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ECONOMY

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1 Global Minimum Tax Rate

Organisation for Economic Co-operation and Development (OECD) released **Pillar Two model rules** for domestic implementation of **15% global minimum tax.**

Challenges in implementing global minimum tax rate:

- **Global consensus** as small economies benefited a lot from attracting investments with low corporate tax, helping to compete against large and developed economies with better infrastructure quality, labor quality, economic and political stability etc.
- **Impact on socio-economic development** as countries use tax incentives to attract MNCs to gain FDI and generate demand with efficient utilisation of resources and create employment.
- **Consensus on tax rate** as 15% rate is lower than what working-class and middle class people typically pay in high-income countries (World Inequality Report). It is also lower than the average statutory rate that corporations face in those places.
- **Reduced ability to pursue specific policy objectives** by governments through tax incentives, such as promoting innovative activities via investment tax incentives or tax incentives for R&D.
- **Favoring rich nations** as G7 and EU will take home two-thirds of new cash that GMT will bring in, while the world's poorest countries will recover less than 3%, despite being home to more than a third of the world's population (Oxfam report).

Implications on India:

The global minimum tax rate proposal could have significant implications for India, both positive and negative.

POSITIVE SIDE	NEGATIVE SIDE
◉ **Increased Tax revenue:** A global minimum tax rate could help prevent multinational corporations from avoiding taxes in the country. ➤ This would help to increase the tax revenue of the Indian government, which could then be used for public services, infrastructure development, and other initiatives. ◉ **Attracting foreign investments**: It could also help India in attracting foreign investment, as it could make the country more attractive to companies looking to invest in a country with a stable and predictable tax regime.	◉ **Less competitive**: The proposal could make it more difficult for India to attract foreign investment if the minimum tax rate is set at a **high level**, as it could make India less competitive compared to countries with lower tax rates. ◉ **Tax erosion:** There is also a possibility that the proposal could lead to the erosion of India's tax base, as multinational corporations could choose to shift their profits to countries with lower tax rates.

A global minimum tax is a laudable attempt to make international tax arrangements fairer and work better in a digitalised and globalised world economy. However, there are major obstacles that may impede the overall implementation of the agreement.

2 Goods and Services Tax

The economies of half-a-dozen states are set to be "most severely affected" because of the termination of the **goods and services tax compensation programme**, a Reserve Bank of India report on state finances said.

Reasons why GST was considered to be a revolutionary step:

- **Elimination of cascading effect of taxes:** Under GST, the tax levy is only on the net value added at each stage of the supply chain. This has helped eliminate the cascading effect of taxes and contributed to the seamless flow of input tax credits across both goods and services.
- **Curb Tax Evasion:** Under GST, taxpayers can claim an input tax credit only on invoices uploaded by their respective suppliers. This way, the chances of claiming input tax credits on fake invoices are minimal. The introduction of e-invoicing has further reinforced this objective.

- **Increases Taxpayer Base:** Previously, each of the tax laws had a different threshold limit for registration based on turnover. As GST is a consolidated tax levied on both goods and services both, it has increased tax-registered businesses.
- **Improve logistic and distribution system:** GST minimizes transportation cycle times, improves supply chain and turnaround time, and leads to warehouse consolidation, among other benefits. With the e-way bill system under GST, the removal of interstate checkpoints is most beneficial to the sector in improving transit and destination efficiency.

Ways in which GST empowers citizens:

- **Reduction in overall tax burden:** It is expected that the tax burden on industries and trades will be reduced, which will result in an increase in consumption and a decrease in the price of goods and services. The ultimate result of this change is expected to be an increase in the production level and development of the industries.
- **No hidden taxes:** As GST is replacing all indirect taxes with one tax, there are no chances of a hidden tax within the invoice of the goods and services. For example, if a commodity costs ₹500, it means that the overall cost of the commodity is ₹500 without any hidden taxes.
- **Development of a harmonised national market for goods and services:** Harmony in tax rates, laws and procedures simplifies its compliance. The common interface of the GST portal brings synergy and efficiency to the filing of taxes. Earlier, service tax and VAT had their own returns and compliances, which was time-consuming. However, GST merges both compliances and lowers the number of returns, ultimately reducing the time spent on these compliances.
- **Higher disposable income in hand:** Disposable income is the money at hand left with the consumer after making all expenses. As GST has reduced the tax burden on the taxpayers, it will increase their disposable income.
- **Customers have a wider choice:** Earlier due to cascading effect, the customer used to have less disposable income at hand to spend on goods and services. But, the reduction in prices of goods and services, and tax burden has increased the disposable income of the consumers giving them a wide choice while purchasing goods and services.
- **Increased economic activity:** Reduction in prices of goods and services, increase in disposable income of consumers, and decrease in the price of goods and services is leading the consumers in performing economic activities.
- **More employment opportunities:** With the implementation of GST, the manufacturing of goods has become simplified, resulting in an increase in the number of manufacturers and industries. More industries will bring employment opportunities to the country, benefiting the citizens of India.

Growing mistrust on issue of GST Compensation:

- It was ensured to the states by the Centre that the state's revenue will grow increase on year by 14%, which ultimately did not happen as our economy was growing at just under 7%.
- The states were promised that the shortfall in revenues, which did not match the projected growth, would be made by the centre, which did not happen ultimately due to shortfall in revenue collection and delay in procedure and policy implementation.
- The shortfall in revenue was to be met by compensation cess which was levied on sin goods. This feature ensured that the states agreed to give up their fiscal autonomy.
- In 2019-2020 the economy did not grow at the expected rate coupled with the centre's decision to reduce GST on some goods and services from 28% to 12% accentuated the problem of revenue collection and there were difference in opinions of states as they supported policies best suited for their state.

Suggestions to overcome the issue:

Above all, the GST structure needs an overhaul for the revenue-enhancing promise to be met. The union still has an opportunity. It can at minimum do three things:

- **First,** reaffirm its commitment to cooperative, consultative principles of federalism by reforming the functioning of the GST Council. In the run-up to last week's meeting, several states made suggestions on improving the functioning of the council. A special council meeting to debate these suggestions must be called.

- **Second**, offer the compensation cess as a transfer, not a back-to-back loan with the caveat that the compensation rate will be re-negotiated.
- **Third,** be transparent about the current macro-economic scenario through an honest appraisal that revisits revenue projections and offers a set of strategic pathways for consultation with states through a special session between the Union Finance Minister and state finance ministers.

3 Role of Economic Budget for Economic Growth and Minimizing Regional Disparities

As per the finance ministry, the measures introduced in budget 2023-2024 (e.g.-increase in capex, boosting the green economy, and initiatives for strengthening the financial markets) are expected to promote job creation and spur economic growth.

Significance of government budget:

- **Economic Growth:** The budget is an avenue to ensure the country's economic growth. The government makes provisions to increase budgetary spending and promote savings. It aims to accelerate the country's economic growth. The government calibrates its budgetary policy depending on economic conditions.
- **Reduces wealth and income disparities:** The budget aids in influencing the distribution of income through subsidies and taxes. It helps to ensure that a high rate of tax is levied on the rich class, thereby reducing their disposable income. On the other hand, a lower rate of tax is charged on the lower income group to ensure they have sufficient income in hand.
- **Ensures efficient allocation of resources:** It is necessary to employ the available resources in the best interest of the country. Allocating resources optimally helps to achieve profit maximization for the government so as to foster public welfare.
- **Avoidsexcessive spending:** Planning a balanced budget helps governments to avoid excessive spending and allows them to focus funds on areas and services that require them the most. Furthermore, achieving a budget surplus can provide funds for emergencies, e.g., if the government wishes to increase spending during a recession without having to borrow.

The government budget has helped economic growth in following ways:

- **Increased investment in infrastructure:** The government has increased its spending on infrastructure which has not only created employment opportunities but has also led to increased economic activity and productivity.
- **Investment in human capital:** The government has also increased its spending on poverty alleviation, education, healthcare, and skill development, which has improved the quality of the workforce and contributed to higher productivity and economic growth.
- **Promoting entrepreneurship and innovation:** The schemes such as **Start Up India, stand up India,** etc. has led to the creation of new businesses and employment opportunities, contributing to economic growth.
- **Fostering foreign investment:** This has attracted foreign investors and contributed to the growth of various sectors of the economy.

The government budget has helped in reducing regional disparity in following ways:

- **Infrastructure:** The government has increased its spending on infrastructure development in less-developed regions, such as the Northeast, Jammu and Kashmir, and Bihar, among others.
- **Rural development:** The government has implemented several schemes, such as the Pradhan Mantri Gram Sadak Yojana, the Mahatma Gandhi National Rural Employment Guarantee Act, and the National Rural Livelihood Mission, etc. This has contributed to reducing regional disparities and improving living standards in rural areas.
- **Special category status:** The government has granted special category status to some states, such as the Northeastern states, Jammu and Kashmir, and Himachal Pradesh, among others. This has led to increased investment in these regions, contributing to their development and reducing regional disparities.
- **Incentives for industry:** The government has provided incentives and subsidies to promote industry in less-developed regions, such as tax breaks, lower interest rates, and land acquisition assistance, among others.

4 Carbon Tax

The European Union (EU) has formally notified the implementation of Carbon Border Adjustment Mechanism (CBAM) at the WTO members of the committee on trade and environment.

Impact

- CBAM or carbon tax is seen as a protectionist move made by Europe and is feared to impact $8 billion worth of Indian exports, especially steel and aluminum sector.
- The law could raise trade tensions between India and the EU.

Why the burden would be more on developing countries (like India)?

China, the **world's biggest greenhouse gas emitter**, has **opposed the CBAM** as a trade barrier, while it is also planning to develop its own emissions trading market.

- **Expensive affair for developing nations:** CBT will depend on the **carbon price** paid in the home country and the **production process**. Since most developed country industries would pay **high carbon prices** in their home countries, the tax rate will be zero or low.
- **Trade diversion:** CBT will create **FTA-like trade diversion effect**. Even though a product from India may be cheaper than an American product, tax plus product price will make Indian products more expensive. This will lead to the EU firms sourcing more from developed countries.

5 Direct Benefit Transfer

India saved over **$27 bn** in key central government schemes through Direct Benefit Transfers (DBT).

Background:

Government of India launched the **Direct Benefit Transfer (DBT) Program** on **1st Jan 2013** to directly transfer the benefits to the under-privileged population covered under 34 central schemes. With DBT program, GoI aims to make payments directly into the **Aadhaar linked bank accounts** of the end beneficiaries, removing any malpractices from the existing system such as diversions and duplicate payments.

What is Direct Benefit Transfer (DBT)?

Aim:

The primary aim of this Direct Benefit Transfer program is to bring **transparency and terminate pilferage** from distribution of funds sponsored by Central Government of India.

Is Adhaar mandatory?

Since Aadhaar provides unique identity and is useful in targeting the intended beneficiaries, it is preferred, and beneficiaries are encouraged but adhaar is not mandatory for DBT Schemes.

Implementation:

- DBT Mission was created in the **Planning Commission** to act as the nodal point for the implementation of the DBT programmes.
- The Mission was transferred to the Department of Expenditure in July, 2013 and continue to function till 2015.
- To give more impetus, DBT Mission and matters related thereto has been placed in Cabinet Secretariat under Secretary (Co-ordination & PG).

Key Enablers for DBT:

- **JAM Trinity:** DBT by leveraging the JAM (Jan Dhan, Aadhaar and Mobiles) trinity and the technological prowess offers to drastically improve the benefit delivery system in the country. The JAM Trinity will enable this novel system to transfer benefits in a leakage-proof, well targeted, cashless and timely manner.
- **Business Correspondents (BC) Infrastructure:** Reserve Bank of India introduced Business Correspondents / Banking Correspondents (BC) as an alternative to brick and mortar banks for infrastructure. Business Correspondents/ Bank Mitras will have a vital role in operationalising the

programme and ensuring the last mile connectivity. The strong presence of BCs will ensure that payments are disbursed to the beneficiaries on time, at their doorstep and of full value.

- **Payments Bank:** The main objective of payments bank is to widen the spread of payment and financial services to small business, low-income households, migrant labour workforce, etc. in secured technology-driven environment across the country. In 2015, the Reserve Bank of India gave in-principle licences to eleven entities to launch payments banks. With payments banks, RBI seeks to increase the penetration level of financial services in the remote areas of the country.
- **Mobile money:** Mobile money is a fast moving way of payment in the country and could be helpful in providing solution to last mile issue for better accessibility of DBT. There is a need to develop a comprehensive eco-system for carrying out cashless transactions over mobile platform using Aadhaar as identifiers.

