and air-breathing organs.
- The tides eroded the coastal areas, **adding minerals to the oceans** an essential element for life to evolve quickly.
- **Effect of lunar cycle on reproduction**- The reproductive cycles of many marine creatures are **closely synchronised** with lunar phases.
 - **Example** - The mass spawning of corals on the Great Barrier Reef is triggered by the Moon.
- Nocturnal animals behave differently depending on where the moon is in the sky during lunar phase.
- There is also a link of **lunar rhythms with human behaviour**, activity and even fertility.
- Some scholars arguing that human reproductive behaviour was originally synchronous with the moon, but got modified recently by modern lifestyles.
- **Impact on climate change**- Moon's gravitational pull helps **transport heat away from equator** to the poles, shaping earth's climate.
- The absence of moon would lead to extreme climate change as there would be huge differences between temperatures and daylight throughout the year.
- Moon also **stabilises the Earth's rotation on its axis** by slowing Earth's rotation on its axis.
- **Impact of Moon's light**- The ability to see and to be seen enhances in the moonlight.
- Studies have documented changes in the **success rates of predators and foraging patterns of prey animals** due to this added night time illumination.
 - Studies have shown that lions are less likely to hunt during the full moon and lion attacks on humans happen 10 days after the full moon.
- **Water distribution**- It is with the formation of the Moon, water came to Earth for the first time in 4.4 billion years ago.
- **Theia's collision with Earth** led to the formation of moon provided sufficient **carbonaceous material** to account for the entire amount of water on Earth.
- **Tectonic plates**- The **moon's pull of gravity** might have set the Earth's tectonic plates.
- It raises the level of the world's oceans towards the equator.

LUNAR MISSIONS		
China  <ul style="list-style-type: none">• Chang'e 1 (2007)• Chang'e 2 (2010)• Chang'e 5 (2020)	India  <ul style="list-style-type: none">• Chandrayaan 1 (2008)• Chandrayaan 2 (2019)• Chandrayaan 3 (2023)	USA  <ul style="list-style-type: none">• Apollo 11 (1969)• Artemis 1 (2022)• Artemis 2 (2024)
Russia  <ul style="list-style-type: none">• Luna 2 (1959)• Ranger 9 (1965)• Luna 25 (2023)	South Korea  Danuri (2022)	Japan  <ul style="list-style-type: none">• Hakuto-R (2022)• Selene (2007)

What is the need for exploring the Moon?

- **Scientific Knowledge**- To pursue scientific activities that address fundamental questions about the history of Earth, the solar system and the universe.
- **Human Settlement**- To extend human presence to the moon to enable eventual settlement.
- **Test Bed** - To test the technologies, systems, flight operations and exploration techniques to reduce the risks and increase the productivity of future missions to Mars and beyond.

- **Economic Expansion-** To expand Earth's economic sphere, and conduct lunar activities with benefits to life on the home planet.
- **Water Exploration** – To utilise the remnants of water in the shaded spots would remain a permanently frozen mixture of dust and ice.
- **Mineral Exploration** - To tap the billions of dollars of untapped mineral resource that the moon holds.
- **Public Engagement-** To use a vibrant space exploration program to engage the public and help develop high-tech workforce to address the challenges of tomorrow.

Only 3 countries have achieved the soft-landing on the moon's surface - United States, Russia and China

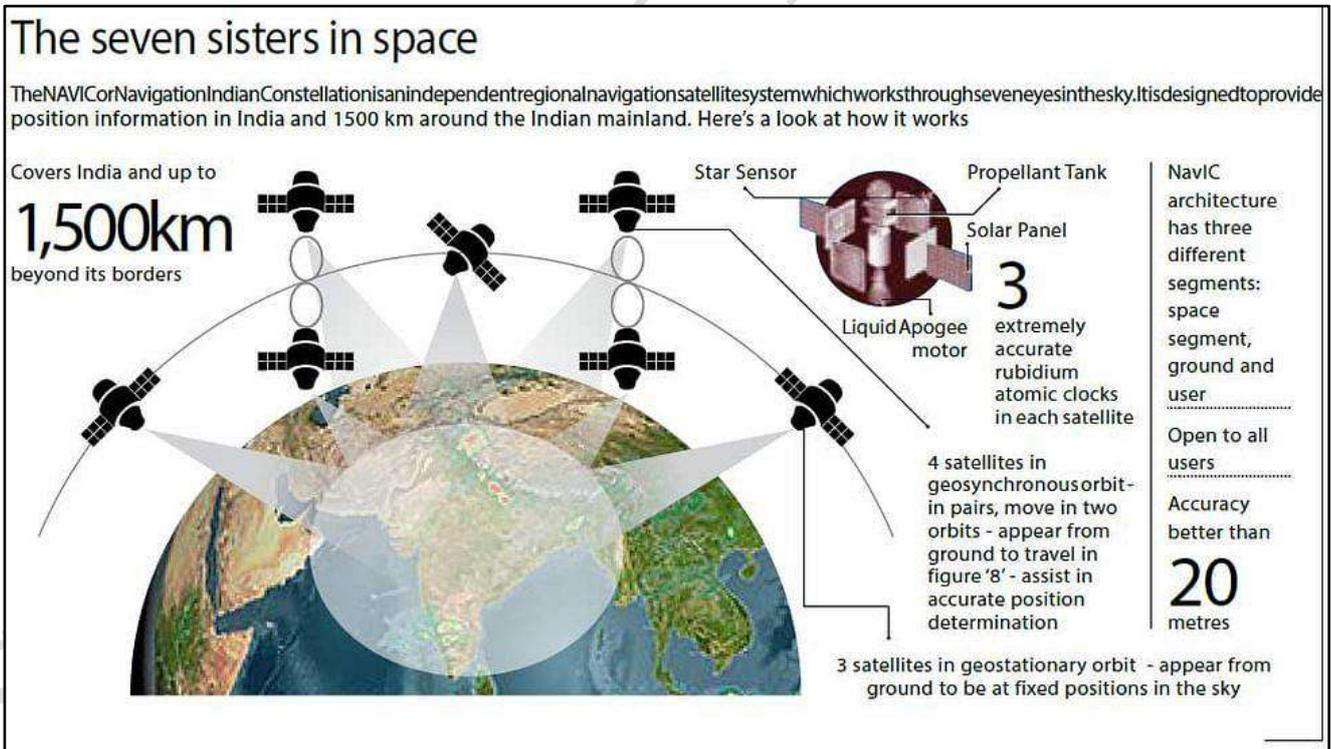
4.4 ISRO's new NavIC satellite

Why in news?

The ISRO has launched the first of the second-generation satellites for its navigation constellation successfully.

What is NavIC?

- NavIC (Navigation with Indian Constellation) is a regional navigation satellite system of India.
- It is erstwhile known as the **Indian Regional Navigation Satellite System (IRNSS)**.
- NavIC is designed with a constellation of **7 satellites**, all launched by PSLV rockets - 3 satellites of the constellation are placed in geostationary orbit and the other 4 are placed in inclined geosynchronous orbit.
- It offers two services: **Standard Position Service (SPS)** for civilian users and **Restricted Service (RS)** for strategic users.
- NavIC satellites will broadcast SPS signals in L1, L5 and S bands after the addition of [NVS-01](#).
- RS signals will be broadcasted in L5 and S bands.



What are the current issues with IRNSS constellation?

- **Atomic clock** - Satellite-based positioning system determines the location of objects by using the atomic clocks on board.
- The atomic clocks accurately measures the time it takes for a signal to travel to and back from it.
- In 2018, ISRO started the launch of the replacement satellites after their onboard atomic clock failed and it stopped providing accurate location data.
- **Mission Life** - IRNSS-1A which was launched into orbit in 2013, is almost defunct.

- All the 3 oldest satellites in the constellation are close to the end of their 10-year mission lives.
- At least three new satellites must be put into orbit to keep the seven-satellite constellation fully functional.
- **Signal Band** - The L1 frequency is among the most commonly used in the Global Positioning System (GPS).
- Earlier IRNSS used only L5 and S frequencies, this limits the interoperability with other global navigation satellite system (GNSS).

What is second generation satellites?

- They are *replacement satellite for the Indian Regional Navigation Satellite System*.
- The second generation satellites will replace satellites located at a **geosynchronous orbit** with additional features.
- **NVS-01** - It is the first of the second-generation satellites envisaged for NavIC services.
- NVS-01 was launched by a Geosynchronous Satellite Launch Vehicle (GSLV) rocket.

What's new in the second-generation NavIC satellite?

- **Mission Life** - The second-generation satellites will also have a longer mission life of more than 12 years.
- **New band (L1)** - The NVS series incorporates L1 band signals additionally to increase the interoperability with other satellite-based global navigation systems widen the services.
- It will increase the use of NavIC in wearable devices and personal trackers that use low-power, single-frequency chips.
- **Atomic clock** - For the first time, an indigenous atomic clock will be flown in NVS-01.
- The satellite will have a Rubidium atomic clock onboard, indigenously developed by Space Application Centre-Ahmedabad.

What practical purpose does the NavIC constellation serve for users?

- NavIC is in use for projects like public vehicle safety, power grid synchronisation, real-time train information systems, and fishermen's safety.
- Initiatives such as common alert protocol based emergency warning and unmanned aerial vehicles are in the process of adopting NavIC system.
- The Ministry of Electronics and IT urging smartphone companies to make their handsets NavIC compatible.

Global Navigation Systems	Satellite-Based
• The American GPS	
• The Russian GLONASS	
• The European Galileo	
• The Chinese Beidou	

What is the advantage of having a regional navigation system?

- Japan has a 4-satellite system that can augment GPS signals over the country, similar to India's GAGAN.
- India is the only country that has a regional satellite-based navigation system.
- **Accuracy** - GPS signals are accurate up to around 20 metres whereas NavIC open signals will be accurate up to 5 metres and restricted signals will be even more accurate when fully operational.
- **Coverage** - NavIC provides coverage over the Indian landmass and up to a radius of 1,500 km around it.
- **Consistency** - NavIC uses satellites in high geo-stationary orbit which enables the satellite to look over the same region on Earth always.
- **Penetration** - NavIC signals come to India at a 90-degree angle, making it easier for them to reach devices located even in congested areas, dense forests, or mountains.

4.5 India joins Artemis Accord

Why in news?

India became the 27th signatory to the American-led Artemis Accords.

What are Artemis Accords?

- The **US** established the Artemis Accords together with 7 other founding member nations in 2020 to return humans to the moon by 2025.

- The Artemis Accords reinforce and implement key obligations in the 1967 Outer Space Treaty.
- These Accords are a non-binding set of principles designed to guide civil space exploration cooperation among nations participating in the agency's 21st century lunar exploration plans.
- It currently has **28 signatories including India.**
- Artemis mirrors a Chinese-Russian plan for an 'International Lunar Research Station' (ILRS).

What is done under Artemis Accords?

The Artemis programme this time plans for permanent settlements on the Moon.

- Through the Artemis program, NASA will land the first woman and first person of color on the Moon.
- The project plan includes
 - a base on the lunar surface
 - multiple spacecraft to ferry humans and cargo
 - a small orbiting space station called the 'Lunar Gateway'
 - a constellation of satellites to help with navigation and communication
- The Artemis Accords was created by the U.S to act as a soft-law alternative to the Moon Agreement, which limits resource extraction in celestial bodies.
- If Artemis Programme succeed in permanent settlement in lunar surface, resource extraction will be limited to lunar surface.
- A key provision in the Artemis Accords allows for actors to extract and utilise space resources.

NASA TIMELINE	
<ul style="list-style-type: none">• Artemis I (2022) First uncrewed test flight of integrated Space Launch System (SLS) rocket and its Orion crew capsule.• Artemis II (2024) First crewed flight around the moon.• Artemis III (2025/2026) First crewed flight to land on the moon's surface.	

What is it that India seeks to gain out of Artemis?

- **Gaganyaan** - Parties to the Accords gain greatly from the exchange of information and gain access to NASA's Artemis programme. This shared information would greatly help India's own Gaganyaan mission.
- **ISRO** - NASA and ISRO have agreed to a joint mission to the International Space Station (ISS) in 2024.
- This opens avenues for knowledge sharing, joint research, and tech-exchange between the 2 space agencies.
- Earlier, ISRO and NASA collaborated in the development of NISAR Mission.
- **Bilateral ties** - The ties between India and the U.S. have been on an upswing and this accord improves bilateral space cooperation between them.
- India in its new space policy allows private players to mine any 'space resource,' which presumably includes the Moon.
- **Economic potential** - It allows Indian companies and industries to participate in the global space economy and access new markets.
- **Space industry** - Increased investment in the space sector drives job creation, research and development and the growth of India's space industry.
- **Collaboration** - India can collaborate and gain knowledge from other Artemis signatories.