Significance of DBT:

- **Increases the transparency:** With DBT in place, the intended amount for the welfare scheme and its movement can be tracked to and forth thereby providing more transparency and ensuring accountability.
- **Addresses Corruption:** DBT helps in reducing the interactions between the beneficiary and officials, thereby reducing the possibility of bribe and corruption.
- **Financial inclusion:** The DBT comes with the pre-requisite of a preferably Aadhaar linked Savings account and this brings the beneficiary into formal economy and introduces him/her to the banking system, pushing the marginalized towards financial inclusion.
- **Targeted beneficiaries:** By using DBT the intended benefit is directly transferred to the accounts of the beneficiaries, cutting down the middle administrative layers that were delaying the process of transfer earlier.
- **Reduces the ghost beneficiaries:** The Aadhaar integrated transfer mechanism with biometric authentication helps to remove the ghost beneficiaries existing in the system, as multiple or fake entries can easily be mapped.

Challenges in DBT:

- **Digital literacy:** The digital literacy of the people in rural areas is comparatively poor and they might be even unaware of the benefits that they are eligible to receive and are left out from receiving the benefits that are designed for them.
- **More choices:** By providing the beneficiary with cash, the intended money may be used in unproductive areas like liquor, gambling etc. thereby derailing the purpose of welfare.
- **Lack of infrastructure:** There exists many regions in the country, which are yet to be brought under the regular banking system like bank branches and ATM's and it is difficult to process DBT for those areas.
- **Profiteering by Banks:** Many banks have levied a fee for transactions in the Jan Dhan Accounts, over a prescribed limit, thereby discouraging the poor beneficiaries from using the banking system.

Routing DBT:

Central Plan Scheme Monitoring System (CPSMS), being implemented by the **Office of Controller General of Accounts** will act as the common platform for routing DBT. CPSMS can be used for the preparation of beneficiary list, digitally signing the same and processing of payments in the bank accounts of the beneficiary using the Aadhaar Payment Bridge of **NPCI (National Payments Corporation of India).**

Other than cash and kind transfers, the **Direct Benefits Transfer scheme** also transfers funds and subsidies to several non -governmental functionaries that help implement government policies until the very end. This includes community workers, NGOs, teachers in aided schools, etc. They are not beneficiaries but are given training, wages, and incentives to serve the beneficiaries.

6 Stagnated Municipal Expenditure

RBI released a report on municipal finances. The report highlights the inadequacy of own revenues of Municipal Corporations and their increasing dependence on grants & transfers.

Issue of stagnated municipal expenditure in India and challenges associated with it:

- **Inadequate Collection efficiencies:** Collection efficiency of property tax, the single largestsource of revenues for ULBs, ranged from 32% to 72% for the five states (**Karnataka, Madhya Pradesh, West Bengal, Himachal Pradesh, and Jharkhand**).
- **Borrowings account only for a minute share of GDP:** Gross municipal borrowings account for only less than 0.05% of GDP for all municipal corporations. It was around 6% of the total receipts of municipal corporations at the national level.
- **Weak fiscal capacity:** Municipalities in India have limited fiscal capacity, as they depend heavily on transfers from state and central governments. This can lead to a lack of resources and a limited ability to invest in infrastructure and services.
- **Limited revenue sources:** Municipalities in India have limited revenue sources, with property taxes being the primary source of revenue. The low tax base and inadequate tax collection mechanisms can limit their ability to generate revenue and invest in infrastructure.
- **Inefficient expenditure management:** Municipalities in India often face challenges in managing their expenditures effectively. This can include issues such as corruption, inefficiencies, and low levels of accountability.
- **Political factors:** Municipalities in India are often subject to political pressures, which can influence their expenditures. This can lead to a focus on short-term projects rather than long-term infrastructure development.
- **Pending Accounting and audit:** As per CAG audit reports, for 2,779 ULBs across thirteen states, approximately 4,400 audits were pending in respect of their annual accounts, for years ranging from 2008-09 to 2015-16.
- **Total revenues of ULBs in India to India GDP:** Aggregate revenues of all ULBs in India put together are estimated at less than INR 150,000 cr. This amounts to less than 1 % of GDP compared to greater than 6% in Brazil and South Africa. Consequently, both revenue- wise and expenditure-wise, ULBs are not significant enough as institutions of local self- government.

Suggestive Measures:

- **Fiscal decentralization:** State governments need to devolve more own revenue streams to ULBs and give them greater powers over such revenue streams. SFCs need to be overhauled into credible institutions, and state governments need to be held accountable for timely consideration and response to ATRs.
- **Revenue optimization:** ULBs need to optimise own revenue streams devolved to them by reviewing and reforming the five stages of the property tax lifecycle namely valuation, assessment, billing, collection and reporting. Particular attention needs to be paid to completeness of assessment and billing, and maximising collection efficiency.
- **Fiscal responsibility and budget management:** There is a need for a **FRBM framework for ULBs** that focuses on realistic budget estimates, timely, credible and standardized audited annual accounts, uniform accounting standards and prudent financial accounting principles, medium-term fiscal plans, performance reporting and citizen participation in budgeting and financial management.
- **Institutional capacities:** State governments need to build capacities of ULBs in two particular areas.
  - **First,** they need to estimate and then provide access to adequate number of skilled staff in revenue and accounts departments.
  - **Second**, integrated information systems that handle end to-end transaction processing and reporting need to be implemented.
- **Special purpose vehicle:** MCs can choose to finance through **special purpose vehicles (SPVs)** and State-pooled finance entities**.**
- **For example**, China's **Local Government Financing Vehicle (LGFV)** is an investment company that sells bonds in the bond markets for financing real estate development and other local infrastructure projects.

7 Impact of Freebies on Indian States Fiscal Health

Experts flag risk to economy if freebies are roled out without any checks.

Indian states' fiscal health:

- **High Fiscal Deficit:** Many Indian states are struggling with high fiscal deficits, which means that their expenditure is much higher than their revenue. High fiscal deficits can lead to a state's indebtedness, which can negatively affect its credit rating, making it more challenging to borrow in the future. The State Bank of India (SBI) in its recent analysis has said that the finances of 18 major states demonstrated that the average fiscal deficit as of gross state gross domestic product (GSDP) is around 3.6 per cent of gross domestic product (GDP) for FY23.
- **Low Tax Revenue:** The tax revenue of Indian states is relatively low, primarily due to the low tax base and evasion. The low tax revenue limits the states; ability to fund essential social and economic development projects, leading to inadequate infrastructure and public services.
- **High Debt Burden:** Many Indian states have a high debt burden due to excessive borrowing. This can lead to higher interest payments and can negatively impact the state's finances in the long run. Five states, namely, Bihar, Kerala, Punjab, Rajasthan, and West Bengal, figure among the most stressed states fiscally, as per a Reserve Bank of India.
- **Poor Expenditure Management:** Poor expenditure management is another challenge faced by many Indian states. Expenditure on non-essential items like freebies, subsidies, and other such measures is often high, leading to a strain on the state's finances. Additionally, inefficient management of government projects can result in cost overruns and delays. Andhra Pradesh, Madhya Pradesh and Punjab incur a very high subsidy bill by doling out freebies that go over and above 10% of their total revenue receipts.

Impact of freebies on fiscal health of states:

- **Financial burden on states:** People pay taxes to the government to improve infrastructure, health care, public facilities, development, and the country's growth. However, taxpayer funds are used for freebies during elections. It discourages the honest taxpayer whose money is used to pay for the freebie.
  - **For instance**: Punjab State Government has been in debt since a long time, at present accounting to Rs 3 lakh crores with GSNP of 2021-22 standing at approx.
- **High revenue deficit:** States have fewer sources of income and a greater need for grants from centers to meet their basic needs. With the uncontrolled rolling out of freebies the states revenue deficit have been increasing.
  - **For example:** Andhra Pradesh, Madhya Pradesh and Punjab incur a very high subsidy bill by doling out freebies that go over and above 10% of their total revenue receipts. The three states give away freebies worth 14.15, 10.85 and 17.8%of their revenue income.
- **Freebies come under revenue expenditure:** As the Fiscal Responsibility and Budget Management (FRBM) Act requires states to eliminate revenue deficit; states have limited resources to spend on revenue expenditure, whereby those available for freebies will be restricted.
- **No capital formation:** Because there is no capital formation or future returns from freebies to the government, they put pressure on the government's budget. The burden of interest payments will increase as the deficit grows.
- **Inflation:** The distribution of free goods causes economic inflation because freebies include free power, water, and other types of consumer goods and these are utilized by the people without paying which in turn disturbs the demand and supply curve thus undermining the fiscal condition of the state by causing an artificial ecosystem of demanded products or commodities.

CHAPTER

2

Money, Banking & Financial Sector

Topic of This Chapter

1	Banking System Liquidity Deficit
2	Financial Support to Digital Payments
3	Bad Banks
4	UPI in Finance
5	New Monetary Policy Tools in Banking
6	Sovereign Green Bonds
7	Stock Manipulation, Accounting Fraud and Corporate Governance

1 Banking System Liquidity Deficit

For the first time since May 2019, the banking system liquidity situation turned into a deficit mode of Rs 21,873.4 crore in September 2022.

Reasons behind recent liquidity deficit in the banking system:

- **Demand for capital by Fintechs:** There has been a demand for capital by the Fintechs amid the festivities as the pressure has been mounting for the businesses to stock the latest trends and boost their inventory to handle the spike in consumer demand.
- **Advance tax payments:** Surplus liquidity in the banking system, as measured by absorption of excess funds by the RBI, fell sharply due to outflows on account of advance tax payments which a quarterly phenomenon is creating liquidity deficit that also increases the call money rate temporarily above the repo rate.
- **Failure to arrest rupee depreciation:** continuous attempts and interventions by RBI in the market to arrest fall of rupee against US dollar has also contributed to the liquidity crunch.
- **Slowdown in deposits:** One of the primary reasons behind the liquidity deficit is the slowdown in deposit growth. Due to the pandemic and the economic slowdown, customers are hesitant to invest in banks, which have led to a decrease in deposits. This has resulted in a decrease in the availability of funds for banks to lend.
- **Reserve Bank of India (RBI) policies:** The RBI's policies also play a role in the liquidity deficit. The central bank has been maintaining a tight monetary policy to control inflation, which has resulted in a decrease in liquidity. Additionally, the RBI's decision to increase the Cash Reserve Ratio (CRR) and Statutory Liquidity Ratio (SLR) has also contributed to the liquidity deficit.

Effects of liquidity deficit:

- **Increase in borrowing costs:** Due to the liquidity deficit, banks have increased their borrowing costs, making loans more expensive for customers. This has resulted in higher interest rates on loans, making it more difficult for customers to access credit.
- **Delay in loan disbursement:** Due to the lack of liquidity, banks have been unable to disburse loans on time, resulting in delays for customers. This has led to frustration among customers who are in urgent need of credit.
- **Decrease in deposit rates:** Banks have decreased deposit rates to attract deposits and increase liquidity. This has resulted in lower returns for customers on their savings and investments.
- Banks will increase **their repo-linked lending rates and the marginal cost of funds- based lending rate (MCLR),** to which all loans are linked to. This rise will result in higher interest rates for consumers while reducing their borrowing capacity impacting the demand in the market.
- **T-bill rates rise:** since RBI stepped on to the path of rate hike cycle **Treasury Bill (T-Bill) rates** have started inching up. Thus, the borrowing cost for short-term papers is expected to increase at a faster pace compared to longer tenor securities.

2 Financial Support to Digital Payments

Government of India is committed to expand digital transactions in the Indian economy, and thereby enhance the quality and strength of the financial sector, as well as ease of living for citizens. The Union Cabinet recently approved the incentive scheme for promotion of **RuPay Debit Cards** and low-value **BHIM-UPI transactions (person-to-merchant)** for a period of one year from April 2022.

About the initiative:

- **Total financial outlay:** Rs 2,600 crore.
- Under the said scheme, acquiring banks will be provided financial incentive, for promoting **Point-of-Sale (PoS)** and e-commerce transactions using **RuPay Debit Cards** and low-value BHIM-UPI transactions (P2M) for the current financial year FY 2022-23.
- This regime has led to complaints from the Reserve Bank of India (RBI) and banks, which have been worried about the sustainability of building digital payments infrastructure in the absence of payments needed to scale and maintain them.

- The scheme will also promote **UPI Lite** and **UPI 123PAY** as economical and user-friendly digital payments solutions and enable further deepening of digital payments in the country.
- This incentive scheme will facilitate building of a robust digital payment ecosystem and promoting RuPay Debit Card and BHIM-UPI digital transactions.

Significance of the scheme:

- **Enhanced financial inclusion:** Digital payments offer anytime, anywhere access to accounts, thus making it easy for citizens to receive payments in their accounts and to also make payments using their phone.
- **Increased transparency in government system:** Earlier cash payments were subject to "leakage" (payments that do not reach the recipient in full) and "ghost" (fake) recipients. Now, benefits are directly transferred to target beneficiary (direct benefit transfer) account through digital modes of payments.
- **Instant and convenient mode of payment:** Unlike cash, money can be instantaneously transferred to the beneficiary account using digital modes like BHIM-UPI and IMPS.
- **Safe and secure:** Digital payments across India are secure as multiple levels of authentication are required for making transactions.
- **Enhanced Credit Access:** Unlike cash payments, digital payments automatically establish a user's financial footprint, thereby increasing access to formal financial services, including credit.

Challenges in digital payment systems in India:

- **Reach of Digital Penetration to end mile of customers: -** While digital payments have reached a long way, Cash is the king model, still being followed by various merchants and customers. The sudden adoption is yet to be elevated and encouraged in various tier 2 & 3 cities to still enable a larger population of users to be digitally savvy.
- **Prone of fraudulent transactions & cyber-attacks: -** Digital applications are prone to cyber-attacks.
- **Rise of Transactional failures on Digital Payments: -** Bank's still run-on legacy technology. This then allows transactions which keep growing to hit a break point, post which it falls as transactional failures hits due to the large number of volumes.
- **Identity frauds and verification: -** While India hosts the largest penetration of smart phone users, it also invites a lot of users to identity duplication for various financial benefits sorted and digital payments. This provides a lot of hassle in identifying the verified users from the raw data set and in larger adoption onto whether digital payments could be a boon or bane.

How digital payments are beneficial for the economy?

- **Increased efficiency:** As digital payments lead to enhanced efficiency and speed of transactions, there is an induced cost saving that helps businesses utilize the amount saved in some other areas where it may provide great results.
- **Reduced cost:** Digital payments lower the cost and increase the security of sending, paying and receiving money.
- **Easy:** They are convenient and easy to use.
- **Accountability and transparency:** Because the payment information is recorded, digital transactions offer improved accountability and transparency. Moreover, an additional tracking availability adds to the security. Hence, overall it helps reduce corruption and theft as a result.
- **Financial inclusion:** It helps in financial inclusion and offers advanced access to a range of financial services.

3 Bad Banks

In its first year of operations, the National Asset Reconstruction Co. Ltd (NARCL) posted a loss of ₹5.9 crore, earning some interest from bank deposits and without any bad loans to manage.

Need for a Bad Bank:

- The risk of a loan converting into a **non-performing asset (NPA), impacting the financial credibility of the banks.**

- The overwhelming chunk of the NPAs is lying mostly with the public sector banks, owned by the government and hence by the public. To keep these banks running the government is sometimes forced to recapitalize them, using the taxpayer's money so that the bank can continue with the lending and funding economic activities.
- To set free the banks from these stressed assets or NPAs, the need for the creation of bad banks aroused. An entity where the stressed assets can be parked. Now the commercial banks can resume their usual business operation, especially lending and the bad bank would try to sell these assets in the market.

NPAs that banks have:

- The total bad loans in the Indian Banking system amount to Rs 8.35 lakh crore in March 2021.
- According to the World Bank data, the share of NPA to gross loans in Indian banking is significantly higher compared to developed western economies
- According to the financial stability report issued by RBI, the (CRAR) of SCBs increased from 14.7 percent in March 2020 to 16 percent in March 2021.

Concerns involved:

- Transferring of stressed asset from one government entity to another, making no economic and financial change on government's fiscal burden.
- Increased burden on government's exchequer and taxpayers' money.
- Opens up a new topic for discussion "a new form of socialism for the capitalists", where the burden of the bad investments and business decisions of the borrower is transferred to the taxpayers.

Benefits:

- Consolidation of debts, single-point decision making in Insolvency and Bankruptcy Code (IBC) 2016.
- Incentivise quicker action and resolution, and a better value realisation of the bad assets.
- Market expertise can be engaged for value enhancement.
- Banks will be able to focus on increasing business and credit growth.
- The government of India will enhance the liquidity of the Security Receipts (SRs) as it is being backed by them, also the SRs are tradable.

4 UPI in Finance

Unified Payments Interface (UPI) has supercharged India's transition to non-cash payments by facilitating direct payments linked to a bank account. UPI has been a revolution for the entire economy in large part due to its rapid adoption.

How UPI is helping?

- UPI has accelerated the adoption of digital payments, and made making peer-to-peer payments easier for use cases such as bill splitting and money transfers.
- UPI has also served to become a central platform that is enabling several other associated financial services such as expense tracking, budgeting, saving, and investing.
- UPI has also increased financial awareness by offering access to various financial services and investments, making millennials and GenZs more knowledgeable about their options.
- UPI has opened up many opportunities for startups and ecommerce players to develop innovative solutions that elevate the customer experience: **Economic Survey 2022-23**

India's UPI system going global

- Bhutan and Nepal became the first to deploy India's UPI-QR code and UPI in their countries, respectively.
- Malaysia's Merchantrade Asia allowed sending remittances to India through UPI.
- India and Singapore has announced to link their payment apps, namely UPI and PayNow which will allow instantaneous and low-cost money transfers between the two countries.The tie-up will benefit the Indian economy on three major grounds:
  - Helping India becoming more integral to globalised economy

- ➤ Supporting the fintech ecosystem
- ➤ Better foreign remittance, and many more

5 New Monetary Policy Tools in Banking

Monetary policy is the bedrock of any nation's economic policy, and everyone from part-time workers to huge financial institutions, both foreign and domestic, are impacted as it shifts.

What is monetary policy?

- ⦿ RBI's monetary policy is a collection of financial tools and measures to safeguard and promote economic growth.
- ⦿ According to the RBI, it conducts monetary policy with the "primary objective of maintaining price stability while keeping in mind the objective of growth."
- ⦿ Monetary policy reviews are among the most effective tools of the central bank of any country to achieve financial stability and economic growth. Monetary policies basically control the overall supply of money available to commercial banks and, indirectly, to individual users and companies.

Objectives of Monetary Policy

- ⦿ To promote saving and investment
- ⦿ To control imports and exports
- ⦿ To manage business cycles
- ⦿ To regulate aggregate demand
- ⦿ To generate employment
- ⦿ To help with the development of infrastructure
- ⦿ To manage and develop the banking sector

Monetary Policy Tools

- ⦿ **Repo Rate:** Repo rate is an interest rate at which the Reserve Bank provides liquidity to commercial banks against the collateral of government and other approved securities.
- ⦿ **Reverse Repo Rate:** The interest rate at which the Reserve Bank absorbs liquidity from commercial banks against the collateral of government securities.
- ⦿ **Variable reverse repo:**The rate at which the RBI issues loans to commercial banks when there is a shortage of funds is the repo rate. It helps to control inflation. The reverse repo is the variable or fixed interest rate banks lend to the RBI.
- ⦿ **Standing Deposit Facility:**A Standing Deposit Facility is an overnight deposit facility that allows banks to park excess liquidity (money) and earn interest. This is much more efficient than the Reverse Repo arrangement where G- secs had to be sold-and-repurchased to absorb liquidity and pay interest. No sale-repurchases.
- ⦿ **Bank Rate:** The rate at which the Reserve Bank agrees to purchase or rediscount bills of exchange or other commercial papers. The Bank Rate acts as the penal rate charged on banks for shortfalls in meeting their reserve requirements such as cash reserve ratio and statutory liquidity ratio. Bank rate is closely linked with the **marginal standing facility (MSF) rate**, thus changes as and when the MSF rate changes.
- ⦿ **Marginal Standing Facility (MSF) Rate:** The rate at which commercial banks borrow on an overnight basis, from the Reserve Bank of India.
- ⦿ **Liquidity Adjustment Facility (LAF):** This rate refers to the Reserve Bank's operations through which it injects or sucks liquidity into or from the banking system. Apart from LAF, other instruments of liquidity management are **open market operations (OMOs)**, forex swaps and **market stabilization scheme (MSS).**
- ⦿ **Cash Reserve Ratio (CRR):**CRR refers to that percentage of the bank's total deposits which it needs to maintain as liquid cash. This is a mandatory RBI requirement where the cash reserve is kept with the RBI. A bank cannot not earn interest on this liquid cash as it is maintained with the RBI and also cannot use this deposit for investing and lending purposes.
- ⦿ **Statutory Liquidity Ratio (SLR):** SLR is an obligatory reserve that all the commercial banks in India are required to maintain by themselves in the form of liquid cash, gold or other securities. This is the minimum requirement that banks are expected to keep before offering credit to customers.
- ⦿ **Open Market Operations (OMOs):** OMOs refers to the outright purchase and sale of government **securities, bond or Treasury Bills (T-Bills)** by the

Reserve Bank either for injection or for absorption of liquidity in the banking system.

6 Sovereign Green Bonds

India debuts in green bond market.

About green Bonds:

- A green bond is a **debt security** that is issued to raise money for initiatives that are relevant to the environment or the climate.
- Governments offer sovereign green bonds to raise money for these kinds of initiatives.
- The Government of India joined the **Sovereign Green Bonds Club on 25 January 2023** when the Ministry of Finance priced an INR 80 billion, for expenditures in grid scale solar and wind, decentralized solar such as solar water pumps for agriculture, green hydrogen, metro lines and afforestation.

Rational behind issuance of sovereign green bonds:

- **Hedge against climate change:** As per World Bank, green bonds offer investors a platform to engage in good practices, influencing the business strategy of bond issuers. They provide a means to hedge against climate change risks while achieving at least similar, if not better, returns on their investment.
- **Attractive to issuers:** They come with tax incentives such as **tax exemption and tax credits**, making them a more attractive investment vs. a comparable taxable bond.
- **Achieving net zero emissions:** The issuance of Sovereign Green Bonds is in consonance with India's vision to achieve **net zero emissions by 2070**, which has been carefully considered after taking into account the principles of **United Nations Framework Convention on Climate Change (UNFCCC)** in the light of national circumstances.
- **Attracting global and domestic investments:** The proceeds generated from issuance of such bonds will be deployed in public sector projects.
- **Blended finance for climate action:** Sovereign green bonds and thematic funds for blended finance in areas including climate action were announced in the **Union Budget 2022-23**. The budget pushes energy transition by encouraging domestic production of solar power equipment and batteries in line with India's climate commitments.
- **Positive environmental and climate benefits:** As per the **Securities Exchange Board of India (SEBI),** green debt securities are created to fund projects that have positive environmental and climate benefits.
- **Reduce carbon intensity:** India has pledged to achieve cumulative installed capacity of electric power from non-fossil fuel-based energy resources of about 50% by 2030 and to reduce the carbon intensity of its economy by 45% from 2005 level by that time.

Implications of sovereign green bonds for a developing country like India:

- **Encouraging private sector participation**: The issuance of sovereign green bonds can encourage private sector participation in financing environmentally sustainable projects. This can increase the availability of capital for such projects, promote the development of a green finance ecosystem, and attract more investments in the Indian domestic market.
- **Fostering innovation:** Sovereign green bonds can also foster innovation in the development of new technologies and practices that promote sustainability. This can lead to the creation of new markets and business opportunities, and contribute to the growth of the Indian domestic market in a sustainable manner.
- **Promoting international cooperation:** The issuance of sovereign green bonds can also promote international cooperation in financing sustainable development projects. This can lead to increased foreign investment in the Indian domestic market, and promote the transfer of technology and knowledge from developed to developing countries.
- **Enhancing transparency and accountability:** Sovereign green bonds can enhance transparency and accountability in the use of proceeds from such bonds. The issuance of green bonds requires the identification and tracking of the use of funds, which can improve governance and promote sustainable development.

- **Contributing to climate change mitigation**: Sovereign green bonds can also contribute to climate change mitigation by financing projects that reduce greenhouse gas emissions and promote sustainable energy sources. This can help India to meet its climate change commitments and reduce its carbon footprint, while promoting sustainable development.

7 Stock Manipulation, Accounting Fraud and Corporate Governance

Hindenburg, a US-based investment research firm that specialises in activist short-selling, said its two-year investigation reveals that "the Rs 17.8 trillion ($218 billion) Indian conglomerate Adani Group has engaged in a brazen stock manipulation and accounting fraud scheme over the course of decades."

Fundamentals:

Stock Manipulation: Stock market manipulation is conduct or technique used by stock market entities to fool the investors by artificially affecting the prices of securities. These entities undertake various measures to falsely increase or decrease the demand for the securities to represent them as a profitable investment even when they know securities to be fundamentally flawed. Almost all the entities indulge in market manipulation for personal gains and exit their positions when their predetermined goals are achieved.

Accounting Fraud: Accounting fraud is an intentional manipulation of financial statements to create a false appearance of corporate financial health. Furthermore, it involves an employee, accountant, or the organization itself misleading investors and shareholders. A company can falsify its financial statements by overstating its revenue, not recording expenses, and misstating assets and liabilities.