Moon Agreement of 1979
<ul style="list-style-type: none">• The Moon Agreement of 1979 is directed towards the use of the Moon and other celestial bodies.• It limits the scope of exploitation of resources from these celestial bodies and establishes that the moon and other celestial bodies are 'the province of all mankind'.• It declares that these regions of space must only be for peaceful purposes, with no state allowed to establish military bases or place weapons on celestial bodies.• - Despite being instrumental in the drafting of the Moon Agreement, the <u>United States did not ratify it.</u>• <u>India is a signatory to the Moon Agreement, but is yet to ratify it.</u>

What is the way forward?

- India has much work to do to make the most of the Artemis programme.
- It has to overcome domestic resistance to collaboration with other space agencies and has to enable its private sector to work with other Artemis members, and develop legislation that encourages space activities.

4.6 Atmanirbhar Bharat in Defence Production

Why in news?

The US-India military deal is not enough to cut the partnership that India has with Russia.

Status of India's Defence Production

- **Arms import** - India is the world's biggest arms importer but the major weapons purchases include provisions for joint manufacture or technology transfer.

- Of India's total volume of procurement in 2016–20, **84%** was of foreign origin.

- As per Stockholm International Peace Research Institute (SIPRI), India bought weapons worth over \$60 billion in the last 20 years, of which **65% were from Russia**.

The US remained the top arms exporter during 2018-22.



- **Military spending** - India is the third largest military spender after the United States and China.

- **Indigenisation** - According to SIPRI, 64% of capital outlays in the military budget of 2021 were earmarked for acquisitions of domestically produced arms.

What is the history of India-Russia defence relations?

- USSR was India's strategic partner during the Cold War and also its primary military equipment supplier.
- Moscow started supplying naval equipment to India from 1964 and by 1987, constituting 70% of Indian Navy's inventory.
- Moscow loaned the 1st nuclear submarine to India in 1988, which was commissioned as INS Chakra.
- **Joint exercises- "INDRA"** is held between the three Armed Forces. Indian contingent participated in International Army Games, Ex Vostok in Russia.
- **Agreement for 2021-2031-** To develop and strengthen the military and technical cooperation in research and development, production and after sales support of armament systems and various military equipment.

What is the history of India-US defence relations?

- Defence relationship has emerged as a major pillar of India-U.S. strategic partnership with the signing of 'New Framework for India-U.S. Defense Relations' in 2005.
- India-US 2+2 Ministerial dialogue further enhanced the defence ties.
- In 2016, US recognised India as "Major Defence Partner" which commits the U.S. to facilitate technology sharing with India.

Agreement	About	Signed in
GSOMIA	General Security Of Military Information Agreement	2002
LEMOA	Logistics Exchange Agreement	2016
COMCASA	Communications Security Agreement	2018
BECA	Basics Exchange Cooperation Agreement	2020

- Both have signed 4 agreements that cover areas of military information, logistics exchange, compatibility, and security.
- **Bilateral Exercises-** Tiger Triumph, Vajra Prahar, Malabar exercises etc.,
- **QUAD (Quadrilateral Security Dialogue)** - It is a strategic security dialogue between Australia, India, Japan and the United States.
- **Other agreements-** 'Security of Supply' (SoS) arrangement and a 'Reciprocal Defence Procurement' (RDP) agreement aims to promote long-term supply chain stability and enhance security and defense cooperation.
- India's first indigenous fighter jet LCA Tejas is powered by GE's F404 engines exported from US, talks to buy MQ-9 UAV (also known as Sea Guardian) is also under the table.

What are the issues with India’s defence import?

Issues in Import from Russia	Issues in Import from USA
Russia-Ukraine War- It disrupted military supplies to India and will also delay remaining two of the five Russian S-400 air defence systems bought by India in 2018.	US relation with Pakistan- Due to the strategic threat to India from Pakistan, this may weaken India’s defence ties with USA.
Payments - Due to sanctions against Russia over war, payment to the defence procurement by India is still a challenging issue.	Technology transfer- US is not open to India with the technology transfer related to defence which is a major hurdle.
Russia -China ties- Russia’s inclusion in the China’s One Belt One Road initiative and its closer proximity to China affects the strategic autonomy of India.	India-Russia Defence ties- India’s purchase of S-400 from Russia weakens the defence partnership with USA.

Why India should move towards indigenization?

- **Self-reliance**– Make in India movement in the defence sector will be a key towards Aatmanirbhar in Defence.
- **Private sector-** Private sector participation in defence will encourage foreign producers to form strategic partnerships with various Indian businesses.
- **Military expenditure-** India will be able to reduce its reliance on imports by increasing domestic production.
- **Exports-** India will be able to achieve its 2025 export target of Rs. 36,500 crore (US\$ 4.8 billion).

What measures were announced by India to attain Atmanirbhar in defence sector?

- The government would approve at least 5 projects under Make-in India during 2022-23 for boosting industry-backed R&D efforts.
- **IDEX-Prime** - It aims to encourage projects that may necessitate support beyond Rs. 1.5 crore and up to Rs. 10 crores, to help developing start-ups in the defence sector.
- Around 68% of the capital procurement budget would be earmarked for the domestic industry.
- The industrial licensing process would be streamlined with longer authentication period.
- An indigenisation portal called **SRIJAN** would be launched to support indigenisation by Indian entities, including MSMEs.
- Two industrial defence corridors would be launched, one each in Uttar Pradesh and Tamil Nadu.

4.7 New Scorpene class submarines

Why in news?

The Defence Acquisition Council (DAC) has cleared proposals to buy 3 additional Scorpene submarines and 26 Rafale Marine fighter jets for the Navy.

What is the naval strength of India?

- Indian Navy has 16 conventional submarines
 1. 7 of the Sindhughosh class (Russian Kilo class)
 2. 4 of the Shishumar class (modified German Type 209)
 3. 5 of the Kalvari class (French Scorpene class)
- It also has 2 nuclear submarine, INS Arihant and INS Arighat.
- **Project 75** – Earlier in 2005, India signed Project 75 to construct 6 Scorpene class submarines over 30 years with technology transfer from France. So far, 5 submarines have been commissioned and the last one, INS Vagsheer is under trials.
- **Project 75I** – It is a follow-up to Project 75 and improves upon the design and technology of its predecessor.
- It aims to procure diesel-electric attack submarines with fuel cells and Air-Independent Propulsion System (AIP) for the Indian Navy.

Defence Acquisition Council (headed by defence minister) is the apex decision-making body for the acquisition of military equipment for India’s armed forces.

Scorpena Submarine

Length: Around 220 feet

Height: Approximately 40 feet

Top speeds:

Surfaced - 11 knots (20 km/h)

Submerged - 20 knots (37 km/h)

Endurance - Approx. 50 days

System - Diesel electric propulsion systems



Projects-75 (Kalvari class)		
Name	Meaning	Commissioned Year
INS Kalvari	Tiger Shark	2017
INS Khanderi	Island Fort built by Chhatrapati Shivaji	2019
INS Karanj	Island located South of Mumbai	2021
INS Vela		2021
INS Vagir	Sand Fish	2023
INS Vagsheer	Sand Fish	Launched in 2022 (under trail)

What is the need for the three additional submarines?

- **Bolster our fleet** - Procurement of the three additional submarines will help in maintaining required force level and operational readiness of the Navy
- **Delay** - The delayed deliveries of submarines under Project 75 made DAC to decide on buying them.
- **Lack of maintenance** - The ageing fleet of India's Russian-made platforms, Moscow's inability to perform maintenance work.

- **Indigenisation** - It will help the MDL in enhancing its capability and expertise in submarine construction.
- Procurement of submarines with higher indigenous content will create employment opportunities domestically.

What are the capabilities of the Scorpena submarines?

- The Scorpena submarines are conventional attack submarines capable of launching torpedoes and missiles.
- They are also equipped with a range of surveillance and intelligence-gathering mechanisms.
- The diesel electric propulsion system enables them to alternate between using diesel and electric.

1. Diesel - for functioning on the surface
2. Electric - for functioning underwater

- The 3 submarines will be fitted with [air-independent propulsion](#) (AIP) systems to allow them to remain submerged for longer.

Nuclear Subs	
Pros of nuclear subs	Cons of nuclear subs
<p>A nuclear reactor on a submarine has an operational life of up to 30 years. Hence, theoretically nuclear submarines have unlimited endurance.</p> <p>They can move faster than conventional ones.</p>	<p>Nuclear submarines are expensive and require a significant amount of specialised experience to operate.</p>
Conventional subs	
Pros of conventional subs	Cons of conventional subs
<p>The range of conventional submarines as well as their stealth is significantly higher.</p> <p>They have improved stealth features such as advanced acoustic absorption techniques, low radiated noise levels, long-range guided torpedoes, tube-launched anti-ship missiles, sonars & sensor suites.</p>	<p>Conventional diesel-electric submarines have lower endurance, need to surface every 48 hours to be recharged.</p>

4.8 Higgs-Boson Decay

Why in news?

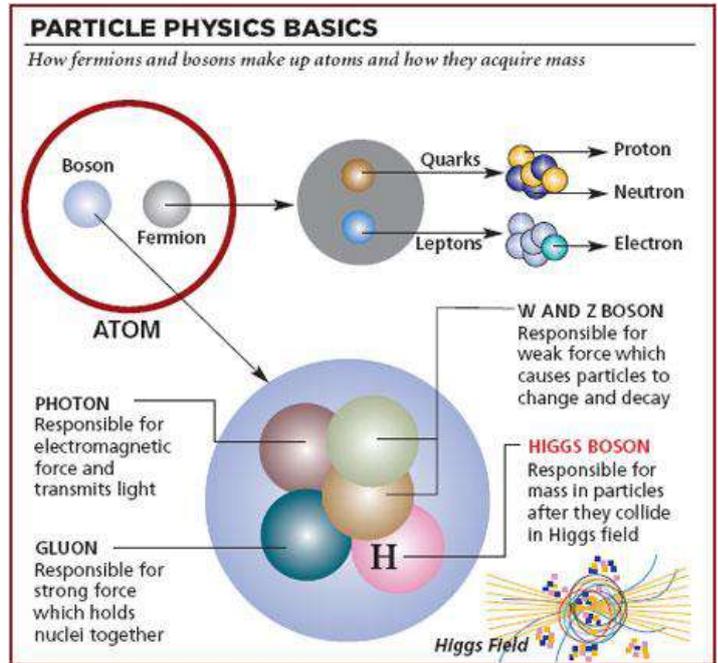
Physicists detected a Higgs boson decaying into a Z boson particle and a photon in the [Large Hadron Collider](#) (LHC) at CERN.

What is the Higgs boson?

- The Higgs boson is the fundamental force-carrying particle of the Higgs field, which is responsible for granting other particles their mass.
- Known as '*God's Particle*', it was first discovered by the ATLAS and CMS detectors in 2012.
- **Properties** - The Higgs boson ***has mass but is chargeless***.
- It has a mass of 125 billion electron volts.
- It has zero spin, making it the only elementary particle with no spin.

How mass of other particles is related to Higgs Boson?

- The mass of the subatomic particle depends on the particle's interaction with the Higgs boson. The stronger the interaction the more the mass it has.
- **Mass** - Photons (particles of light) have no mass because they don't interact with Higgs bosons.
- The Higgs boson has a mass of 125 billion electron volts which is 130 times more massive than a proton.
- A Higgs boson's mass is greater than that of protons or neutrons because a Higgs boson can interact with another Higgs boson.



How universe could be studied using Higgs boson particles?

- **Universe** - Higgs bosons can tell us a lot about the universe on studying two factors -
 - Understanding the properties of Higgs bosons
 - How strongly each type of atomic particle couples to Higgs bosons.
- **Virtual particles** - According to quantum field theory, space at the subatomic level is filled with virtual particles.
- They are particles that quickly pop in and out of existence which can't be detected directly but their effects sometimes linger.

Weak force, Strong force, Gravitational force and Electromagnetic force are the 4 Fundamental forces.

What is the Higgs Boson decay?

- The LHC creates a Higgs boson by accelerating billions of highly energetic protons into a head-on collision. This releases a tremendous amount of energy that condenses into different particles.
- When a Higgs boson is created in LLHC, it has a brief interaction with virtual particles that creates a Z boson and a photon.
- The Z boson is also unstable & decays to 2 muons some 3% of the time.

What is the Standard Model (SM)?

- The SM of particle physics explains how the basic building blocks of matter interact by 4 fundamental forces.
- The Standard Model is an established and well-tested theory of particle physics.
- It successfully explained how these particles and 3 of the forces are related to each other.
- But it could not explain dark energy or the warping of space and time or hoe neutrinos have mass.
- SM theory states that a Higgs boson will decay to a Z boson & a photon 0.1% of the time if its mass is 125bn eV/c².

Large Hadron Collider

- The Large Hadron Collider (LHC) is the world's largest and most powerful particle accelerator.
- Started in 2008, it is located in the CERN's accelerator complex.
- It consists of a 27-kilometre ring in which two high-energy particle beams travelling in opposite directions are made to collide.
- It has 4 particle detectors - ATLAS, CMS, ALICE and LHCb at 4 colliding locations around the accelerator ring.