Why corporate governance is under radar?

- Corporate governance is the system of rules, practices and processes by which a firm is directed and controlled. Corporate governance essentially involves balancing the interests of a company's many stakeholders, such as shareholders, senior management executives, customers, suppliers, financiers, the government, and the community.
- Since corporate governance provides the framework for attaining a company's objectives, it encompasses practically every sphere of management, from action plans and internal controls to performance measurement and corporate disclosure.
- If the allegations are proved then the recent crisis will reflect on failure of corporate governance in the following ways:
  - Inability to provide transparency, rationalized guidance to leadership which leads to compromising interest of the shareholders, directors, management and employees.
  - Undermining the trust dynamics between the investors, community and public officials.
  - A hindrance in promotion of long-term financial viability, opportunity, and returns.
  - The repercussions may aggravate potential for financial loss, waste, risk and corruption.

Some of the corporate scam in India in recent times is as follow:

- **Satyam Scandal:** In 2009, the chairman of Satyam Computer Services, Ramalinga Raju, admitted to inflating the company's revenue and profits for several years. The scam, which involved falsifying financial statements and creating fictitious assets, was estimated to be worth around $1.5 billion.
- **Nirav Modi Scandal:** In 2018, it was revealed that Nirav Modi, a diamond jeweler, and his associates had defrauded Punjab National Bank (PNB) of around $2 billion. The scam involved the misuse of Letters of Undertaking (LoUs) to obtain credit from overseas branches of Indian banks.
- **IL&FS Scandal:** In 2018, Infrastructure Leasing & Financial Services (IL&FS), a leading infrastructure development and finance company, defaulted on several debt obligations.
- **Sahara Scandal:** In 2011, the Securities and Exchange Board of India (SEBI) accused Sahara India Parivar of raising funds from the public through illegal means.

Role of SEBI in maintaining stability of the securities market:

- Registration and granting permission to various brokers, sub-brokers and other key plays in

the market Registration of various investment schemes and mutual funds.

- Identifying the fraudulent and unfair trade practices in the stock market and taking necessary actions against them
- Controlling insider trading through proper observations and imposing proper penalties for such practices.
- Investor education by conducting various awareness camps. providing training for intermediaries for enhancing knowledge and awareness
- Conducting proper research and development and publishing necessary information to all market participants.
- SEBI charges Rs. 5 lakh fine on Serene Industries for not resolving an investor complaint within the stipulated time.

CHAPTER

3

Industries

Topic of This Chapter

1	Labor Laws and Associated Challenges
2	Gig Workers
3	Increasing Role of MSMEs
4	Special Economic Zones (SEZs)
5	Pharmaceuticals Industry
6	Semiconductor Industry and Design Linked Incentives
7	Transformation in Indian Telecom Industry
8	Public Private Partnership (PPP)
9	Economic Survey 2022-23: Indian Startup Ecosystem & Challenges

1 Labor Laws and Associated Challenges

The Indian government has introduced new labour codes, which are expected to simplify labour laws, provide greater flexibility for companies to manage their workforce, and offer better protection and benefits for workers.

About Labor laws:

Labour laws, also known as employment laws, are the body of laws, administrative rulings, and precedents that address the legal rights and restrictions of working people and their organisations. Labour laws attempt to regulate the relationships between an **employer or group of employers and their employees.** In 2020, the Central Government has promulgated around 44 labour-related statutes, 29 of which have been consolidated into four new labour codes.

Code on Wages, 2019:

- Applying to all the employees in organized as well as unorganized sectors.
- Under these new codes, a number of aspects related to employment and work culture, in general, might change including the take-home salary of employees, working hours, and the number of weekdays.
- According to this wage code, once an employee quits, is fired, or is removed from employment and services, a company is required to pay the full and final settlement of their salaries within two days after their last working day.
- Currently, firms require anywhere from 15 to 60 days, and in some situations up to 90 days, to pay the full settlement of wages.

Code on Industrial Relations, 2020:

- Employees in India may be able to enjoy a four-day workweek, as opposed to the current five-day workweek.
- In that case, however, employees will have to work for 12 hours on those four days since the labour ministry has made it clear that even if the proposal comes through, the 48-hour weekly work requirement has to be met.

Code on Social Security, 2020:

- The regulations restrict allowances to 50 percent.
- This implies that half of the salary would be basic wages and contribution to the provident fund is calculated as a percentage of basic wages that involves the basic pay and **dearness allowance (DA).**
- Under the current labour regulations, the employer's percentage-based contribution towards the PF balance depends on the employee's basic pay and dearness allowance.

The Occupational Safety, Health and Working Conditions Code, 2020:

- Bill provides that women will be entitled to be employed in all establishments for all types of work under the Bill.
- It also provides that in case they are required to work in hazardous or dangerous operations, the government may require the employer to provide adequate safeguards prior to their employment.

Emerging issues related to labour laws in India:

- **Informalization of labor:** A significant trend in India's labor market is the increasinginformalization of labor. More than 90 percent of the total workforce has been engaged inthe informal economy. It shows that a large portion of the workforce is employed in theinformal sector, where labor laws are not always enforced, and workers do not have accessto social security benefits such as health insurance and retirement savings.
- **Gender pay gap:** Despite several laws aimed at promoting gender equality in the workplace, the gender pay gap in India remains significant. Women continue to earn less than men for the same work, and there is a need to address this issue through better implementation of existing laws and policies. According to World Inequality Report 2022, men in India capture 82% of labour income, while women earn just 18%.
- **Digitalization of work:** With the growth of the gig economy and remote work, there is a need to adapt labor laws to the new realities of digital work. There is also a need to address issues such as job insecurity, low pay, and lack of benefits for workers in the gig economy.

- **Changes in labour laws:** In 2020, the Indian government introduced significant changes to the country's labour laws, aimed at simplifying and rationalizing them. These changes have been criticized by some experts and labor unions, who argue that they may lead to the erosion of workers's rights and job security.
- **Social security for workers:** Many workers in India, especially those in the informal sector, do not have proper access to social security benefits such as health insurance, pension, and disability benefits. There is a need to extend these benefits to all workers, including those in the informal sector, to provide them with a safety net.

Implications of new labor reforms:

- **Boost to local economy:** Reverse migration of labour from industrialized states back to their homelands is expected to create a glut of labour. As fears around mounting unemployment rise, it is imperative for the government to create a large number of new jobs. Relaxing labour laws is expected to encourage local industry to hire more. Thus, the reforms make rural economy an attractive place for investment while channelizing the government move of Vocal for Local.
- **Ease of doing business:** The recent labor law reforms are aimed at simplifying and rationalizing the existing labor laws in India, making it easier for businesses to operate in the country. The reforms will reduce compliance costs for businesses, making it easier for them to hire workers and expand their operations, which in turn is expected to facilitate employment growth.
- **Increased flexibility:** The recent labor law reforms have introduced more flexibility in labor laws, allowing businesses to hire workers on a contract basis and make changes to the terms of employment. This increased flexibility is expected to attract foreign capital, as businesses will have more options to structure their operations in a way that suits their needs.
- **Promoting formalization of labor:** The labor law reforms are also aimed at promoting formalization of labor in the country. The informal sector in India is a significant contributor to employment, but it is largely unregulated, leading to issues such as low pay and job insecurity. Formalizing the labor sector is expected to attract foreign capital, as it will provide a more stable and predictable environment for businesses to operate in.
- **Relieve from cumbersome regulatory compliances:** The recent reforms will relieve the whole system from cumbersome regulatory compliances as the complex India's labour laws rarely serve the purpose of protecting workers, but rather act as an instrument to harass businesses. The consolidation of these reforms will simplify the whole process which in turn will ease the regulatory mechanism and redressal making India and attractive foreign capital destination.
- **Reducing litigation:** The labor law reforms are aimed at reducing litigation related to labor laws, which has been a significant challenge for businesses operating in India. The reduction in litigation is expected to provide a more predictable and stable environment for businesses, making it more attractive for foreign capital to invest in the country.

2 Gig Workers

According to Skill, labour, talent for MSMEs, the demand for skilled gig workers earning over Rs 1.5 lakh per month has increased by 21.38 per cent in the past six months, indicating higher demand for skilled gig workers.

WHY GIG ECONOMY IS IMPORTANT FOR INDIA?

For workers	For companies	Gig Workers
◉ Enjoy flexible hours ◉ Choice of work ◉ Ability to enhance income by doing multiple gigs.	◉ Avoiding cost of social security and fixed remuneration ◉ Save overhead costs on office space and equipment ◉ Give them greater recruitment flexibility. ◉ Provide more options to recruit gig talent given the opportunities it affords in the current market scenario.	◉ As per a BCG report, the gig economy has the potential to serve up to 90 million jobs, add up to 1.25% to India's GDP. ◉ Enable India to harness demographic dividend, which is estimated to be around 65%, and average age of India is 28 years.

NITI Aayog report findings on Gig economy:

- **Workforce count:** In 2020–21, 77 lakh workers (1.5% of total workforce) was engaged in the gig economy. It is expected to reach 2.35 crore workers (4.1% of the total workforce) in India by 2029–30.
- **Skill set of workforce engaged in the gig economy:** Presently, about 47% of the gig work is in medium skilled jobs, about 22% in high skilled and about 31% in low skilled jobs.
- **Skill Polarisation:** The report draws attention to skill polarisation as the trend shows gradual decline in concentration of workers in medium skills while that of the low skilled and high skilled is increasing.

Rajasthan state is planning to enact a social security law for "gig workers". It will make it the first of its kind in the world.

ADVANTAGES OF GIG ECONOMY FOR COMPANIES	DISADVANTAGES OF GIG ECONOMY FOR WORKERS
◉ Flexibility	◉ Erosion of traditional economic relationships
◉ Cater to immediate demand	◉ Discourage Investment in Human Resources
◉ Cheaper and more efficient	◉ Crowding out traditional workers
◉ Wider choice for employers	◉ Disrupted work-life balance for gig workers
◉ Offers specific expertise	◉ No employment-related rights
◉ Wider choice for employees	◉ High risk, no safety net
◉ Youth economic productivity	◉ **Disadvantages for women**
◉ Advantages for women	➤ Gender segregation of work
➤ Balancing Home and Work	➤ Wage Disparities
➤ Safe Work Environment for Women	➤ Digital Divide
➤ Addressing Migration issue	➤ **Dual burden:** On-demand work schedules do not allow women to reap the benefits of peak hours due to additional domestic and childcare responsibilities
➤ On-Demand Work	
➤ Earning Extra Income	

Suggestive measures to streamline gig economy (Source: NITI Aayog):

- **Catalyse Platformization:** A Platform India initiative, built on the pillars of Accelerating Platformization by Simplification and Handholding, Funding Support and Incentives, Skill Development, and Social Financial Inclusion, like the immensely successful Startup India initiative, should be introduced.
- **Accelerate Financial Inclusion:** Access to institutional credit may be enhanced to bolster the Government's existing efforts to promote financial inclusion through financial products specifically designed for platform workers and those interested to set-up their own platforms.
- **Skill Development for Platform Jobs:** Pursue ends- or outcome-based, platform-led models of skilling and job creation development of youth and the workforce to make them employable.
  - ➤ Integrate employment and skill development portals such as E-shram and National Career Services Portals or Udyam portal with ASEEM portal.
- **Platform-led Transformational Skilling:** Platforms can enable the upskilling and diversification of platform workforce in a newly structured and industry tested manner.
- **Gender Sensitisation & Accessibility Awareness Programmes**: Platform businesses can undertake partnerships with civil society organisations (CSOs) and non-governmental organisations (NGOs).

3 Increasing Role of MSMEs

MSME manufacturing firms have been imperative to the growth of the Indian economy. These small to medium sized ventures have always contributed largely to the country's GDP, hence contributing to different aspects of its development.

- Thus, there is urgent need of exclusive emphasis on this sector to further transform the economy.

Increasing role of MSMEs in Indian Economy:

- The Indian MSME sector contributes to about 29% towards the GDP through its national and international trade.
- As per the **MSME Ministry data**, as of May 16, 2021, India has approximately 6.3 crore MSMEs (including both service and manufacturing firms).
- It is to be noted that this sector still has a lot of unexplored territories for growth.
- It won't be wrong to say that with so much of growth potential, emphasising on the development of MSME manufacturing firms can work as a long-term development tool for India.

Benefits of MSME

- Rural growth
- Inclusion of remote areas
- All-inclusive growth
- Industrialization
- Balanced regional development
- Absorb a large workforce
- Further generating new entrepreneurs
- Competition led growth
- **Employment generation:** According to the estimates of the Ministry of MSME, Government of India, the sector generates around 100 million jobs through over 46 million units situated throughout the geographical expanse of the country.
- **Different arenas:** It has a role in different areas due to benefits like low investment, flexibility in operations, low rate of imports, and a high contribution to domestic production.
- **Multiple benefits:** They are also important for the promotion of industrial development in rural areas, use of traditional or inherited skill, use of local resources, mobilization of resources and exportability of products.

Problems faced by MSME sector	Measures need to be taken
◉ Lack of Finance ◉ Lack of Basic Infrastructure ◉ Access to Market ◉ Access to Modern Technology ◉ Labour Laws ◉ Access to Raw material and Other Inputs ◉ Lack of Skill development and training ◉ Poor tax structure	◉ Tax reforms ◉ Industrial Training Institutes and management schools ◉ Promote R&D ◉ E-Commerce and Marketing ◉ Time bound procedure for bankruptcy and insolvency

Recent government initiatives

- Public Procurement Policy 2012
- **FDI:** In many FDI proposals such as FDI in Retail, there is clause that 20-30% inputs shall be procured only from MSME
- Mudra Scheme
- Udyog Aadhaar Memorandum (UAM)
- A Scheme for Promotion of Innovation, Rural Industry and Entrepreneurship (ASPIRE)
- Scheme of Fund for Regeneration of Traditional Industries (SFURTI)
- Stand Up India
- Credit Linked Capital Subsidy Scheme

4 Special Economic Zones (SEZs)

Union Budget 2023: Make SEZs manufacturing, innovation and export hubs.

Incentives for setting up SEZ:

- Duty free import and domestic procurement of goods for the development, operation, and maintenance of your company/SEZ unit
- 100% income tax exemption on export income for first five years, 50% for five years thereafter, and 50% of the export profit reinvested in the business for the next five years
- Exemption from GST and levies imposed by state government (supplies to SEZs are zero rated under the IGST Act, 2017, meaning they are not taxed).
- Exemption from Minimum Alternate Tax (MAT)
- Single window clearances for all state and federal government approvals
- Exemption in electricity duty and tax on sale of electricity by certain states in India
- Presence of customs officer in the SEZs to facilitate and expedite the trade processes

Despite several efforts taken by the government, SEZs have not been able to grow and induce development at the expected pace. UNCTAD report suggests that SEZ exports did not rise at a faster rate than overall exports even before the pandemic.

Factors that have impeded the growth of India's SEZs:

- **Difficulty in obtaining land:** Some state governments in India (e.g. West Bengal, Odisha) countered strong political resistance to acquiring land for SEZ development by the private sector. The resistance led to violent conflicts and loss of material property and human lives. With state governments accused of being 'brokers' for industry by forcibly acquiring agricultural land, SEZ projects were mired in controversy.
- **Lack of federal coordination:** State governments accused of being 'brokers' for industry by forcibly acquiring agricultural land, SEZ projects were mired in controversy. As states realized the political cost of promoting SEZs and began backing off from land acquisitions, developers without sufficiently large financial set up were saddled with large debts.
- **Non-Availability of funds:** Government should not have introduced the SEZ scheme without an effective policy of land acquisition, banks on the other hand SEZs increasingly became synonymous with non-performing loans and risky ventures.
- **Depressed demand:** Poor export prospects have led to low capacity utilizations in many zones. Several upcoming SEZs have failed to take off with manufacturers refraining from using the facilities in the zones due to low global demand for their products.
- **Pressure on financial system:** There are quite a few IT-SEZs in India that houses global capability centers of large multinationals. These are companies that produce high value- added services to clients worldwide, thereby generating employment for the skilled workforce in India.

To revive interest in SEZs and promote more inclusive economic hubs, the government has introduced a bill on Development of Enterprise and Service Hubs (DESH), 2022. The Bill is an attempt to remove restrictions around businesses that were allowed inside SEZs, thereby attracting a wider set of occupiers and infrastructure growth.

Factors that have impeded the growth of India's SEZs:

- **Development hubs:** The bill proposes to create two kinds of development hubs – enterprise hub and the services hub, as enclaves for the purposes of the promotion of economic activity, employment generation, integration with global supply and value chains and maintenance of manufacturing and export competitiveness, development of infrastructure facilities, promotion of investments, and investment in research and development.
- **Multi-disciplinary approach:** It proposes to do away with industry-specific zones and allow multi-disciplinary tenants to occupy space across all SEZs, Thus increasing the scope of occupancy.
- **Dynamic market policy and revenue base:** Tenants of SEZs no longer are required to sell

only in the international market. With enactment of DESH, tenants of SEZs will be allowed to cater to the local market and indulge in sub-contracting to firms outside of SEZs. Such firms, naturally, will attract an "equalization levy" to bring tax treatments fairly at par with non-SEZ occupiers.

- **Digitalization:** Benefits such as single-window digitized approval mechanisms, self- certification for developers and occupiers of DESH for defined set of business activities, removal of restrictions around foreign currency payments, allowing partial de-bonding of SEZ premise by developers, single point of contact across multiple ministries in the central government etc. aims at significant improvement in Ease of Doing Business through the DESH bill.
- **Reformed evaluation:** The evaluation of units would not be based on net foreign exchange. Instead the performance of the units will be measured on parameters such as investment, employment generation, etc.

5 Pharmaceuticals Industry

The pharmaceutical industry in India is expected to reach $65 Bn by 2024 and to $130 Bn by 2030.

About Pharmaceutical industry:

- The pharmaceutical industry in India is currently valued at **$50 Bn.**
- India is a major exporter of Pharmaceuticals, with over 200+ countries served by Indian pharma exports. India supplies over 50% of Africa's requirement for generics, ~40% of generic demand in the US and 25% of all medicine in the UK.
- India also accounts for 60% of global vaccine demand, and is a leading supplier of DPT, BCG and Measles vaccines. 70% of WHO's vaccines (as per the essential Immunization schedule) are sourced from India.
- The Average Index of Industrial Production of Manufacturing of pharmaceuticals, medicinal chemicals and botanical products in the FY 2021-22 is 221.6 and has grown by 1.3%
- For the period 2021-22, export of drugs and pharma products stood at $24.6 Bn compared to $24.44 Bn as of 2020-21. The Indian pharma industry witnessed exponential growth of 103% during 2014-22 from $11.6 bn to $24.6 Bn.

Reasons why pharmaceuticals industry is flourishing in India:

- **Strong domestic demand:** The growing middle class and aging population have created a large demand for pharmaceutical products.
- **Low cost of manufacturing:** Cost of manufacturing 33% lower than western markets due to factors such as cheap labor, affordable equipment, competitive property rates and low-cost utilities.
- **Favorable government policies:** The Indian government has implemented several policies to promote the growth of the pharmaceutical industry.
- These include tax incentives, R&D grants, and support for technology transfer.
- **Skilled workforce:** India has a strong pool of skilled scientists, researchers, and technicians who are involved in research and development, quality control, and manufacturing.
- **Expanding exports:** India is the 12th largest exporter of medical goods in the world. Indian drugs are exported to more than 200 countries in the world, with US being the key market. Generic drugs account for 20% of the global export in terms of volume, making the country the largest provider of generic medicines globally.
- **Foreign investment:** Pharmaceutical is one of the top ten attractive sectors for foreign investment in India. The cumulative FDI equity inflow in the Drugs and Pharmaceuticals industry is US$ 20.96 billion during the period April 2000-September 2022. This constitutes almost 3.35% of the total FDI inflow received across sectors.

Challenges faced by pharmaceuticals industry:

- **From regulator side:** Doing a post-mortem kind of work by inspecting the drugs after getting into market. Low data collection on drugs coupled with insufficient training to drug inspector leading to huge malpractice among drug sellers
- **From Marketing side:** Medical representatives and drug sellers inefficient training to meet the man power along with prevalence of Quack(fake

doctor) increases risk of life of patients . Pharma companies unethical pratice of providing freebies and gifts to Doctors to promote their drugs

- Quality is getting compromised due to high demand for drugs among people. This is evident by wide scale recall of drugs in India.
- **Low R&D investment:** India only invests 0.7% of its GDP for research and investment. This is very low compare to the demand in the sector
- **International Challenges:** Global Pharma companies accuse Indian pharma companies as an abuser of Patent laws and criticise India's Compulsory Licensing Policies. India nearly 90% depend on China for its Active Pharmaceutical Ingredients.

Government initiatives to promote the pharmaceuticals industry

- **Ayushman Bharat Digital Mission (ABDM):** Under the ABDM, citizens will be able to create their ABHA (Ayushman Bharat Health Account) numbers, to which their digital health records can be linked. This will enable creation of longitudinal health records for individuals across various healthcare providers and improve clinical decision making by healthcare providers.
- **PLI Scheme** for promotion of domestic manufacturing of critical Key Starting Materials (KSMs)/Drug Intermediates (DIs)/ Active Pharmaceutical Ingredients (APIs) in India: The outlay of the scheme is Rs 15,000 crore and the tenure of the scheme is proposed to be from 2021-22 to 2028-29.
- **Promotion of Bulk Drug Parks:** It aims to bring down the cost of manufacturing of bulk drugs by creation of world class common infrastructure facilities supported by the Central Government.
- **Pharmaceutical Promotion & Development Scheme (PPDS):** The scheme aims at promotion, development and export promotion in pharmaceutical sector by extending financial support for conducting seminars, conferences etc.
- **Pharma Bureau:** It provides facilitation to investors and resolution of their interdepartmental coordination issues in the Pharmaceuticals and Medical Devices sector.
- **Pradhan Mantri Bhartiya Janaushadhi Pariyojana (PMBJP):** It aims to make quality generic medicines available at affordable prices to all especially for the poor and the deprived ones.

6 Semiconductor Industry and Design Linked Incentives

Semiconductor industry will double from current $600 billion to $1 trillion plus.

Background:

Semiconductor industry, which is now an inseparable part of almost all sectors, has emerged as one of the most important industries. It forms an essential part of all electronic items. Ministry of Electronics and Information technology has announced the Design Linked Incentive (DLI) Scheme to offset the disabilities in the domestic industry involved in semiconductor design in order to not only move up in value-chain but also strengthen the semiconductor chip design ecosystem in the country.

Current status of the semiconductor industry of India:

- The global semiconductor industry is currently valued at $500-$600 billion and caters to the global electronics industry currently valued at about $3 trillion.
- India has a very fast growing electronics system design manufacturing (ESDM) industry. India also has a strong design base.
- According to the Department of Electronics and Information Technology (DeitY), nearly 2,000 chips are being designed every year in India and more than 20,000 engineers are working on various aspects of chip design and verification.
- The government has a strong focus in developing the ESDM ecosystem in India. Several subsidies and other incentives are on offer for setting up electronics manufacturing units in India. The Union Cabinet has allocated an amount of ₹76,000 crore for supporting the development

of a 'semiconductors and display manufacturing ecosystem'.

- A report by Deloitte estimated that the Indian semiconductor market may reach $55 billion by 2026 with more than 60% of the market being driven by three industries.

For rapid development of the semi-conductor industry following steps is required:

- Bring manufacturing closer to home with both entirely new fabs and the expansion of existing facilities.
- Manage the diversification risks and challenges that come with localization and friendshoring.
- Digitally transform and digitize many parts of their processes: financial planning and operations, order management, and supply chain.
- Address and balance the semiconductor talent equation: shortages in some roles but layoffs in others.
- Establish and accelerate the path toward achieving environmental, social, and governance goals, particularly around sustainability.

Ways in which Design linked Incentive will give a major boost to semi conductor industry in India:

- **Increased Participation:** 50% of the project cost across all technology nodes for establishing semiconductor labs, including cutting-edge computing chips and those used in the power, telecom, and automotive sectors will be funded by the government. With such high incentive more players are entering the semi-conductor industry leading to an increase in manufacturing base.
- **Incentivize companies:**The scheme was initially introduced in India to incentivize companies for incremental sales of products manufactured in India over the base year. They have been particularly intended to increase domestic manufacturing in the sunrise and strategic sectors, minimise import bills and curb cheaper imports, improve the cost competitiveness of domestically manufactured goods, and promote domestic capacity and exports.
- **Promotes in house production:** PLI aims to provide subsidies to companies that manufacture their goods in the country as the government offers incentives for additional sales in form of tax breaks and reduced import duties. These schemes are linked to the organisation's performance.
- **Domestic Resources:** The semiconductor industry is an important and time taking component in the electronics ecosystem for countries like India. All our efforts to make motherboard and networking will get more local components with the rise of the semiconductor industry while cutting on the import bill.