How significant is the decay?

- According to the Standard Model, the LHC needed to have created at least 1,000 Higgs bosons to have been able to spot one of them decaying to a Z boson and a photon.
- The LHC would have had to create at least 30,000 Higgs bosons to observe the decay just once to spot a pair of muons plus a photon created at the same time.
- Testing Standard models predictions as precisely as possible is a way to find whether there are any cracks in the Model.
- Some theories predict a higher rate of decay through this pathway.
- The experimental proof of this can validate new theories of physics and open new realm of science.

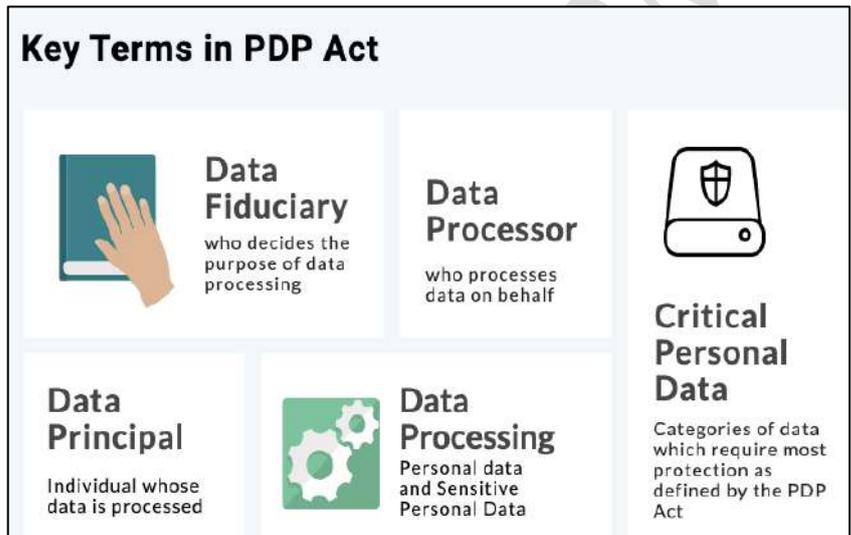
4.9 The Digital Personal Data Protection Bill, 2023

Why in news?

Recently, Lok Sabha passed the Data Protection Bill, India's 2nd attempt in framing a privacy legislation.

What is the history of Data Protection Bill?

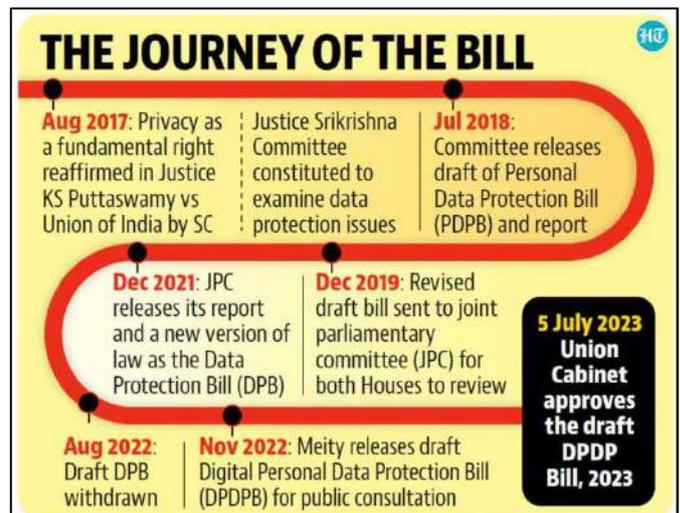
- In 2017, the central government constituted the **B.N.Srikrishna Committee** to examine issues relating to data protection in the country.
- Based on the recommendation of the Committee, the Personal Data Protection Bill, 2019 was introduced in Lok Sabha.
- It is formulated based on the data regulation of European Union (General Data Protection Regulation (GDPR)) which empower citizens to have a greater say in how their online data is used.



What are the key features of the bill?

- **Applicability**- The Bill applies to the processing of digital personal data within India where such data is
 - Collected online, or
 - Collected offline and is digitised.
- It will also apply to the processing of personal data *outside India* if it is for offering goods or services in India.
- **Consent**- Personal data may be processed only for a lawful purpose after obtaining the consent of the individual.
- For individuals below 18 years of age, consent will be provided by the parent or the legal guardian.
- Consent may be *withdrawn at any point* in time.
- **Rights of data principal**- Data principal is an individual whose data is being processed. He/She will have the right
 - To obtain information about processing
 - To seek correction and erasure of personal data

India does not have a standalone law on data protection. Use of personal data is regulated under the Information Technology (IT) Act, 2000.



- To nominate another person to exercise rights in the event of death or incapacity and
- Grievance redressal
- **Duties of Data Principals-** Data Principals must not
 - Register a false or frivolous complaint
 - Furnish any false particulars or impersonate another person in specified cases
 - Violation of duties will be punishable with a penalty of up to Rs 10,000.
- **Obligations of data fiduciaries-** Data fiduciary is the entity determining the purpose and means of processing.
- Data fiduciary must
 - Make reasonable efforts to ensure the accuracy and completeness of data
 - Build reasonable security safeguards to prevent a data breach
 - Inform the Data Protection Board of India and affected persons in the event of a breach
 - Erase personal data as soon as the purpose has been met and retention is not necessary for legal purposes
- In case of government entities, storage limitation and the right of the data principal to erasure will not apply.
- **Personal data outside India-** It allows transfer of personal data outside India, except to countries restricted by the central government through notification.
- **Exemptions-** Rights of the data principal and obligations of data fiduciaries will not apply in specified cases such as
 - Prevention and investigation of offences
 - Enforcement of legal rights or claims
- The Central government may exempt certain activities
 - In the interest of the security of the state and public order
 - Research, archiving, or statistical purposes
- **Data Protection Board of India-** It will be established by the Central Government. Key functions of the Board include
 - Monitoring compliance and imposing penalties
 - Directing data fiduciaries to take necessary measures in the event of a data breach
 - Grievance redressal
- **Appeal-** The decisions of the board can be appealed to Telecom Dispute Settlement and Appellate Tribunal.

Personal data is defined as any data about an individual who is identifiable by or in relation to such data.

Penalty	Reason
Rs 200 crore	Non fulfilment of obligations for children
Rs 250 crore	Failure to take security measures to prevent data breaches.

What is the significance of the bill?

- **Multi-pronged approach** - This framework encompasses various legislative measures such as the
 - [Digital India bill](#) that would replace existing Information Technology Act, 2000,
 - Draft Indian Telecommunication Bill, 2022, and
 - Policy addressing the governance of non-personal data.
- **Privacy** - It will enhance the privacy cognizance of Indian citizens through transformative accountability measures to be adopted by enterprises.
- **Compliance-** It is due to robust protection and security measures, combined with effective privacy policies and grievance redressal mechanisms

According to data from the United Nations Conference on Trade and Development, 137 out of 194 countries have put in place legislation to secure the protection of data and privacy

- **Data breach-** Multiple exemptions were provided to prevent data breaches such as the
 - [privacy breach in CoWIN portal](#) where the personal details of vaccinated users had been leaked on Telegram.
 - 12,000 confidential records of State Bank of India employees were reportedly made public on Telegram.

What are the issues with the bill?

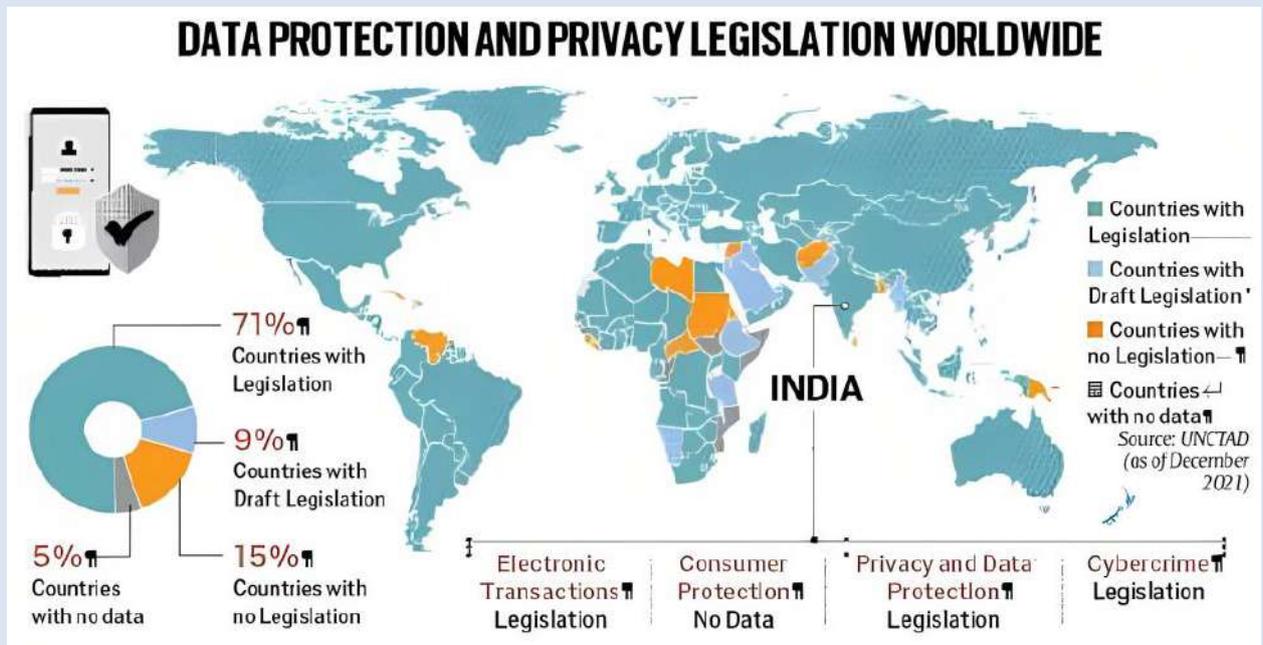
- **Article 21-** It violates the fundamental right to privacy because of the exemptions provided to the State on grounds such as national security.
- **Regulation-** The Bill does not regulate risks of harms arising from processing of personal data.
- **Rights -** The Bill does not grant the right to data portability and the right to be forgotten to the data principal.
- **Personal data outside India-** This mechanism may not ensure adequate evaluation of data protection standards in the countries where transfer of personal data is allowed.
- **Independence -** The *short term (2 years)* of the members of the Data Protection Board of India with scope for *re-appointment* may affect the independent functioning of the Board.
- **Multiple exemptions-** Exemptions citing national security etc., resemble China’s data regulation.
- **Right to Information (RTI) Act-** The personal data of government functionaries is protected making it difficult to be shared with an RTI applicant.
- **No compensation -** *Section 43A of IT Act,2000* imposes an obligation on corporates to award damages to affected persons in case of negligent handling of their sensitive data. However, the Bill excludes the application of Section 43A.

Right to data portability- The right to data portability allows data principals to obtain and transfer their data from data fiduciary.

- It is obtained for their own use, in a structured, commonly used, and machine-readable format.
- It gives the data principal greater control over their data.

Right to be forgotten- It refers to the right of individuals to limit the disclosure of their personal data on the internet.

Models for data protection laws



- **European Union Model-** The GDPR focuses on a comprehensive data protection law for the processing of personal data
- *Right to privacy* is enshrined as a fundamental right that seeks to protect an individual’s dignity and her right over the data that she generates.
- *Digital Services Act* focuses on issues such as regulating hate speech, counterfeit goods etc.

- *Digital Markets Act* has defined a new category of “dominant gatekeeper” platforms and is focused on non-competitive practices and the abuse of dominance by these players.
- **The US Model-** Privacy protection is largely defined as a “*liberty protection*” which is focused on the protection of the individual’s personal space from the government.
- There is no comprehensive set of privacy rights or principles that collectively address the use, collection and disclosure of data in the US.
- **China model-** The Personal Information Protection Law (PIPL), gives data principals, the right to prevent the misuse of personal data.
- *Data Security Law* requires business data to be categorised by different levels of importance and puts new restrictions on cross-border transfers.
- It gives the government overreaching powers to both collect data and regulate private companies that collect and process information.
- Businesses may also be required to suspend operations until they demonstrate compliance.
- India too, has introduced a similar provision, where any platform that has violated its norms for at least 2 times can be blocked by the Central government.

What lies ahead?

- Data is new oil. It is the currency of the digital age and processing of personal data is the pivot around which today’s digital economies revolve.
- Hence proper regulation and guidelines by the Government to enhance the data security is need of the hour.

4.10 Digital India Bill

Why in news?

The act which is a successor to the Information Technology (IT) Act, 2000, will impact a host of entities on the Internet, including social media, e-commerce, and artificial intelligence-based platforms.

What is the IT Act, 2000?