ISSUES/CHALLENGES	REQUIRED MEASURES
• **Dominance of Few Countries:** Taiwan and South Korea dominated the semiconductor manufacturing space. 75% of the semiconductor manufacturing capacity is concentrated in East Asia and China. • **Pursuing Western Companies:** India needs to attract foreign investment to built-up chip fab capacity by overcoming the intense competition from other countries. • **Inadequate logistics and absence of proper waste disposal** have further exacerbated the poor state of its production.	• **Supporting startups Ecosystem** • **Budgetary support** • **Impetus on back-end of manufacturing:** India should especially look at back-end of manufacturing such as assembly, packaging and testing. Once it stabilises and an ecosystem develops, front-end of manufacturing will follow. • **Cooperation of states:** Transport logistics: Roads, railway and air connectivity to the site are also critical.

7 Transformation in Indian Telecom Industry

Industry 4.0 is transforming the way businesses operate across various sectors. The telecommunications industry, in particular, is experiencing a major shift as it adopts new technologies such as the Internet of Things (IoT), Artificial Intelligence (AI), and Machine Learning (ML) to improve efficiency, customer experience, and service delivery.

Evolution of Telecom Sector in India

- Indian telecom sector is more than 165 years old.
- Telecommunications was first introduced in India in 1851 when the first operational land lines were laid by the government near Kolkata (then Calcutta).
- Although telephone services were formally introduced in India much later in 1881.
- The Indian telecom sector was entirely under government ownership until 1984
- The actual evolution of the industry started after the separation of the **Department of Post and Telegraph in 1985** by setting up the **Department of Posts** and the **Department of Telecommunications (DoT).**

Current status of the Sector

- India is currently the **world's second-largest telecommunications market** and has registered strong growth in the past decade and half with a **subscriber base of 1.20 billion.**
- The liberal and reformist policies of the Government of India have been instrumental along with strong consumer demand in the rapid growth in the Indian telecom sector where key policies are enhancing the use of internet in various sector leading to growth of telecom sector, like:
  - National optical fibre mission
  - National digital communication policy 2018
  - PM-WANI scheme

FDI in Telecom Sector

- In October 2021, the government notified 100% foreign direct investment (FDI) via the automatic route from the previous 49% in the telecommunications sector.
- FDI of up to 100% is permitted for infrastructure providers offering dark fibre, electronic mail and voice mail.
- The Telecom sector is the 3rd largest sector in terms of FDI inflows, contributing 7.1% of total FDI inflow in India.

What are the challenges faced by the sector?

- Poor Financial Health of the Sector
- Limited Spectrum Availability
- Higher cost of Spectrum auction
- High competition and tariff war
- Lack of Telecom Infrastructure in Semi-rural and Rural areas
- Government policies against this sector
- Low Broadband Penetration
- Newer technologies decrease the revenue
- License fee

Forward looking

- As a next step, like other countries, DoT would need to strongly consider allowing Cloud, Voice **Services and Software-Defined Wide Area Network (SD-WAN)** over the internet, by avoiding data forwarding technologies such as MPLS, exempting CDR storage in India, and allowing **Voice over Internet Protocol (VoIP).**
  - This will help organisations be cost-effective, agile, and focus on providing better products and services with superior customer experience.
- Going forward, the latest technologies like 'Internet via satellite' will drastically increase internet penetration to the remotest locations in the country.
- This is expected to further propel digitisation efforts, with many rural and remote users gaining access to the World Wide Web.

8 Public Private Partnership (PPP)

With the aim is to boost private sector participation in improving the State's infrastructure government to formulate a detailed public private partnership policy.

What makes PPP attractive for the private players?

Public-private partnerships often involve concessions of tax or other operating revenue, protection from liability, or partial ownership rights over nominally public services and property to private sector, for-profit entities.

Motivation for governments to Engage in PPPs:

The three main needs that motivate governments to enter into PPPs for infrastructure are:

- to attract private capital investment (often to either supplement public resources or release
- them for other public needs)
- to increase efficiency and use available resources more effectively
- to reform sectors through a reallocation of roles, incentives, and accountability

Role of PPP In order to meet financing needs of projects:

- PPPs generally spread the costs of procuring an asset over time and/or cause the associated capital expenditure to affect private firms; rather than the public sectors balance sheets. These objectives may be achieved by basing the procurement on the public services required—that is, upon outputs—rather than on the underlying assets, or inputs. Where public sector capital budgets are constrained, there are obvious advantages in adopting a PPP to deliver public services that might otherwise be unaffordable to a government.
- At the heart of all PPPs is the deployment of private sector capital. Within a PPP framework, this can result in greatly improved value for money for the government in terms of the risks transferred to the private sector (in cases where the latter is better able to assess the risks) and powerful private sector incentives for the long-term delivery of reliable public services. These benefits are sufficient to ensure that PPPs often become the favored means of procurement, even where public sector capital constraints do not apply. In many countries, such as India, therefore, the motivation for making greater use of PPPs is to obtain increased value for money in the procurement of public services.
- PPPs operate at the boundary of the public and private sectors, being neither nationalized nor privatized assets and services. Thus, politically, they represent a third way in which governments may deliver some public services. Moreover, in a practical sense, PPPs represent a form of collaboration under contract by which public and private sectors, acting together, can achieve what each acting alone cannot.
- Extracting long-term value-for-money through appropriate risk transfer to the private sector over the life of the project – from design/ construction to operations/ maintenance.
- Creating persification in the economy by making the country more competitive in terms of its facilitating infrastructure base as well as giving a boost to its business and industry associated with infrastructure development (such as construction, equipment, support services.
- Utilizing PPPs as a way of developing local private sector capabilities and infrastructure simultaneously through joint ventures with large international firms, as well as sub-contracting opportunities for local firms in areas such as civil works, electrical works, facilities management, security services, cleaning services, maintenance services.

Risks of relying on PPP:

- Development, bidding and ongoing costs in PPP projects are likely to be greater than for traditional government procurement processes - the government should therefore determine whether the greater costs involved are justified.
- There is a cost attached to debt – While private sector can make it easier to get finance, finance will only be available where the operating cash

flows of the project company are expected to provide a return on investment.

- Some projects may be easier to finance than others (if there is proven technology involved and/ or the extent of the private sectors obligations and liability is clearly identifiable), some projects will generate revenue in local currency only (e.g water projects).
- Private sector will do what it is paid to do and no more than that – therefore incentives and performance requirements need to be clearly set out in the contract.
- Government responsibility continues – citizens will continue to hold government accountable for quality of utility services. Government will also need to retain sufficient expertise, whether the implementing agency and/ or via a regulatory body, to be able to understand the PPP arrangements.
- There is no unlimited risk bearing – private firms (and their lenders) will be cautious about accepting major risks beyond their control, such as exchange rate risks/risk of existing assets. If they bear these risks then their price for the service will reflect this.

Mitigating the risks associated with PPP:

- A clear legal and regulatory framework is crucial to achieving a sustainable solution (for more, go to legislation and regulation).
- Government needs to retain sufficient expertise, whether the implementing agency and/ or via a regulatory body, to be able to understand the PPP arrangements, to carry out its own obligations under the PPP agreement and to monitor performance of the private sector and enforce its obligations.
- The government should see PPP in the light of supplementing the public sector capacities to meet the growing demand of infrastructure development rather than the key provider.

9 Economic Survey 2022-23: Indian Startup Ecosystem & Challenges

The Indian startup ecosystem is facing several challenges despite recording an increase in the number of startups to 84,012 in 2022 from 452 in 2016, according to the Economic Survey Report 2022-23.

Why is India seeing the rise of start-ups?

- India's demographic dividend has blessed it with population of such age group that
- Government initiatives such as start-up India, stand-up India etc.
- Availability of investors, both foreign and domestic,
- Increasing demand of products and services
- Telecom and IT revolution in India has made getting access to new products and services

How can Start-ups help the Indian Economy?	Why start-ups are not a complete panacea to India's economic woos?
◉ Opportunity to the entrepreneurial youth their finances exponentially. ◉ Wealth creation ◉ Growth in employment opportunities. ◉ Creation of products or services ◉ solving a regional or local issue or catering to a local demand ◉ creation of economic opportunities ◉ Reducing regional disparity in economy	◉ Statistically, a large number of start-ups do not make it big and are shut down. ◉ Risk of failure and loss of investment ◉ Employment opportunities in start-ups, are not proportionate to their valuation. ◉ Disparities in the salary and working conditions ◉ Resource utilization are not at optimal level ◉ Minimal legal provisions and legal safeguards for investors and workforce ◉ Demand supply mismatch of skilled labour force

Challenges faced by Start-ups

- The challenges include funding, revenue generation struggles and lack of access to supportive infrastructure.
- The regulatory environment and tax structures have also posed hurdles for startups.
- To circumvent these challenges, many Indian companies are **setting up bases overseas**, especially in countries with favourable legal environments and taxation policies,

Flipping

- The process of transferring the entire ownership of an Indian company to an overseas entity, including the transfer of all Intellectual Property and data owned by the Indian company, is called 'flipping'.
- Typically, flipping happens at the early stage of the startup. However, this trend can be reversed with active collaboration with the government-related regulatory bodies and other stakeholders. Further, companies are also exploring 'reverse flipping'.

CHAPTER

4

Agriculture

Topic of This Chapter

1	Minimum Support Price (MSP)
2	Primary Agricultural Credit Societies
3	LPG Reforms and Agriculture Sector
4	Role of Agriculture Startups in Enhancing Productivity and Farm Income
5	Need for India to Multiply Investment in Agricultural Research and Development
6	Pradhan Mantri Kisan Samman Nidhi (PM-KISAN)
7	Micro-irrigation for depleting water resources
8	Farm Subsidies
9	Fisheries Sector
10	Farmers Distress Index
11	Role of Technology in Agriculture
12	Land Records
13	Food Processing Sector

1 Minimum Support Price (MSP)

Government reopens window for farmers to sell mustard at MSP post dip in prices.

Inefficiencies plaguing the MSP regime in India:

- **Implementation challenges:** MSP is announced for 23 crops every year, but the procurement in terms of percentage of crop production remains uneven. **For example**, only 1% of coarse grains and 12% of pulses produced were procured in 2019-20 compared to 43% of rice and 36% of the wheat.
- **Market distortion:Economic Survey 2020** pointed out that the MSP distorted market of the food grains by creating artificial demand and supply in the country.
- **Regional variation in capability in procurement:** Green Revolution states like Punjab and Haryana have strong procurement system in place while the eastern states of Bihar, Odisha etc. have limited capabilities.
  - **Example:** In Punjab, 87% of the rice, wheat produced was procured compared to just 15% in Uttar Pradesh.
- **Low reach, small farmers left behind:** According to the **Shanta Kumar Committee,** MSP covers just 6-10% of the farmers, mostly the medium and large farmers, which creates wide inequality within the agriculture sector.
- **Ecological and environmental challenges:** MSP has resulted in distorted cropping patterns in the country causing environment challenges. **Example:** Paddy, a water intensive crop, is grown aggressively in water stressed state of Punjab because of the high MSP. This has led to severe depletion of ground water level in the state.

Benefits for farmers	Concerns regarding the MSP system
Stable income: It provides them with a stable source of income and protects them from the volatility of market prices.	**Overproduction:** It has led to overproduction of certain crops and distorted the market by discouraging farmers from diversifying their crops.
Guaranteed return: It also encourages them to invest in agriculture by providing them with a guaranteed return on their investment.	FCI stocks are way above the stipulated limit causing additional burden on the exchequer and high rate of wastage as well.
Stabilized food prices: MSP helps to stabilize food prices and ensures the availability of food grains in the market.	**Wastage:** The cost of procurement and storage of excess food grains, which can lead to wastage and inefficiencies in the system.
Controlling instrument: An instrument to control the production quantities of various crops to match demand.	**High fiscal burden on the government**
Self-sufficiency: The country could also become self-sufficient in edible oils and pulses if we ensure remunerative MSPs for these crops.	**Implementation challenges:** Mandatory MSP will cause logistical challenges. States with weak institutional capacities will face additional burden.
Food Security: It will further increase the food security of the nation with the growth in the population.	**Politicization of the issue:** The issue around the MSP has created a strong political lobby that is not always in interest of the farmers.

2 Primary Agricultural Credit Societies

India to establish 2 lakh primary agricultural credit societies over 5 years. Union Cabinet approved the establishment of viable PACS and dairy and fishery cooperatives with an outlay of Rs. 20 Lakh crore.

What makes PACS attractive?

- **Last mile connectivity:** For farmers, timely access to capital is necessary at the start of their

agricultural activities. PACS have the capacity to extend credit with minimal paperwork within a short time.

- **Simplification of paperwork:** With other scheduled commercial banks, farmers have often complained of tedious paperwork and red tape. For farmers, PACS provide strength in numbers, as most of the paperwork is taken care of by the office-bearer of the PACS.
- **Promotes inclusion:** In the case of scheduled commercial banks, farmers have to individually meet the requirement and often have to take the help of agents to get their loans sanctioned. NABARD's annual report of 2021-22 shows that 59.6 per cent of the loans were extended to the small and marginal farmers.