- It is the primary law in India for *matters related to cybercrime and e-commerce*, giving legal sanction to e-commerce and transactions, enabling e-governance, and preventing cybercrime.
- Under the law, for any crime involving a computer or network located in India, foreign nationals can also be charged.
- The act gives legal recognition to digital signatures.

[Section 66A of the IT Act.](#)

What is the new law for the Internet?

- The IT Act needs an update since it was framed for an Internet era that looked very different from the Internet of today.
- **Objectives** – To ensure an open and safe Internet in the country, to ensure users’ rights and reduce risks for them online, accelerate the growth of technology innovation.
- The Bill is a key pillar of an overarching framework of technology regulations the Centre is building, including:
 1. Draft Digital Personal Data Protection Bill, 2022
 2. Indian Telecommunication Bill, 2022
 3. Policy for non-personal data governance

What is safe harbour?

- **Safe harbour** – As given under *Section 79 of the IT Act, 2000*, it is the *legal immunity* that online intermediaries enjoy against content posted by users on their platforms.
- **Due diligence** – This is available as long as these platforms abide by certain due diligence requirements, such as censoring content when asked by the government or courts.
- **Origin** – The concept originally came from *Section 230 of the United States’ Communications Decency Act*, which has been termed one of the foundational laws behind the modern Internet.

- **Web 2.0** – It is one of the main reasons behind the meteoric rise of Internet giants such as Facebook that have defined the Web 2.0 era where users can post content on the internet.

Why revisit the norm?

- **Complex intermediaries** – The idea behind revisiting the concept of the safe harbour is that the intermediaries have become more complex.
- Hence, there is a need to classify different types of intermediaries and form relevant regulations for each of them.
- **IT Rules of 2021** – The government has reined in the safe harbour by introducing additional due diligence requirements.
- Such requirements include, appointing India-based employees to cooperate with the government and address users' queries.

What else will the Digital India Bill deal with?

- **Cybercrimes** – The proposed law will also regulate a range of crimes include cyberbullying, doxxing, and identity theft.
- **Misinformation** – The weaponisation of misinformation under the garb of free speech will not be entertained and will be regulated under the Bill.
- **Adjudicatory mechanism** – An effective mechanism that is easily accessible, deliver timely remedies, resolve cyber disputes, and create cyber jurisprudence will also be explored under the Digital India Bill.

What is the way forward?

- Countries around the world are reconsidering their respective safe harbour norms, including in the US where the concept originated.
- Regulation of hate speech and disinformation on the Internet is a must and intermediaries, including digital news media and social media platforms, have an accountable role to play.
- Modern regulations to tackle issues related to misinformation, problematic content and the side effects of the new form of the Internet are a must.
- However, they should still retain first principles of safe harbour without whittling down their core.

4.11 India and Graphene

Why in news?

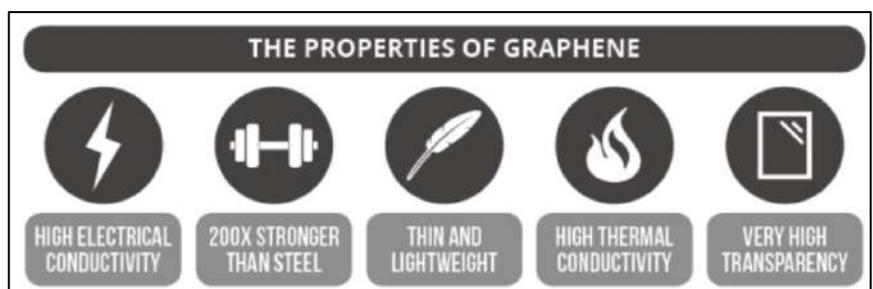
India needs to catch up in the area of graphene to be among the leaders in AI and a potential challenger in quantum computing.

Global trends towards Graphene

- Over 300 companies are producing graphene or its derivatives.
- **China & Brazil** - Global leaders in the commercial production of graphene.
- China, the U.S., the U.K., Japan, South Korea, Russia, and Singapore - Leading countries in graphene research.
- Europe has set up the *Graphene Flagship*, with a budget of 1 billion Euro in 2013.
- In 2018, China filed 218 graphene-related patent while the other leading countries together filed 79.
- India had eight graphene-related patent filings.

What is graphene?

- Graphene is an **allotrope of carbon** consisting of a single layer of atoms arranged in a hexagonal lattice nanostructure.
- Graphene was discovered in 2004 for which the scientists received the **Nobel Prize in Physics in 2010**.



- It is the *world's thinnest, strongest, and most conductive material* of both electricity and heat.
- **Properties** - It is 200 times stronger than steel but 6 times lighter.
- It is almost perfectly transparent as it absorbs only 2% of light.
- It is impermeable to gases, even those as light as hydrogen and helium.
- It has the potential to absorb and dissipate electromagnetic waves.
- It is highly sensitive to environmental changes.

What are the applications of Graphene?

- Graphene in itself has huge potential to revolutionise electricity, conductivity, energy generation, batteries, sensors and more.
- Graphene composites are used in aerospace, automotive, sports equipment and construction.
- It is used for high-performance batteries and [super-capacitors](#), touchscreens, and conductive inks.
- Graphene-based sensors are used for environmental monitoring, healthcare and wearable devices.
- Graphene oxide membranes are used for water purification and desalination.
- Graphene has an attractive potential in defence and aerospace as a promising material for armour and ballistic protection due to its exceptional strength.

How is India's progress in graphene industry?

- India produces about one-twentieth of graphene products compared to China and one-third compared to Brazil.
- Some start-ups and foreign subsidiaries have started graphene or graphene derivatives in India.
- The India Innovation Centre for Graphene in Kerala is being setup and implemented by the Digital University Kerala in partnership with Tata Steel.
- Indian companies have patented for a technology for graphene-based ultra-capacitors and developed applications of graphene-based nanotubes.

What should India do to progress in graphene industry?

- India missed the semiconductor bus in the mid-1990s, now it has to step on the graphene.
- Centre needs to become the nodal point to spur large-scale innovation activity around graphene.
- A nodal Ministry needs to be entrusted with the responsibility of '*National Graphene Mission*'.
- India needs to be among the leaders in graphene to get benefitted the most from the industry and to excel in AI and quantum computing.

USES OF GRAPHENE

TOUGH SCREENS IN DEVICES

Graphene's transparency and conductivity means that it can be used in displays and touchscreens. However, currently these are more expensive to produce than the currently used material, indium tin oxide.

WATER FILTRATION SYSTEMS

Graphene allows water to pass through it, but not other liquids and gases, so it can be used in water purification. Researchers are working on a device that could be capable of filtering salt from sea water.

IN ELECTRONIC DEVICES

Graphene has been touted as silicon's successor, and has been used to make very fast transistors. However, its conductivity cannot be 'switched off' as silicon's can. Other 2D materials seem more promising.

MEDICAL SENSORS & DRUG DELIVERY

Several biomedical applications are being explored for graphene, including drug delivery, cancer therapy, and its use as a sensor. However, its toxicity profile must be investigated before any clinical uses.

ENERGY STORAGE & COMPOSITES

Graphene-based energy storage devices are possible. It can also substitute for graphite in normal batteries, improving efficiency. Additionally, it can be added to materials to make them stronger and more lightweight.

4.12 AI in Healthcare

Why in news?

At a time of mounting healthcare challenges, Artificial intelligence (AI) is adding new capabilities to the health sector with astonishing speed.

What is Artificial intelligence (AI)?

- **Artificial intelligence (AI)** – It is when computers and other machines *mimic human cognition*, and are capable of learning, thinking, and making decisions or taking actions.
- AI in healthcare is an umbrella term to describe the application of machine learning (ML) algorithms and other cognitive technologies in medical settings.

Scenario of AI healthcare in India

- India is one of the few developing countries leading the way on AI in health.
- By 2025, India would invest 11.78 billion USD in India's AI in the primary sector, which will enhance the country's GDP by 1 trillion USD by 2035.
- As per the *Indian AI Healthcare Market 2019-2025 report*, AI in the Indian healthcare industry is estimated to grow at a CAGR of 50.9% during the forecast period.
- **Present case** - Indian start-ups are continuing to refine and prioritise increased personalised medical care by using AI tools.
- Some of the AI healthcare start-ups in India that are reshaping the industry are:
 1. **HealthifyMe** - Harnesses AI to provide personalised diet and fitness information and coaching.
 2. **Tricog** - Offer virtual cardiology services to distant clinics.
 3. **Dozee** - Contactless health monitors that enable early detection of any health deterioration.
 4. **Niramai** - Early-stage detection of breast cancer.

How AI is leveraging healthcare systems?

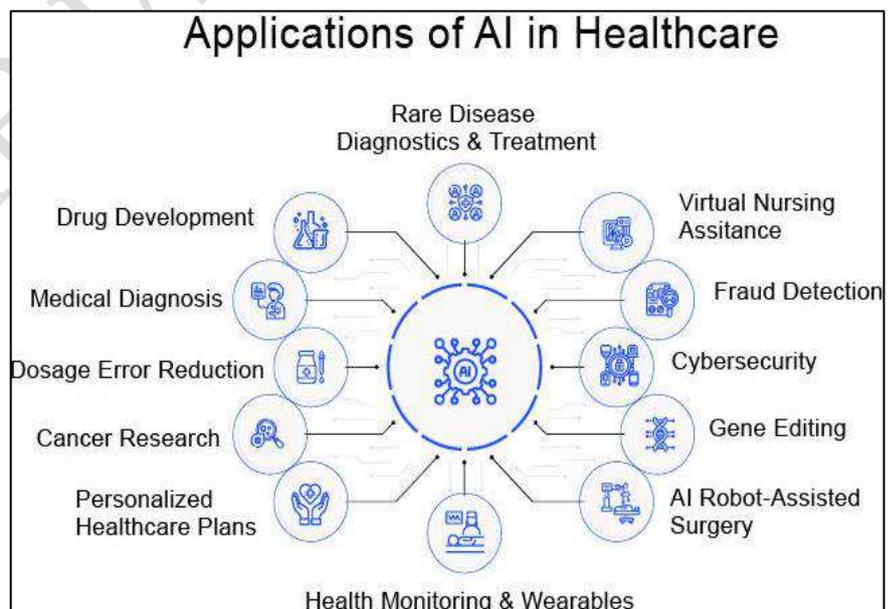
- **Diagnosis** - AI can improve diagnosis and risk stratification.
- The large and untapped potential of AI is it can diagnose a range of diseases at scale and earlier than clinicians.
- AI can suggest early interventions for those whose genetics, environment or behaviours place them at greater risk.

- **Infectious disease intelligence** - Climate change and human migration increases the risk of future occurrences of infectious disease.

- AI-driven systems can predict outbreaks and map their spread and deliver customised mitigation suggestions.

- For example, by testing wastewater, analysing web traffic and modelling mosquito movement patterns can help map the spread.

- **Clinical trial optimisation** - Clinical trials are expensive, time-consuming and under representation of underserved groups and women.



- AI can select optimal trial sites, recruit and retain participants and create more representative synthetic data.
- New therapies and treatments that work optimally across demographic groups will be faster in time to market through AI optimised clinical trials.
- **Others** - AI also offers the promise of greater transparency into the medical supply chain.
- AI tools based on deep learning offers insights about the mechanisms underlying disease.
- Identify the patient subgroups that is likely to respond to a given treatment and discover new therapeutic assets.

What are the challenges for AI in healthcare?

- There are 4 major barriers to leverage healthcare system through AI.
 1. Insufficient high-quality data.
 2. Low doctor trust of AI solutions.
 3. Over-emphasis on flashy pilots at the expense of easily scalable solutions.
 4. Inadequate technological infrastructure, especially in low- and middle-income countries.

What should be done to overcome these challenges?

- **Stakeholders** – All stakeholders should come together to ensure AI in healthcare is ethical, responsible and equitable resulting in improved outcomes for all.
- Stakeholders from across healthcare, government and beyond must ensure that algorithms are developed and work *responsibly and transparently*.
- **Data privacy** – Governments must strengthen data privacy laws regulating the use of anonymised patient data to train algorithms.
- **Data ownership** – They must also help *codify data ownership* and security policies to encourage interoperability of data across borders and corporate walls.
- Governments must incentivise *private investment* in AI and allocate funds to scale solutions that are already working elsewhere.
- **Partnerships** – The partnerships between countries must also be cultivated to ensure AI innovations accessible across borders, especially reaches low and middle income countries.