Challenges associated with PACS:

- **Shortage of funds:** Its working capital is low and insufficient due to which they are unable to meet their requirements. As a result, these societies face a significant financial dilemma and are unable to pursue their job properly.
- **Politicized nature:** Because politicians employ cooperative societies as a vote bank, these society can be easily exploited by politicians.
- **Credit Share:** Over time, the share of credit cooperatives in rural credit have declined to 1/3rd from a share of more than 60% in the 1950s.
- **Regional imbalance in growth:** The cooperatives in northeastern areas and in areas like West Bengal, Bihar, Odisha are not as well developed as the ones in Maharashtra and Gujarat.
- **Lack of fair audit mechanism:** Delay, and irregular audits impinge upon the democratic spirit of cooperative movement.
- **Inadequate resources:** The resources are too inadequate in relation to the short-and medium-term credit needs of rural economy. The bulk of even these inadequate funds come from higher financing agencies and not through owned funds of societies or deposit mobilization by them.
- **Overdues:** Large over-dues have become a big problem for the PACS. They check the circulation of loanable funds, reduce the borrowing as well as lending power of societies, and give them the bad image of the societies of defaulting debtors are willful. Bigger landowners take undue advantage of their relatively stronger position in villages in both appropriating cheaper cooperative credit and not paying back their loans in time.

3 LPG Reforms and Agriculture Sector

The new model of economic reforms, commonly known as the **LPG or Liberalization, Privatization, Globalization model,** is believed to have had limited influence on Indian agriculture. More significantly, policy reforms in the farm sector have not yielded the anticipated outcomes.

Positive impact of LPG reforms on Indian agriculture:

- **Modern Agro- technologies:** There is availability of modern agro technologies in pesticides, herbicides, and fertilizers as well as new breeds of high yield crops were employed to increase food production. Use of High Yielding Varieties (HYVs) like **IR8** a **semi-dwarf rice variety**significantly outperformed traditional varieties in the presence of adequate irrigation, pesticides, and fertilizers.
- **Rise in production and productivity:** Due to adoption of HYV technology the production of food grains increased considerably in the country.
  - The production of wheat has increased from 8.8 million tonnes in 1965-66 to 184 million tonnes in 1991-92.
- **Growth of National Income:** New technology, new seeds, new agriculture practices etc. helped to grow the agricultural product. From the monetary point of view the share of agriculture sector in the economy is raised to 14.2% of the GDP (2010-11).
- **New areas of employment:**After LPG the agro allied industries has created employment in various sector like packing, exporting, standardizing, processing, transportation and cold storage etc.
- **Rise in the share in trade:** Because of the conditions of WTO all of the countries get the same opportunities, so there is an increase in the export of agricultural products.

Negative impacts of LPG reforms on Agriculture:

- **Migration of labours:** The domestic farmer

could not stand the competitiveness of internationalmarket, which has resulted in migration of labor from agriculture to other industrial activities.

- **Vicious debt cycle and farmers suicide:** The **National Sample Survey Organization (NSSO) Report 2005** indicates that 1 in 2 farm households are in debt, 32.7 per cent of farmers still depend on money lenders falling into their exploitative policies. The National Crime Records Bureau reports that between 1997-2005 1,56,562 farmers committed suicide.
- **Lessening international competitiveness:** Because of marginal land holding the production cost of Indian farmers is higher as well as the quality and standardization of agro produce is much neglected. Along with this, the curtailment in subsidies and grants has weakened the agricultural sector. On this background the farmers in India are not in a position to compete in international market.
- **Abnormal hike in Fertilizers and Pesticide prices:** Immediately after globalization, Indian rupee was devaluated by 25%, which led Indian farmer for export and encouraged them to shift from growing a mixture of traditional crops to export oriented cash crops like chilli, cotton and tobacco. These need far more inputs of pesticides, fertilizers and water than the traditional crops require. It automatically increased Fertilizer and pesticide prices by 300%.
- **Fall in agricultural employment:** In 1951, agriculture provided employment to 72 per cent of the population and contributed 59 per cent of the gross domestic product. However, by 2001 the population depending upon agriculture came to 58 per cent whereas the share of agriculture in the GDP went down drastically to 24 per cent and further to 22 per cent in 2006-07. This has resulted in a lowering the per capita income of the farmers and increasing the rural indebtedness.

An overview of Indian agricultural sector indicates that globalization did not yield the desired results in India. Without taking into account the state of an economy, and the state and nature of the agricultural sector in India, **the IMF and the World Bank**, with the cooperation of the Indian government, embarked on mismatched reforms, which have caused misery and despair among millions of Indian farmers, driving large numbers of them to suicide.

4 Role of Agriculture Startups in Enhancing Productivity and Farm Income

To support agro startups, Finance Minister has announced the **Agriculture Accelerator Fund**. It would attempt to implement cost-effective solutions to problems encountered by farmers by introducing contemporary technologies and boosting output.

Importance of Agriculture startups:

- **Innovative and affordable solutions:** They use innovative technologies like precision farming, smart irrigation systems, and weather-based advisory services to optimize crop yield and minimize wastage.
- **Strengthening the supply chains and logistics**: They incorporate technology to streamline the distribution of agricultural produce and reduce the number of intermediaries involved in the supply chain. **Example:** Online grocers like Swiggy can expand their reach to source the produce.
- **Real-time data and insights to farmers:** This helps farmers make informed decisions regarding seed selection, fertilizer application, and pest management thus increasing the productivity and profitability.
- **Access to credit and financing:** Agricultural startups provide farmers with access to financial services and products like microfinance and crop insurance.
- **Employment generation away from agriculture:** This can reduce the issue of disguise employment in Indian agriculture.

Agriculture Accelerator Fund:

The Fund has been announced in the Union Budget 2023-24 with the aim to encourage agri-startups by young entrepreneurs in rural areas.

Benefits of Agriculture Accelerator Fund for the agri-startups:

- **Provides a supportive environment:** It that can help agri-startups to grow faster by providing them with resources, exposure, and opportunities to succeed. This can further accelerate the pace of innovation in a sector.

- **Fast- track agricultural entrepreneurial activity:** The success of startups in the tech sector can be replicated with the help of the Fund.
- **Higher investment in the sector:** The move can turn agri-tech into a 'sunrise sector' which can attract investments from diverse sources.
- **Better connectivity with the farmers:** Budget has also announced a Digital Public Infrastructure which coupled with the Fund would help the agri-tech startups to connect with more farmers and in turn enable them to realize better value for their produce. This will in turn enable the famers to realize better value for their produce.

5 Need for India to Multiply Investment in Agricultural Research and Development

India has surpassed China to become the most populous country which puts an additional pressure on agriculture to match up with the demand.

Why R&D is critical?

- **The objectives of agricultural R&D are**
  - **crop diversification** (from rice and wheat to maize, millets, pulses and oilseeds)
  - **crop rotation** (for soil health and pest management)
  - **cultivation with no or minimal soil disturbance** (to conserve water, improve soil health and avert tractor emissions)
  - **doubling the productivity** of livestock and crops

Ways in which higher investment in R&D help tackle the challenges:

- **Better yield and productivity:** The average yield of wheat in India is one-third of France currently. There is huge potential to increase it with the help of technological and mechanical interventions.
- **Higher return on investment:** R&D expenditure acts as capital expenditure and marginal returns in terms of agri-growth from expenditures on agri-R&D are almost five to 10 times higher than through subsidies.
- **Higher resilience:** The temperature rise results in higher rate of plant and livestock disease causing further stress. This can be averted by better monitoring and timely intervention through research on plant and livestock genetics.
- **Development of new farming techniques:** Ex Hydroponics offers a pathway towards a more sustainable food system in the field of horticulture.
- **Development of better seed varieties:** Biotechnology plays an important role in creating genetically modified organisms (GMOs) which has increasingly been used in agriculture. Genetically engineered golden rice variety has been developed with increased nutritional value.
- **Sustainable productivity in the long-term:** Agriculture is impacted by the environment degradation and is also a cause of it. Intervention like crop-diversification, higher efficiency in the inputs like water and fertilizers is the need of the hour.
- **Reduction of post-harvest losses:** According to the FAO, the post-harvest losses in India are as high as 40%. This can be reduced by developing varieties with higher shelf life and technological intervention like food irradiation.
- **Other benefits:** Like the development of food processing sector, improved digitization, higher market efficiency, and interventions specific to micro-regions.

6 Pradhan Mantri Kisan Samman Nidhi (PM-KISAN)

Several farmers have benefited from the introduction of the **Pradhan Mantri Kisan Samman Nidhi (PM-KISAN),** which offers financial support to all landholding farmer families in the country who have arable land.

Features of PM Kisan Samman Nidhi Yojana:

- **Income Support:** It provides the minimum income support to farmers.
  - Each eligible farmer family is entitled to receive Rs.6000 per annum across India. However, the amount is not disbursed at once. Instead, it's divided into three equal instalments and meted out four months apart. Each farmer, thus, receives Rs.2000 every 4 months.

- **Funding:**The entirety of its funding comes from the Government of India. Initially, it announced a reserve of Rs.75000 crore a year to be spent on this initiative.
- **Identification Responsibility:** While the responsibility of funding lies with GOI, the identification of beneficiaries is not under its purview. Instead, it's the responsibility of the State and Union Territory governments. Here, it is crucial to note that per PM Kisan Samman Nidhi Yojana definition, a farmer's family shall comprise a husband, wife, and minor child or children.

Shortcomings of the scheme:

- **Issue in the identification:** A majority of the States have incomplete tenancy records and land data are not digitized (for instance, in Jharkhand, Bihar, Gujarat and Tamil Nadu) making identification of beneficiaries is daunting. The exclusion is very high in UP.
- **Absence of updated land records and complete databases:** Thus, benefitting only those who hold land titles and not the small, marginal or tenant farmers who are the most vulnerable.
- **Lack of effective framework for grievance redressal:** The scheme does not provide a clear design of transfers and a framework for effective grievance redressal.

Suggestive measures to overcome the inefficiencies:

- **Proactive role of Banks:** Banks involved in primary sector lending or disbursement of crop loans, etc. need to be sensitized properly on their critical role in implementation of PM-KISAN.
- **Strengthening IT backbone:** With ICT usage and direct transfer of money to farmers' bank accounts, pilferage would also be less.
- **Targeting benefits and updation of land records:** Involvement of Gram Panchayat is the key here.
- **Indexing the income support with inflation:** This will give better cushion to the farmers to cope up with the financial challenges.
- **Well-planned implementation mechanism:** It would allow weaknesses to be identified and rectified at the local level.

7 Micro-irrigation for depleting water resources

Successful micro-irrigation project to be replicated in seven more districts in Kerala.

Need for micro-irrigation:

Water resources in India are under tremendous pressure due to rise in population coupled with increasing food demand. India's per capita water availability has come down to **1,486 cubic metre in 2021 from 1,820 cubic metre in 2001** and is expected to decline further. As the agriculture sector is the largest consumer of water in India accounting for almost **90% annual freshwater withdrawals**, micro-irrigation provides the way forward.

Advantages of Micro-irrigation	Disadvantages of Micro-irrigation
Higher water use efficiency: By applying water directly to the root zone, the practice reduces loss of water through conveyance, run-off, deep percolation and evaporation. Thus reaching the water use efficiency as high as 75-95% compared to current 40% India has with traditional practices.	**Expensive initial cost**
Better yield, increase in productivity: Adoption of micro-irrigation systems helps boost the yield of fruit as well as vegetable crops.	The sun can affect the tubes used for drip irrigation, shortening their usable life
Higher nutrient uptake: It results in balanced nutrient application, reduced fertilizer requirement, higher nutrient uptake and nutrient use efficiency.	If the water is not properly filtered and the equipment not properly maintained, it can result in clogging

⊙ **Reduction of soil degradation:** It avoids large run-offs which coupled with efficient fertilizers use protect the top layer of the soil.	⊙ **Waste of water, time & harvest**, if not installed properly
⊙ **Less consumption of electricity and labour**	⊙ Systems require careful study of all the relevant factors like land topography, soil, water, crop and agro-climatic conditions, and suitability of drip irrigation system and its components
⊙ **Promotes sustainable agricultur**	⊙ **Salt piling:** Without sufficient leaching, salts applied with the irrigation water may build up in the root zone.
	⊙ **Poor economy of scale in Indian conditions**: Very low average landholding sizes in India (1.08 ha) coupled with poor financial conditions of Indian farmers decreases the economy of scale of the system.

8 Farm Subsidies

India is spending huge sums of money on incentivising and subsidising farmers to adopt new technology and also increase incomes.