4.13 Open Network for Digital Commerce (ONDC)

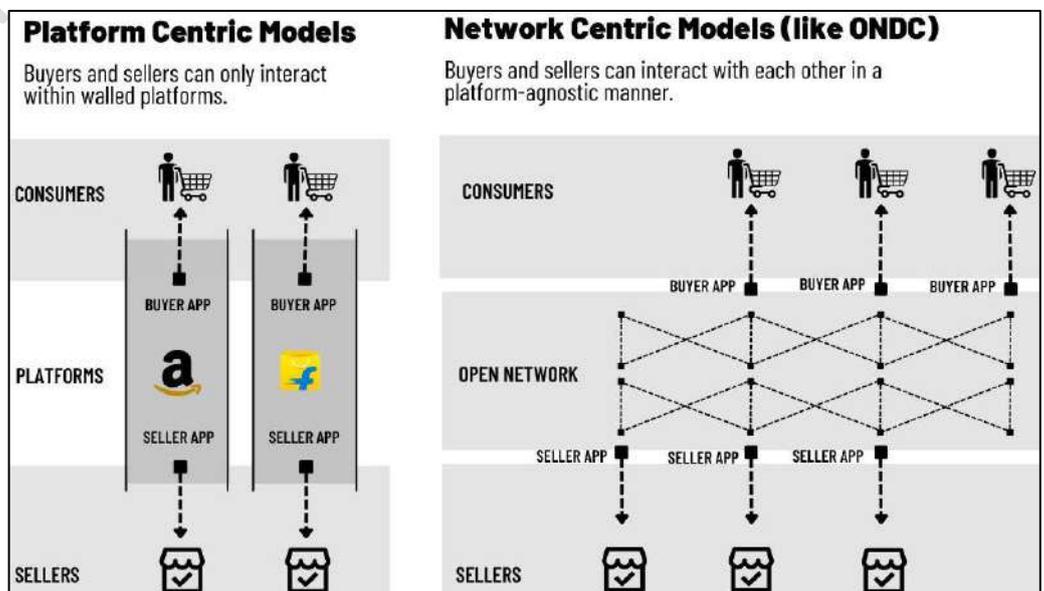
Why in news?

After the revolution of Unified Payments Interface (UPI), the Open Network for Digital Commerce (ONDC) is set to break new ground in India's digital commerce ecosystem.

What is Open Network for Digital Commerce (ONDC)?

- **ONDC** – It is a *network based on open protocol* and will enable local commerce across segments (mobility, grocery, food order, hotel booking, etc.) to be engaged by any network-enabled application.
- **Aim** - To dramatically increase e-commerce penetration in the country by enabling inclusion of all types and sizes of sellers.
- ONDC goes beyond the current platform-centric digital commerce model where the buyer and seller have to use the same platform or application to be digitally visible and do a business transaction.
- **Initiative of** - It is an initiative of **Department for Promotion of Industry and Internal Trade (DPIIT)** under the Ministry of Commerce and Industry.
- **ONDC entity** – It is a not-for-profit company incorporated under **Section 8 of the Companies Act 2013** that manages and operates the ONDC Network.

The government has set up a 9-member advisory council, including Nandan Nilekani and National Health Authority CEO R S Sharma, on measures needed to design and accelerate the adoption of ONDC.



- **Founding members** - *Quality Council of India* and *Protean eGov Technologies Limited*.
- **Funding** - Multiple investors includes private and public sector banks, depositories, development banks, and other financial institutions.

What are the key features of ONDC?

- **Backed by government** - It is backed by government to create a more open and inclusive digital commerce ecosystem in India.
- **Data storage** - Through ONDC, merchants will be able to save their data to build credit history and reach consumers.
- **Compliance** - The platform will be compliant with the Information Technology Act, 2000 and the emerging Personal Data Protection Bill.
- **Independency** - It aims at promoting open networks developed on open-sourced methodology, using open specifications and open network protocols independent of any specific platform.
- **Privacy** - ONDC shall take all measures to ensure confidentiality and privacy of data in the network.
- **Confidentiality** - It shall not mandate sharing of any transaction-level data by participants with ONDC.
- **User Council** - A User Council will be established, comprising representatives from Network Participants and civil society.
- It will provide regular guidance on various aspects of the network's functioning and governance, serving as a link between Network Participants, Consumers, and the network.

Challenges of ONDC
<ul style="list-style-type: none"> • Lack of awareness • Technical challenges • Regulatory challenges • Lack of consensus among e-commerce companies • It is still in a nascent stage

What are the advantages of ONDC?

For businesses	For consumers
<ul style="list-style-type: none"> • Level playing field – It aims to curb digital monopolies of few e-commerce platforms and create a more level playing field for businesses of all sizes. • Benefits to small businesses – It will support micro, small and medium enterprises and small traders in getting on online platforms. • Sellers - The network-centric approach of ONDC reduces the skewed bargaining power in favour of the platforms, which often results in higher entry barriers and lower margins for sellers. • Economic development – It will help to boost the Indian economy by creating new jobs and businesses. 	<ul style="list-style-type: none"> • Inclusive - ONDC will make e-Commerce more inclusive and accessible for consumers. • Freedom of choice - Consumers can discover any seller, or product by using any compatible platform. • Transparency – It require all sellers to publish their prices which will be easy for comparison. • Lower costs – It would streamline the process of buying and selling goods online, which could lead to faster delivery times and lower costs. • Preferring local business - It will enable the consumers to match demand with the nearest available supply and gives consumers the liberty to choose their preferred local businesses.

4.14 Methanol poisoning

Why in news?

Recently, around 20 people died after consuming spurious liquor in Villupuram and Chengalpattu districts of Tamil Nadu.

Beverage	Alcohol content
Beer	5% or so
Wine	12% or so
Distilled spirits	40% or so

What is the difference between liquor and spurious liquor?

- **Liquor** – It is an *alcoholic beverage made by distillation* rather than by fermentation.
- The alcohol content varies from the *5% or so (beer) to 12% or so (wine) to 40% or so (distilled spirits)* by volume.

- The alcohol used is almost always **ethanol (C₂H₅OH)**, a psychoactive drug that, in low doses, reduces the level of neurotransmission in the body, leading to intoxicating effects.
- **Spurious alcohol** – It is an illicit liquor made up by improper distillation.
- It contains methanol (CH₃OH) as well ethanol.

Liquor	Maximum permissible quantity of methanol (grams per 100 litre)
Coconut fenny	Absent
Country liquor	50
Pot-distilled spirits	300

What is methanol and how is it regulated?

- **Methanol** – It is a colorless, fairly volatile, flammable liquid with a faintly sweet pungent odor like that of ethyl alcohol.
- It is primarily used as an industrial solvent, antifreeze, alternative motor fuel and as an ingredient in paint and varnish removers
- **Regulations** - The Food Safety and Standards (Alcoholic Beverages) Regulations 2018 stipulate the maximum permissible quantity of methanol in different liquors.
- Schedule I of the Manufacture, Storage and Import of Hazardous Chemical Rules 1989 includes methanol.
- The Indian Standard IS 517 applies to how the quality of methanol is to be ascertained.
- Ministry of Chemicals and Fertilizers has notified Quality Control Order for the **mandatory certification** for methanol that shall come into force on the 3rd August, 2023.

WHO's Lists of Essential Medicines

- Essential medicines, as defined by the WHO, are the medicines that satisfy the priority health care needs of the population.
- These are the medications to which people should have access at all times in sufficient amounts and the prices should be at generally affordable levels.
- The lists are updated **every 2 years** by the **Expert Committee** on Selection and Use of Essential Medicines.
- The current versions, updated in 2021, are the 22nd Essential Medicines List (EML) and the 8th Essential Medicines List for Children (EMLc).

What is methanol poisoning?

- **Methanol poisoning** - The deadliness of spurious liquor arises from methanol due to its conversion into **formic acid**.
- The accumulation of formic acid over time leads to a baneful condition called metabolic acidosis.
- **Treatment** - There are 2 immediate ways to treat methanol poisoning.
- To administer ethanol of a pharmaceutical grade by healthcare workers & to administer an antidote called fomepizole (that is present in WHO's list of essential medicines)

4.15 Copyrights and Intellectual Property

Why in news?

The Bombay high court ruled that FM radio channels must pay royalties to composers and lyricists for the copy righted music that they use in the channel.

What is radio royalties?

- Although 'royalty' has not been defined under the Copyright Act 1957, the Income Tax Act 1961 defines royalty.
- Income tax act 1961 defines royalty as royalties are payments to the copyright owners made by the user in exchange for the right to use, broadcast, or communicate their music to the public.
- These royalties are administered by numerous copyright societies like the IPRS, the Indian Singer Rights Association (ISRA), Novex, and Phonographic Performance Limited (PPL).

To know more about [Intellectual Property Rights](#).

What is the status of copyrights protection in India?

- **Copyrights act 1957** - Governs the law pertaining to copyright in India.

Copyright is a type of intellectual property right and Authors who have original works such as works of literature dramatic, musical, and artistic works, cinematographic films, and audio recordings are all awarded copyright safeguards under Indian law.

- The original authors were not entitled to claim royalty once their original works became part of a film.
- India's first copyright law and six amendments have been made since then.
- **Indian Performing Right Society Limited (IPRS)** - A society registered under the Copyright Act 1957.
- **IPRS v Eastern India Motion Pictures** - The court held that, once the underlying original works of the authors became part of a cinematograph film, the producer enjoys the exclusive right of the said work.
- **2012 amendment of copyright act 1957** - Recognized **performers' rights** under the copyright framework.
- Performers' rights cannot be transferred or sold through an agreement.
- The 2012 amendment ensured that the rights of the original authors could not be overridden.
- The amendments also mentions that if an author's work is used for new formats he should be compensated for it.
- **WIPO Copyright Treaty (WCT)** - The 2012 amendment of copyrights act 1957 is in line with WCT.
- **Intellectual Property Appellate Board (IPAB)** - In December 2022 IPAB fixed royalties for radio broadcasts at 2% of the Net Advertisement Revenues.
- **Delhi high court** - In the case *IPRS vs Entertainment Network India Ltd (ENIL)* held that there is no need of separate license to be obtained or royalties paid to the IPRS.

Intellectual Property Appellate Board is a statutory body under Department for Promotion of Industry and Internal Trade (DIPP)

What is the recent verdict by Bombay high court?

- The Bombay high court recently pronounced the verdict of cases **IPRS vs Rajasthan Patrika Pvt. Ltd** and **IPRS vs Music Broadcast Limited**.
- The Bombay High Court has upheld the rights of IPRS to collect music royalties from FM radio broadcasters.

Quick facts	
Indian Performing Right Society Limited (IPRS)	WIPO Copyright Treaty (WCT)
<ul style="list-style-type: none"> • IPRS is a representative body of Owners of Music, viz. Composers, Lyricists (or Authors) and the Publishers of Music and is also the sole authorized body to issue licenses for usage of Musical Works & Literary Music within Indian. • IPRS legitimize use of copyrighted Music by Music users by issuing those licenses and collect Royalties from Music Users for and on behalf of IPRS members. • IPRS members include Authors, Composers and Publishers of Music. • IPRS came into existence on August 1969. 	<ul style="list-style-type: none"> • The WIPO Copyright Treaty (WCT) is a special agreement under the Berne Convention. • Berne Convention for the Protection of Literary and Artistic Works adopted in 1886. • WCT deals with two subject matters to be protected by copyright which are <ul style="list-style-type: none"> ○ Computer programs, whatever the mode or form of their expression and • Compilations of data or other material (databases).

4.16 Newborn Genome Sequencing & Pangenome Reference Map

Why in news?

Newborn genome sequencing unlocks the blueprint of health.

What is genome?

- The genome is the *entire set of DNA instructions* found in a cell.
- It contains all the information needed for an individual to develop and function.
- In humans, the genome consists of 23 pairs of chromosomes located in the cell's nucleus, as well as in the mitochondria.
- Each chromosome is a contiguous stretch of DNA string which in turn is composed of millions of individual building blocks called **nucleotides or bases**.

- The four bases include *adenine, thymine, guanine and cytosine (A, T, G and C)*.
- The genome is an identity card like Aadhaar as each our genome is unique.
- To date, humans are the *only life form* that has successfully sequenced its own genome, yet there are many life forms that have substantially larger genomes.

What is genome sequencing?

- A genome is defined as an *organism's complete set of Deoxyribose Nucleic Acid (DNA)*, including all of its genes.
- It consists of all of the approximately 3 billion base pairs of DNA that make up the entire set of chromosomes of the humans.
- Genome Sequencing is the state-of-art, robust and high throughput technique to *sequence the entire genome of an organism*.

To know about the Complete Human Genome, click [here](#)

What methods are deployed for Genome sequencing?

- **Clone-by-Clone method**- It is a traditional method that requires high density genome map and works well for larger genomes like eukaryotic genomes.
- **Whole genome shotgun sequencing**- It is the improved version of Clone-by-Clone method that doesn't require a genome map,
- It is the faster method of sequencing but not suitable for larger genomes as they have a number of repetitive DNA sequences.
- **Next-Generation Sequencing**- It is the most advanced, robust, accurate, faster, cheaper and high throughput genome sequencing technique.
- It relies on the chemistry of bridge amplification and can sequence more than 5 separate human genomes simultaneously. It is the most trusted Genome Sequencing method so far.

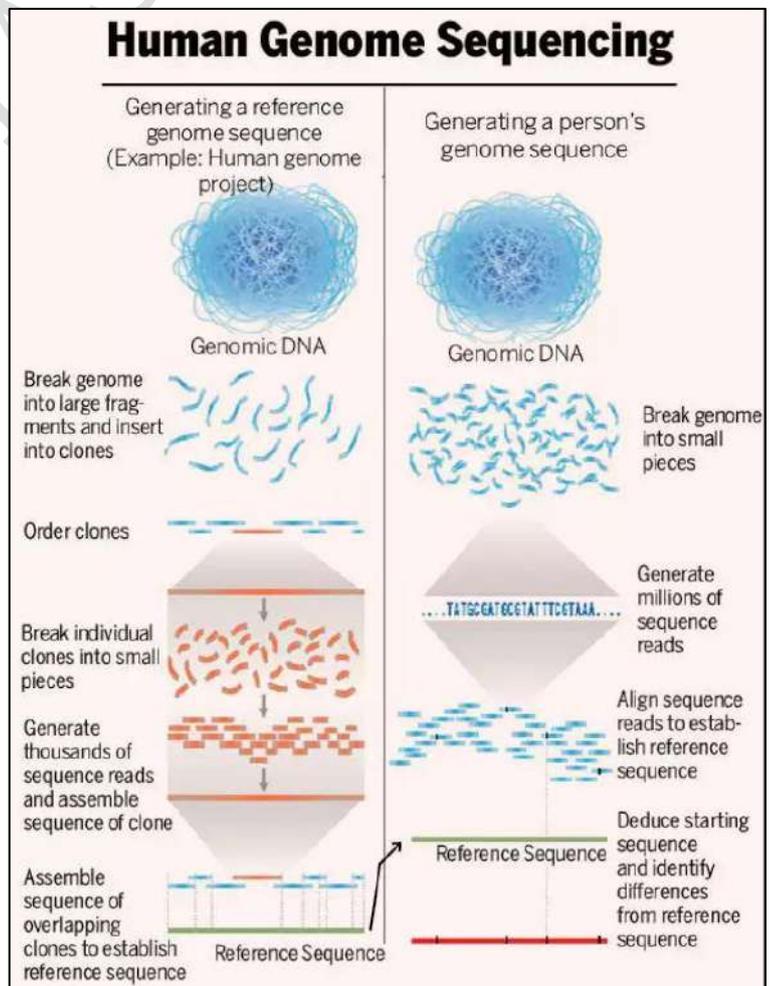
There are 6000 genetic disorder diseases of which 3500 are documented and only few of them have been properly mapped.

Why is it important to sequence new born genome?

- New born genome sequencing helps in early diagnosis of the disease that would lead to effective treatment and prevent from death/disability of child.
- The rapid diagnosis would consequently translate into a significant reduction in the cost of treatments.
- Population-scale genome-sequencing efforts have provided insights into the prevalence of many of the diseases in an unbiased manner.
 - The U.K. National Health Services has recently launched a nationwide programme to sequence 100,000 sick newborns.
- It helps in predictive diagnosis and precision medicine.
- It identifies potential causative variants for further follow-up studies for gene expression and regulating mechanism.

What are the ethical challenges?

- **Privacy** - The issue of disclosing and managing incidental and secondary findings.
- **Psychological impact** - Stereotyping and stigmatization of the participants inducted in the research.



- **Justice** - Equitable distribution of benefits and burdens associated with accessing and utilizing this technology.

- **Human Genome project**- It is an international research collaboration between 1990 and 2003 with the primary goal to
 - Decipher the entire human genetic material.
 - Sequence the whole genome at 3 billion base pair per second.
 - Improve the tool for data analysis and create a physical map of human genome.
- **Genome India project**- It is a whole genome sequencing of 10,000 individuals representing country's diverse populations.
- The vision is "Cataloguing the genetic variations in Indians" for 3 years (2020-2023).
- **IndiGen project**- The Council of Scientific & Industrial Research (CSIR) has conducted Whole Genome Sequencing of 1,008 Indians from different populations across the country.

Pangenome Reference Map

Feature	Reference Genome	Pangenome Map
Definition	A complete sequence of DNA for a particular species that acts as a reference map for newly sequenced genomes.	A collection of genomic sequences found in the entire species rather than a single individual.
Purpose	Used as a standard for comparing other genomes.	Used to study genetic diversity and identify genes associated with diseases.
Accuracy	Typically more accurate than pangenome maps.	More comprehensive than reference genomes.
Diversity	Typically based on the genomes of a small number of individuals.	Typically based on the genomes of a large number of individuals.
Applications	Gene mapping, genome sequencing, and drug discovery.	Disease research, personalized medicine, and evolutionary biology.

Importance of Pangenome Reference Map

- **Human genetic diversity** - A complete and error-free human pangenome map will help to understand the differences and explain human diversity better.
- **Genetic variation** - It will also help us understand genetic variants in some populations.
- **Health** - It will allow scientists to identify the genes and gene variants that are associated with specific diseases.
- **Personalized medicine** - Information in the map can be used to develop personalized medicine approaches that are tailored to the individual patient's genetic makeup.
- **New insights into human evolution** - Can be used to study how genetic variation has changed over time and the history of our species.

4.17 Role of Calcium-41 in Radiometric Dating

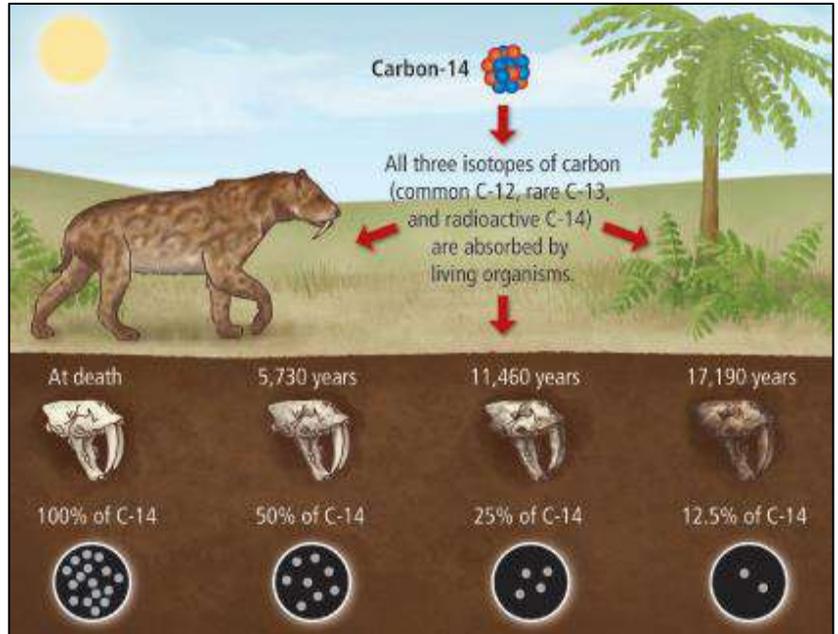
Why in news?

Recent study shows that Calcium-41 can be used the same way as Carbon-14 in carbon dating, but with several advantages.

What is radio carbon dating?

- **Carbon-14** - Radiocarbon (Carbon 14) is an isotope of the element carbon that is *unstable and weakly radioactive* [The stable isotopes are carbon 12 and carbon 13]
- It has a half-life of **5,700 years**, so it can't determine the age of objects older than around **50,000 years**.

- **Radiocarbon dating** – It is a method that provides objective age estimates for carbon-based materials that originated from *living organisms*.
- Plants and animals assimilate Carbon 14 from carbon dioxide throughout their lifetimes.
- When they die, they stop exchanging carbon with the biosphere and their carbon 14 content then starts to decrease at a rate determined by the law of radioactive decay.
- An age could be estimated by measuring the amount of carbon-14 present in the sample.
- There are 3 principal techniques used to measure carbon 14 content of any given sample.
 1. Gas proportional counting
 2. Liquid scintillation counting
 3. Accelerator mass spectrometry (Advanced method)
- The method was developed 1940s by **Willard Libby**, who received the **Nobel Prize in Chemistry** to this work in **1960**.
- The issue with carbon dating was to detect carbon-14 atoms, which occur *once in around 10^{12} carbon atoms*.



What is Calcium-41?

- Calcium-41 is a rare long-lived *radioisotope of Calcium* that has a half-life of **99,400 years**.
- Calcium-41 is called a **cosmogenic nuclide**, because it is produced when cosmic rays from space smash into calcium atoms in the soil in a fission reaction, called **spallation**.
- It is found in the earth's crust, opening the door to dating fossilized bones and rock.
- The issue is Calcium-41 is rarer, occurring once in around 10^{15} Calcium atoms.

How can the issue of detecting C-14 and CA-41 be resolved?

- **Atom Trap Trace Analysis (ATTA)** - Researchers at the University of Science and Technology of China pitched a technique called atom-trap trace analysis (ATTA) to spot these atoms.
- ATTA is both *extremely sensitive and selective*, and is based on the laser manipulation and detection of neutral atoms.
- **Procedure** - A sample is vaporised in an oven.
- The atoms in the vapour are laser-cooled and loaded into a cage made of light and magnetic fields.
- In ATTA, a laser's frequency is tuned such that it imparts the same energy as required for an electron transition in Calcium-41.
- The electrons absorb and release this energy, revealing the presence of their atoms.
- **Significance** - It can spot one calcium-41 atom in every 10^{16} calcium atoms with 12% precision in seawater.
- ATTA also avoids potassium-41 atoms, which are similar to calcium-41 atoms but lack the same electron transition.
- It can also be modified to study isotopes of some noble gases that have defied techniques developed for carbon-14, such as argon-39, krypton-81, and krypton-85.

What are the applications of ATTA and Calcium-41?

- Opens the possibility of extension to other metal isotopes
- To study how long rocks has been covered by ice
- Open avenues for exploring Earth-science applications

4.18 India's new guidelines on Genetically Modified Insects

Why in news?

In April 2023, the Department of Biotechnology (DBT) issued the 'Guidelines for Genetically Engineered (GE) Insects'.

What are Genetically Modified insects?

- A genetically modified insect is any insect whose genetic material has been altered using genetic engineering techniques. Such insects are also called Genetically Engineered insects (GE insects).
- These techniques help achieve the desired physiological traits or the production of desired biological products.
- **Control** - GE organisms or cells and hazardous microorganisms and products thereof are regulated as per '**Rules 1989**' under the *Environment (Protection) Act of 1986*.

Significance of GE insects	
Economic value	Applications
<ul style="list-style-type: none"> • Usage of GE insects uplifts the standard of living by reducing disease burden, enables food security and conserves the environment. • India's bioeconomy contributes 2.6% to the GDP. (Bioeconomy - Using of renewable biological resources from land and sea, like crops, forests, fish, animals and micro-organisms to produce food, materials and energy) • It is expected to be closer to 5% by 2030 as envisaged in the Department of Biotechnology's '<i>Bioeconomy Report 2022</i>' report. 	<ul style="list-style-type: none"> • Vector management in human and livestock health; • Management of major crop insect pests; • Maintenance and improvement of human health and the environment through a reduction in the use of chemicals; • Production of proteins for healthcare purposes; • Genetic improvement of beneficial insects like predators, parasitoids, pollinators (e.g. honey bee) or productive insects (e.g. silkworm, lac insect).

What is the guideline about?

- The Department of Biotechnology (DBT) functions under Ministry of Science and Technology (MoST) is the nodal agency and promoter of biotechnology in India.
- DBT issued the 'Guidelines for Genetically Engineered Insects'.
- The guidelines provide procedural roadmaps for those interested in creating GE insects.
- The guidelines have been harmonised to the guidance from the World Health Organisation on GE mosquitoes.

What are the issues with the guidelines?

- **Uncertainty of purpose** - The guidelines only provide regulatory procedures for R&D on insects with some beneficial applications.
- The guidelines don't specify the purposes for which GE insects may be approved in India or how the DBT envisions their use.
- **Uncertainty for researchers** - The guidelines are applicable only to research and not to confined trials or deployment. There is no criteria to approve the deployment of GE insects
- **Categorising** - The guidelines define GE insects by their risk group and not by the end product.
- **Uncertainty of ambit** - The guidelines offer standard operating procedures for GE mosquitoes, crop pests, and beneficial insects.
- There is a lack of clarity about the insects and the modifications to them that are deemed 'beneficial'.
- **Ill effects** - Genetic engineering can also be used to unintentionally generate malicious products.
- The new guidelines don't sufficiently account for more dangerous possibilities.

What could be done to improve India's bioeconomy?

- **Funding** - The ambitious leap of \$220 billion in 8 years as envisioned in 'Bioeconomy Report 2022 report' will require aggressive investment and policy support. Efforts are needed to attract private funding in R&D.
- **Robust Policy** - The policies need to be aligned to the economic goals set out in the Bioeconomy report.

- **Deployment** - GE insects can't be recalled once deployed, so wider community engagement and monitoring of the impact of GE will be required.
- **Non-consumption GE insects** - GE insects for human/animal consumption require stringent checks but GE insects used for silk or lac production and other non-consumption do not require such checks.
- **Precise Guidelines** - Clear cut definition and ambit is to be mentioned in guidelines to avoid doubts.

4.19 Mitochondrial Donation Treatment

Why in news?

An announcement was made recently that a baby was born using three persons' DNA in the UK.

What is mitochondria?

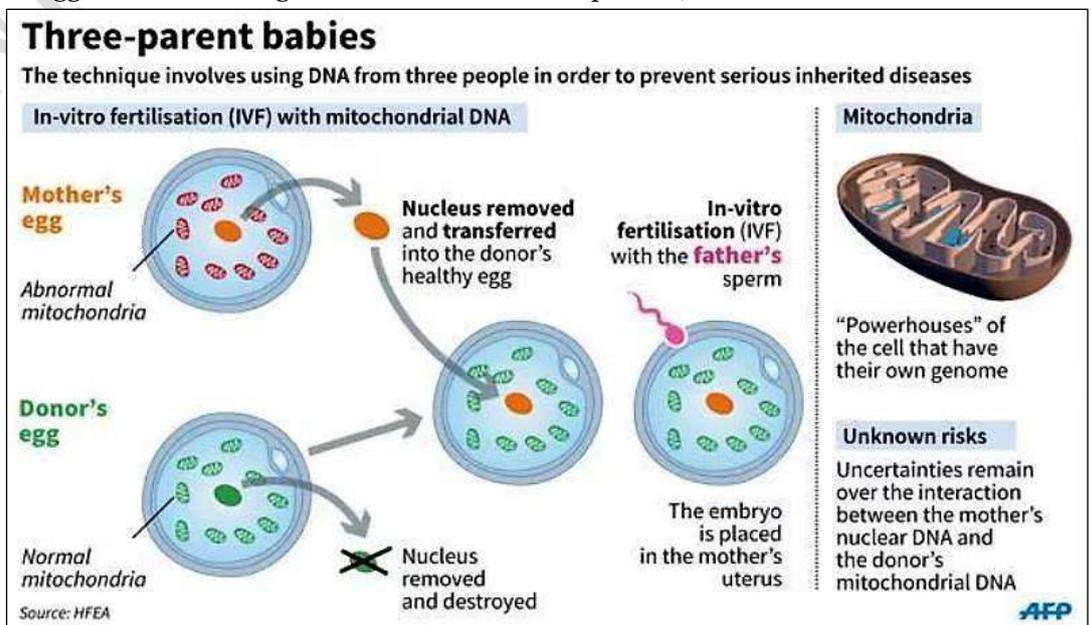
- **Mitochondria** - They are membrane-bound cell organelles that are the powerhouses of the cells as they generate the energy needed to power the cell's biochemical reactions.
- Chemical energy produced by the mitochondria is stored in a small molecule called adenosine triphosphate (ATP).
- Mitochondria contain their own small chromosomes.
- Generally, mitochondria, and mitochondrial DNA, are inherited **only from the mother**.
- **Mitochondrial diseases** - When the mitochondria are impaired and do not produce sufficient energy, it affects the functioning of organs.
- The diseases that arise out of mitochondrial mutations are called mitochondrial diseases.
- Mitochondrial diseases are **only passed on by the mother**.
- It has no cure, but can be treated.
- In order to prevent the child from inheriting the mother's mitochondrial disease, the three parent technology was used.

What is Mitochondrial Donation Treatment?

- Mitochondrial donation treatment is also known as **mitochondrial replacement therapy (MRT)**.
- **Advanced in-vitro fertilization technique** is used for mitochondrial donation treatment.
- The baby's biological father's sperm was used to fertilise the eggs from the biological mother, who has a mitochondrial disease, and a third, female donor with clear mitochondria, separately.
- Then, the nuclear genetic material from the donor's egg is removed and replaced with the genetic material from the biological parents'.
- The final product (the egg) which has the genetic material from the parents, and the mitochondria from the female donor, is implanted in the uterus.
- This baby (three-parent baby) will be **free from the mother's mitochondrial disease**.

What are the short falls of mitochondrial donation treatment?

- Sometimes it is possible that a small amount of the maternal mitochondria with errors may



get passed on during the procedure.

- So-called reversion or reversal could lead to a disease in the child.

4.20 Advanced Driver Assistance Systems (ADAS)

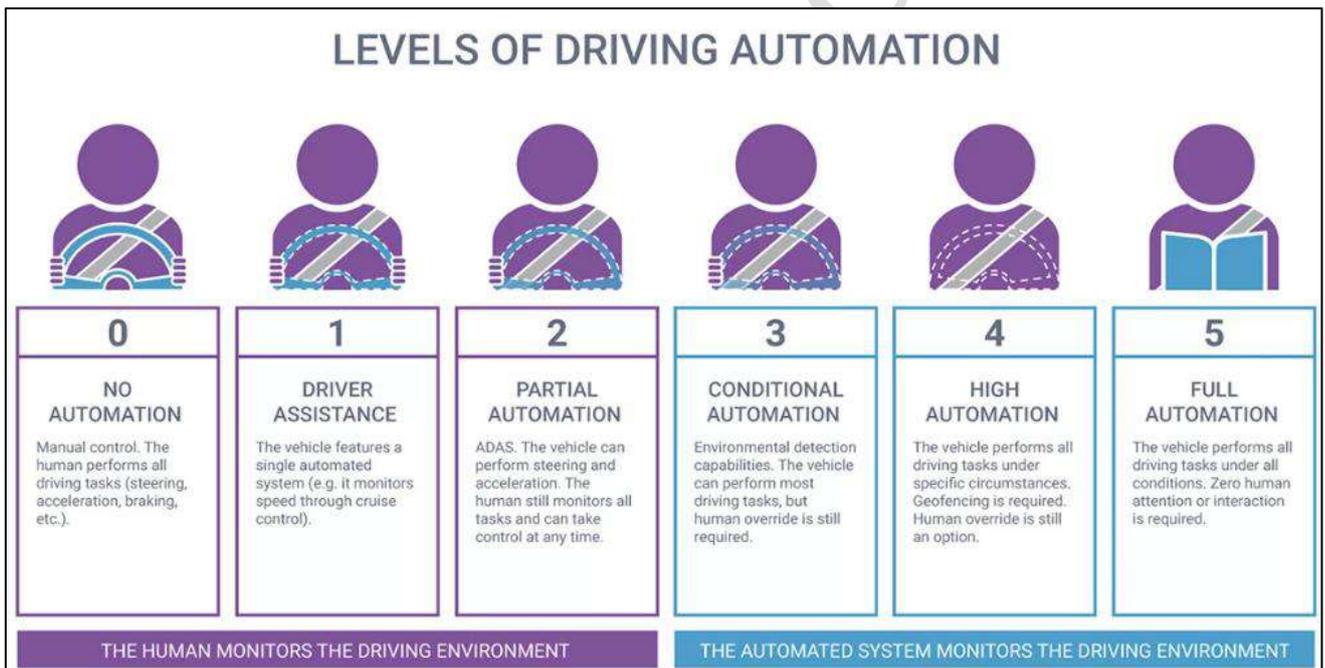
Why in news?

Car manufactures have started providing ADAS which could create a safe traffic environment resulting in reduced accidental death.

What is advanced driver assistance systems (ADAS)?

- **Electronic system** - Advanced Driver Assistance Systems (ADAS) is an electronic system of automated vehicle safety features.
- The System uses innovative sensor technology to provide information, warnings, and assistance to the driver while they are driving.
- **Prevent death** - The role of ADAS is to prevent deaths and injuries by reducing the number of car accidents and the serious impact of those that cannot be avoided in [road](#).
- **Autonomous driving** - Many of the features that are included in an ADAS system are essential for autonomous driving.

Application of ADAS	
1. Adaptive Cruise Control	5. Autonomous Valet Parking
2. Glare-Free High Beam Light	6. Navigation System
3. Adaptive Light Control	7. Night Vision
4. Automatic Parking	8. Unseen Area Monitoring



What are the challenges to self-driving cars?

- **Limited success** - The test conducted by various companies for self-driving have not yielded any success.
- **No consensus** - While few companies choose cameras for self-driving whereas few companies uses combination of technology such as include LIDAR, radar, sensors and camera.
- **Lack of government support** - Only the private companies are investing in the self-driving technologies and there is lack of support from the government.

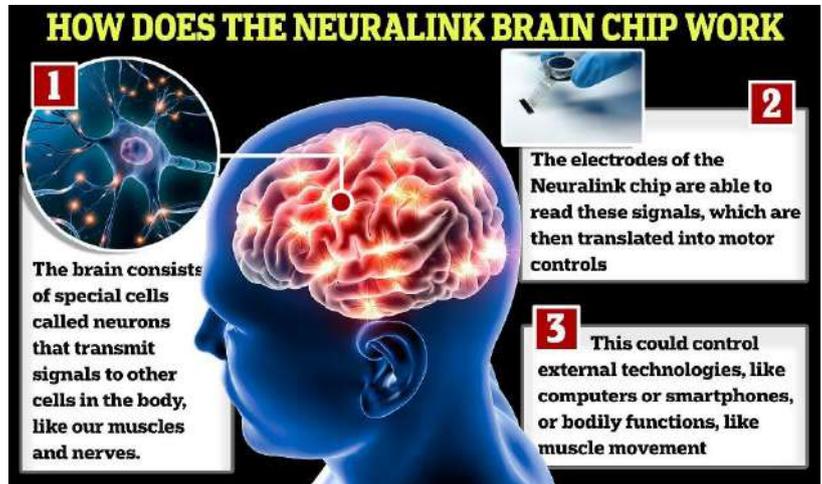
4.21 Concerns over Neuralink Chip

Why in news?

Elon Musk's company Neuralink gets the U.S. Food and Drug Administration's (FDA) approval for study of brain implants in humans.

What is Neuralink?

- **Neuralink** is brain-implant Company, co-founded by Elon Musk. It is about making a Class III medical device known as a **brain-computer interface (BCI)**.
- The device connects the brain to an external computer via a Bluetooth signal, enabling continuous communication back and forth.
- The device itself is a coin-sized unit called a Link. It is implanted within a small disk-shaped cut-out in the skull using a precision surgical robot.
- The robot splices a thousand tiny threads from the Link to certain neurons in the brain.
- Each thread is about a quarter the diameter of a human hair.



What are the benefits of Neuralink?

- If the Neuralink successfully works in humans, it would have wide range of benefits.
- The device could enable precise control of prosthetic limbs, giving amputees natural motor skills.
- It could revolutionise treatment for conditions such as Parkinson's disease, epilepsy, and spinal cord injuries.
- It can also be used in the treatment of obesity, autism, depression, schizophrenia and tinnitus.

What were the FDA's concerns over clinical human trials of Neuralink?

- Neuralink received FDA approval for its first human clinical trial in May 2023.
- The FDA had also raised a list of concerns that needed to be resolved before human trials could commence.
- **Safe surgery** - A precision robot known as Implant/r1 performs the surgical procedure to implant the Neuralink BCI.
- This robot should be reliably and safely implant and remove the Neuralink BCI without damaging surrounding brain tissue.
- **Harmful side effects** - The implanted Neuralink BCI must not unintentionally influence other brain functions and should not cause any unwanted side effects such as seizures, headaches, mood changes, or cognitive impairment.
- **Safe power supply** - Overheating lithium-ion batteries can pose great risk to BCI users.
- **Wire migration** - The Link consists of a chip with very thin wire electrodes that connect to neurons in the brain. There is a risk of wire migration over time due to natural movement, inflammation, or scar tissue formation.
- **Implant removal** - The safety and difficulty of removal of implants.
- **Data privacy** - Safeguards of the data collected against being hacked, manipulated or otherwise misused.

Class III medical device
<ul style="list-style-type: none">• The Food and Drug Administration (FDA) has established classifications for different generic types of devices which are assigned to one of 3 regulatory classes.<ul style="list-style-type: none">○ Class I - General Controls○ Class II - General Controls and Special Controls○ Class III - General Controls and Premarket Approval• It is assigned based on the level of control necessary to assure the safety and effectiveness of the device.• Class III includes those with the greatest risk like pacemakers and breast implants.• For Class III devices, a premarket approval application (PMA) is required.

What is Neuralink's reply to the FDA's concerns?

- Extensive animal studies provides evidence that its wires neither migrate over time nor cause any adverse effects in the brain.
- The company has come up with a method for tracking and adjusting the position of the wires to overcome wire migration.

- Neuralink has specially designed a battery to evaluate its performance, durability and bio-compatibility.
- Elon Musk claims that Neuralink could augment human intelligence by creating an on-demand connection with artificial intelligence systems.
 - For example, improved cognition through enhanced memory, and improved learning and problem-solving skills.

What is the way ahead?

- Neuralink with at this growth pace needs regulation.
- The cutting edge technology must not be released to the public until proven to be safe and this requires exhaustive testing.

5. INTERNAL SECURITY

5.1 The History of Insurgency in Manipur

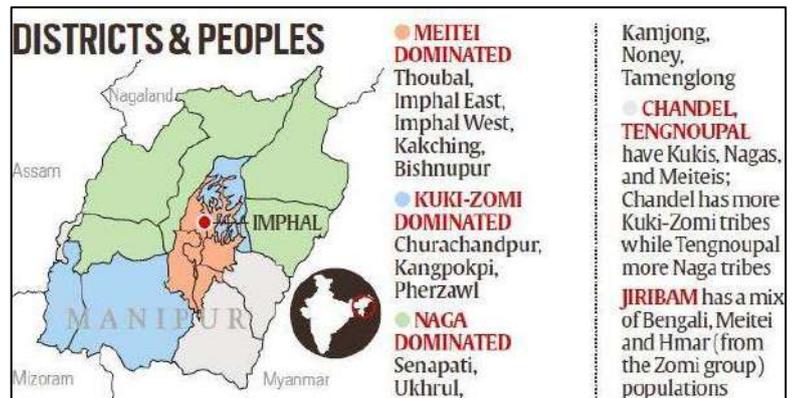
Why in news?

A battle is waged between Manipuri commandos and Kuki-Zomi insurgent groups killing many insurgents amidst rising protests and spurts of violence in Manipur.

Demographic dividend of Manipur	Communities of Manipur
<ul style="list-style-type: none"> • Manipur is bounded by Assam, Nagaland, Mizoram, and Myanmar. • Most of Manipur is surrounded by hills with a fertile saucer shaped valley in the middle. • It has 10 hill districts inhabited by various tribes. • About 40% of the state’s 28 lakh people (2011 census) live in the hills. • There are 34 recognized tribes, which are broadly classified as ‘Any Kuki Tribes’ and ‘Any Naga Tribes’. 	<ul style="list-style-type: none"> • The central valley in the state accounts for about 10% of the landmass of Manipur. • The majority <i>Meitei community</i> (Hindus) and the Meitei Pangal (Muslims) who constitute roughly 64.6% of the state’s population, live in the densely populated valley. • This is because of the power centre from a time when Meitei Kings rules the region. • The remaining 90% of the state’s geographical area comprises hills surrounding the valley, which are home to the recognized tribes, making up about 35.4% of the state’s population.

What is the history of conflict in Manipur?

- Manipur has been in the cross-currents of India’s oldest insurgent movements.
- **Naga** - The Naga movement (1950s) is the country’s longest-running insurgency which fights for the Greater Nagaland or Nagalim.
- **Kuki** - Kuki groups also have fought the Indian government for an ‘independent Kuki homeland’, spread across Manipur.
- The Kuki insurgency gained momentum after ethnic clashes with the Nagas of Manipur in the early 1990s.
- **Meitei** - The Meiteis in Manipur also opposed the merger agreement between the Manipuri king and the Indian government (1949).
- In 1964, the United National Liberation Front (UNLF), a meitei insurgent group, was formed, demanding secession from India.
- Subsequently, numerous Meitei insurgent (valley insurgent) groups like the People’s Revolutionary Party of Kangleipak (PREPAK) and the People’s Liberation Army (PLA) came into being.



Kukiland – An imagined country spreading across the Kuki-Zomi inhabited areas of India, Myanmar & Bangladesh.

What are the major ethnic conflicts in Manipur?

- **Naga-Kuki clash** - Land that the Kukis claim to be their 'homeland' in the Manipur hills overlaps with the Greater Nagaland or Nagalim.
- The NSCN-IM entered a ceasefire agreement with the Indian government only in 1997.
- **Kuki-Zomi** - In 1993, a massacre of Kukis by the NSCN-IM left thousands of Kukis homeless.
- The Kuki-Zomi tribes organised various armed groups as a reaction to this aggression of Nagas.
- **Meiteis and Meitei Pangals (Muslims)** - Similar clashes were taking place between them which led to the formation of the Islamist group People's United Liberation Front (no longer active).

What is the Kuki-Zomi movement?

- The Kuki-Zomi movement started as defence against aggression by other groups.
- It later transformed into a call for Kukiland and later diluted to simply a call for a separate state.
- The United National Liberation Front (UNLF) is considered the mother of all Meitei insurgent groups.
- Out of the valley insurgent groups, the UNLF remained the most powerful till recently.
- Few other powerful groups are the Kangleipak Communist Party (KCP) and the Kanglei Yawol Kanna Lup (KYKL).
- Over the years the power of the valley groups has waned, even UNLF is at its weakest.
- Amongst the Naga groups, the NSCN-IM remains the most prominent group.

How influential are these insurgent groups in politics?

- The insurgent groups are intricately woven into the daily life in Manipur.
- The valley groups, in particular the UNLF, have from time to time called for strikes.
- They have rules as 'moral codes' such as ban on Hindi movies and music, ban on Indian clothing, ban on alcohol and regulations on what can be shown in Meitei movies, etc.
- They also levy 'taxes' on the public.
- Cutting across party lines, candidates stand for elections with insurgent backing.
- The groups also dictate to the voters who should win and influence the voters.

What was the Government's reaction towards these clashes?

- The Indian government enacted the **Armed Forces Special Powers Act (AFSPA)** in 1958 in reaction to the Naga separatist activity in Nagaland and parts of Manipur.
- When the valley movement gained momentum, the AFSPA act was extended to the entire state.
- In the 1980s, Manipur was declared a disturbed area.
- A tripartite **Suspension of Operation (SoO) agreement** between the Centre, the state and the Kuki-Zomi groups was signed in 2008 after several peace talks.

Meiteis

- Meiteis, are the valley people present predominantly in the Imphal valley, and they are Hindus.
- Meiteis speak Meitei language which is one of the 22 schedule languages of the constitution.
- Meitei enjoyed tribal status even before September 1949 when the princely state of Manipur signed merger agreement with Indian union.
- Meiteis also get more representation in the state assembly as 40 of the total 60 assembly seats in Manipur are from the Imphal Valley region

Scheduled Tribes (STs)

- **Article 366** - Defines schedule tribe as any tribe deemed under article 342.
- **Article 342** - Provides for specification of tribes which are deemed to be for the purposes of the Constitution the Scheduled Tribes in relation to that State or Union Territory.
- **Criteria**
 - Indications of primitive traits,
 - Distinctive culture,
 - Geographical isolation,
 - Shyness of contact with the community at large, and
 - Backwardness.
- These criteria are not spelt out in the Constitution.

To know about National Commission for Scheduled Tribes [click here](#).

- With the gradual improvement of law-and-order AFSPA has been repealed in several areas.
- The Manipur government recently decided to [withdraw from the SoO agreement](#).
- The Valley Insurgent Groups which remain active never entered an agreement with the Centre or participated in any peace talks.

5.2 Increasing Maoist Activities

Why in news?

The Maoists conducted an IED attack in Jharkhand killing 10 personnel.

Why the Maoist activities in the Jharkhand are on the rise?

- The special units local police force was formed late in the state which led to the state becoming the [Maoist](#) zone.
- The absence of roads in the interiors in the interior places
- Minimal presence of the administration in the interiors in the Maoist area
- Local support from the people
- The state geographical (jungle) provides a perfect condition for Tactical Counter Offensive Campaigns (TCOCs)

What is Tactical Counter Offensive Campaigns (TCOCs)?

- It is a campaign carried out by the CPI Maoist between February and June every year.
- This period is chosen because with the onset of the monsoon in July.
- During this period the over flowing rivers cannot be crossed.
- The tall grass and shrubs everywhere reduce visibility.
- The TCOC period this year has been characterised by increasing IED attacks.
- Almost all major attacks by Maoists on security forces, including the 2010 Chintalnar massacre of 76 CRPF personnel, have taken place during TCOC period.

- Maoist violence in the country has gone down by 77% since 2010.
- The number of resultant deaths (security forces + civilians) has come down by 90 % from the all-time high of 1,005 in 2010 to 98 in 2022.
- The number of districts declared to be Naxal-affected has reduced from over 200 in the early 2000s to just 90 now.
- The presence of Naxals is said to be minimal to zero in Andhra Pradesh, Telangana, Odisha, Jharkhand, and Bihar, which were at one time their strongholds.

Measures taken so far

Security related expenditure (SRE)

- Constituted by central government to provide financial support to the states affected by left wing extremisms (LWE).

Special infrastructure scheme (SIS)

- To strengthen local police and intelligence.

Special central assistance

- To build infrastructure such as roads in LWE districts.

CRPF

- Has been consistently enlarging its footprint by opening new camps deeper in the jungles of Jharkhand.

Bastariya Battalion

- By CRPF to recruit the local people to gain the local intelligence about the Maoist.

NIA and ED

- Have been directed to track CPI (Maoist) cadres, leaders and sympathizers with the aim to choke their funding.

District Reserve Guard (DRG)

- Have been constituted to include the local police in neutralizing the Maoists.

5.3 Khalistan and the Sikh Diaspora

Why in news?

A tableau celebrating the assassination of late Prime Minister Indira Gandhi by her Sikh bodyguards went around the city of Brampton in Canada.

What is the background of the issue?

- The 39th anniversary of *Operation Bluestar*, the controversial Army action to flush out Khalistani militants from the Golden Temple in Amritsar, was observed on June 6.
- In the lead up to it, a parade was organised in Brampton, Ontario, in Canada. The tableau drew strong reactions from India, with External Affairs Minister S Jaishankar registering his disapproval.

What was the course of the movement?

- **Evolution-** The Khalistan movement is a Sikh nationalist movement that desired to create an independent state for Sikh people inside the North-Western Republic of India.
- In early 1980s, the movement had emerged as a major separatist movement that was fed on arms under the patronage of Pakistan's ISI.
- **Emergence of Bhindranwale-** Bhindranwale emerged as the extremist voice of Sikhs and declared himself as the protector and arbiter of Sikh rights.
- **Operation Blue Star-** Operation Blue Star was conducted to capture Bhindrawale in Harmandir Sahib Complex, but the operation resulted in a strong anti-India sentiment.
- **Killing of Indira Gandhi-** The then PM Indira Gandhi was seen as an enemy of the Sikhs and two Sikh guards of her killed her in 1984.
- Her killing was followed by wide-spread riots against the Sikhs across India fuelling more anti-India sentiment.
- At the present, Khalistan movement is dormant in India but gets ideological support from Sikhs living in Canada, UK, USA and ISI of Pakistan.

Operation Sundown- Aborted mission which was planned by the RAW agency to abduct Bhindranwale.

Operation Metal- It was limited to Golden Temple

Operation Shop - Capturing of suspects from outskirts of Punjab

Operation Woodrose- Carried out by Indian Army throughout Punjab

Operation Black Thunder- Second phase of Operation Blue Star that began in 1988 to remove Sikh militants from the Golden Temple.

What are the historical events responsible for Khalistan?

- **1947 Partition of India** - Independence of India was not a joyful event for Sikhs, partition left Sikhs in a lot of discontentment with regard to their traditional lands being lost to Pakistan.
- **Punjabi Suba movement** - A movement was initiated in 1955 under Akali Dal a Sikh dominated political party.
- It seeks the re-organisation of Punjab along linguist lines, seeking division of the state into Punjabi and non-Punjabi speaking areas.
- The [movement](#) resulted in trifurcation of Punjab into Punjab, Haryana and Himachal Pradesh.
- **Water sharing** - The disputes of sharing of waters of Ravi-Beas and Sutlej between the two states, Punjab and Haryana were the foundation on which the Khalistan dispute was created.

How Khalistan and Canada are connected?

- Sikhs lawmakers and officials serve at all levels of Canada's government.
- The first declaration for a separate Sikh state was made in the United States on October 12, 1971, an advertisement in The New York Times proclaimed the birth of Khalistan.
- Today, the movement finds little resonance in the Sikh population within India. However, it survives in parts of the Sikh diaspora in countries like Canada, the US, and the UK.

As per the 2021 Canadian census, Sikhs account for 2.1 % of Canada's population, and are the country's fastest growing religious group. After India, Canada is home to the largest population of Sikhs in the world.

What is the relationship between Khalistan and the Sikh diaspora?

- The support for Khalistan within the Sikh diaspora is in its lack of connection to the ground realities of Punjab.

- The diaspora comprises people who chose to leave, including those who left during the 1980s, when the movement was at its peak.
- The Indian state was extremely hard on Khalistani separatists, with a lot of extra-judicial arrests and killings.
- The memories of those times have kept the movement alive among these people, even though the ground realities of Punjab are very different today.
- There is a small minority that is clinging to the past, and that small minority remains significant not because of popular support.

What is the way forward?

- The Khalistan movement is not about popular support rather it is about geo-politics.
- Countries like China and Pakistan tolerate, subsidise and assist in various ways the Khalistan movement on the basis that it is making trouble for their enemies in India.