Rationale behind subsidies

⊙ **Increased food production of the country**: Subsidies have helped the country to become one of the largest food grain producers globally. They make inputs affordable to farmers who cannot buy them, owing to poverty, lack of access to credit etc.

⊙ **Food security:** Subsidies play an important role in the overall food security of the nation and the poor and marginalized section of the population.

⊙ Cushion to the farmers during distress: During the volatility in the market MSP helps farmers to avoid distress sale. They act as a tool of equity between rich and poor farmers.

⊙ **Protection from external shocks:** Subsidies protect Indian farmers amid the high fertilizers and energy prices.

Failure of subsidies to increase the farm income

⊙ **High subsidies means low capital investment on agriculture**: High agriculture subsidies cause high burden on exchequer thus squeezing the budget in more productive areas like R&D investment and infrastructure development. These subsidies also have crowding out impact on private investment.

➤ **For ex:** This year's fertiliser subsidy is likely to cross ₹2.76-lakh crore.

⊙ **Subsidies are not permanent solutions**: Though subsidies act as a short-term relief measure during distress period like market failure, they are not a permanent solution.

⊙ **High inequality in agriculture**: Small and marginal farmers (owning less than 2 ha of land) who comprise about 86% of the country's total farmers have largely been left behind.

Impacts of subsidies on environment:

⊙ **Depletion of groundwater resources:** High power subsidy has resulted in water intensive crops like paddy being grown in the water stressed regions of Punjab, Haryana. In Punjab, groundwater extraction is 165% of the naturally-available recharge.

⊙ **Degradation of soil:** Subsidized urea has led to massive overuse of nitrogeneous fertilizers. Ex. N:P:K ratio in Punjab and Haryana is 25:5:1 going against the ideal ratio. This has damaged the soil and caused pollution to local water bodies through run-off.

⊙ **Skewed cropping pattern:** Intense cultivation of paddy Punjab because of high level of MSP. This goes against the agro-climatic conditions of the region.

9 Fisheries Sector

As per ICAR- CMFRI research, carbon emission from India's marine fisheries sector is much lower than the global level.

Significance of fisheries sector:

- **Large resource base:** India's more than 7500 km long coastline, vast freshwater resources, extensive Exclusive Economic Zone (EEZ) and sizable continental shelf region makes it the third largest fish producing country in the world accounting for 8% of global production.
- **Huge export potential:** Currently India is the 4th largest exporter of fish and fisheries products and total export is targeted to reach $14 bn by 2025. Thus, the sector is crucial to realize the full potential of agri-exports which currently stands at **$50bn in FY 2021-22.**
- **Link with the subsidiary sectors:** The sector stimulates growth of a number of subsidiary industries including the food processing sector. **Example** canned tuna, cod liver oil etc. are in high demand.
- **Support to marginalized communities:** The sector has been instrumental in sustaining the livelihoods of over **28 million people** in India especially for marginalized and vulnerable communities especially in the coastal areas. Many more are employed along the value chain.
- **Mitigation of hunger and nutrition deficiency:**Fish being an affordable and rich source of animal protein is one of the healthiest options to **mitigate hunger and nutrient deficiency** thereby contributing in the fulfilment of the Sustainable Development Goals (SDGs). The Government has been taking multi-pronged approaches to maximise the potential of 'Fish for Health and Fish for Wealth'.
- **Exports:**The fish production reached an **all-time high of 16.25 MMT during FY 2021-22 with marine exports touching Rs. 57,586 Crores**. India has emerged as a fish surplus country and has increased its exports of fish and fish products steadily in recent years. Diverse aqua products are exported from India to several countries across the globe.

Issues plaguing the fisheries sector:

- **Overfishing:**lead to declines in fish populations and can have ripple effects throughout the ecosystem. Overfishing can also lead to economic losses for fishing communities and can even lead to a collapse of entire fish stocks.
- **Bycatch:** It is unintended capture of non-target species when fishing for a certain species. This is a significant problem facing the fishing industry today, with estimates indicating that **40% of the total global catch is bycatch**. This is a significant wastage of resources and can also lead to the deaths of many marine animals, including endangered species.
- **Illegal, unreported and unregulated fishing (IUU):** IUU fishing can lead to overfishing, bycatch, and habitat degradation, which can have a negative impact on the population of specific species and the ecosystem balance. Additionally, it undermines the livelihoods of legitimate fishermen, as it reduces the number of target species available for harvest and sale.
- **Bottom Trawling:** It involves dragging a large net along the bottom of the ocean floor, which can cause significant damage to marine habitats. The practice stirs up large amounts of sediment, damaging coral species which provides shelter to deep-sea dwelling species.
- **Others:** Other destructive practices include **blast fishing** and **cyanide fishing** which are also illegal in many places but still continue to be used. These practices cause destruction to the underlying habitats disturbing the whole aquatic ecosystem.

Government measures to promote fisheries sector and achieve the goals of Blue Revolution:

- **Pradhan Mantri Matsya Sampada Yojana (PMMSY):** It is the flagship scheme of the government for the sector. It is a holistic scheme focusing inland and marine fisheries, infrastructure, farmers' welfare, skill development etc.
  - PMMSY has supported 31.89 lakh farmers from 22 states and seven UTs under insurance coverage and an additional 6.77 lakh farmers have been covered for livelihood and nutritional support during the lean/ban period.
- **Independent Ministry:** Recognising the importance of the fisheries sector, the Department

of Fisheries was created in February 2019 to provide sustained and focused attention to the development of the sector. This was followed by the creation of an independent Ministry of Fisheries, Animal Husbandry and Dairying in June 2019.

- **Fisheries and Aquaculture Infrastructure Development Fund (FIDF):** It is a dedicated fund provides concessional finance to the Eligible Entities (EEs).
- **Concessional credit under Kisan Credit Card:**To deepen the financial inclusion in this sector, the Government of India introduced insurance coverage for fishing vessels for the first time in fisheries and also extended Kisan Credit Card (KCC) facility to fishers and fish farmers to help them meet their working capital and short-term credit needs. It was a part of **Atmanirbhar Bharat Package.**
- Other than these schemes, the government has also taken steps addressing critical gaps in the value chain through technology infusion.

10 Farmers Distress Index

At the Central Research Institute for Dryland Agriculture (CRIDA), an Indian Council of Agricultural Research (ICAR) organ, the scientists have developed an early warning system called the 'Farmers Distress Index'.

Why Indian farmers are stressed?

- Increased shortage of fertilizers
- Fragmented land holding
- depleting water table
- deteriorating soil quality
- increasing input costs
- low productivity
- forced to borrow
- Limitations of loan waiver schemes to benefit 'very high' and 'high' distress farmers.
- Growing instances of Farmers' suicides

Significance

- Use of weather data derived from remote sensing technology, automatic weather stations, mobile telephony and artificial intelligence can help in identifying the distressed villages.
- The index can be used by the policy makers and the government to plan and design a timely and targeted method of supporting distressed farmers.

11 Role of Technology in Agriculture

Agriculture in India is faced with several challenges (climate change, low productivity, low water use efficiency, and low profitability) and is in dire need of paradigm shift due to increasing pressure of population accompanied with rising food demand. In this challenging scenario, technology can play a vital role in transforming the agriculture from subsistence based, non-remunerative activity to a modern enterprise.

Important roles played by technology

- **Monitoring and controlling crop management system via smartphone:** Farm data like yield mapping, soil sampling, moisture, intelligent software analysis for pest and disease prediction etc. can be done.
- **Automation: Example:** Automated irrigation, light and heat control, application of fertilizers in quick and efficient manner, removing weeds, harvesting of crops etc. Robots can address the issue of labor shortages as well.
- **Management of spatial data:** Geographic Information System (GIS) can be used to manage and analyze spatial data relating crop productivity and agronomic factors. It can integrate all types of information and interface with other decision support tools.
- **Quick information sharing:** Information related to weather, market signals etc. can be shared with the farmers quickly regardless of the location.
- **Development of resistant varieties:** Through use of biotechnology, disease and pest resistant varieties can be developed.
- **Promotion of climate smart agriculture**: Technology can help mitigate the devastating effects of climate change while producing food and energy in a sustainable manner.

Smart Farming

Smart farming is about using the new technologies which have arisen at the dawn of the **Fourth Industrial Revolution** in the areas of agriculture and cattle production to increase production quantity and quality, by making maximum use of resources and minimising the environmental impact. Also, the implementation of technology in agriculture and cattle production will make it possible to boost food security throughout the world.

Benefits of smart farming

The application of the above technologies has a positive impact on agriculture and cattle farming. Let's take a look at some of these improvements:

- **Increased production:** The optimisation of all the processes related to agriculture and livestock-rearing increases production rates.
- **Water saving:** weather forecasts and sensors that measure soil moisture mean watering only when necessary and for the right length of time.
- **Better quality:** analysis of the quality of the produce obtained in relation to the strategies applied makes adjustments possible to increase subsequent production quality.
- **Reduced costs:** automation of sowing, treatments and harvesting in the case of agriculture reduces the use of resources.
- **Pest detection and animal health:** early detection of infestations in crops or sickness in animals means that their impact on production can be minimised and animal welfare improved.
- **Better sustainability:** saving resources like irrigation water and getting maximum benefit from the land reduce the impact on the environment.

Initiatives by the government to promote smart farming:

- **Digital Agriculture Mission (DAM):** It includes India Digital Ecosystem of Agriculture (IDEA), Farmers Database, Unified Farmers Service Interface (UFSI), Funding to the States on the new Technology (NeGPA), Soil Health, Fertility and profile mapping etc.
- **Per Drop More Crop component of the Pradhan Mantri Krishi Sichai Yojana (PMKSY-PDMC):** **It** aims to increase water use efficiency at the farm level through micro irrigation technologies, i.e., drip and sprinkler irrigation systems.
- **Crop yield prediction model using artificial intelligence (AI):** NITI Aayog partnered with IBM for developing a crop yield prediction model using AI. This helps in providing real-time advisory to farmers.
- **Sensor-based Smart Agriculture (SENSAGRI):** It involves drones for monitoring soil and crop health. In this project, drones would be used for smooth scouting over land fields, for collecting precious information and transferring the data to farmers on a real-time basis.
- **Other steps:** Financial support to Agri-tech startups and promoting the adoption of AI to transform agricultural and farming trends.

12 Land Records

In recent years, India has taken proactive steps to digitize land records under the **Digital India Land Records Modernisation Programme (DILRMP)** to create an integrated land management system.

Significance of accurate land records:

- **High litigation:** A World Bank study states that some estimates suggest that land-related disputes account for two-thirds of all pending court cases in the country. A **NITI Aayog paper** suggests that land disputes on average take about 20 years to be resolved.
- **Access to credit:** Accurate land records provide legal proof of ownership, which is required for obtaining credit from banks and other financial institutions. Without proper land records, farmers may find it difficult to secure loans, which can limit their ability to invest in their land and improve their agricultural practices.
- **Government schemes:** The government of India offers various schemes and subsidies for farmers to invest in their land and improve their agricultural practices. Accurate land records are often required to access these schemes, as they provide proof of ownership and help to prevent fraud.
- **Planning and development:** Accurate land records are crucial for planning and developing infrastructure such as roads, water supply systems,

and other public amenities. This information is used to identify areas where development is needed, as well as for determining land acquisition and compensation rates.

- **Land transactions:** Accurate land records are essential for carrying out land transactions such as buying, selling, or leasing land. In the absence of proper records, disputes over land ownership can arise, which can lead to legal and financial complications.
- **Land consolidation:** Land consolidation involves combining small and fragmented land holdings into larger and more productive farms. Accurate land records are essential for identifying potential areas for consolidation, as well as for ensuring that the process is carried out in a fair and transparent manner.

Scope and relevance of block chain technology for digitization of land records in India:

Blockchain technology is a peer-to-peer protocol that can be leveraged to keep track of transactions over the internet. It has the potential to revolutionize the digitization of land records in India.

Significance of blockchain technology for digitalization of land records:

- **Decentralization:** Blockchain technology operates on a decentralized network, which means that the data is not controlled by a single entity or authority. This can help to eliminate the risk of fraud or corruption in the management of land records.
- **Secure land registries:** India: In 2018, the Uttar Pradesh government announced plans to introduce the block chain-based record-keeping system to secure the land registries and revenue records. A major reason is that 67 percent of the total 220 million people in the State are dependable upon the land to earn a living.
- **Transparency:** The use of blockchain technology can bring transparency in the management of land records. It can provide access to all relevant parties, including landowners, government officials, and banks, to the same set of data. This can help to reduce disputes and increase trust among stakeholders.
- **Efficiency:** Digitizing land records using blockchain technology can reduce the time and cost associated with manual record-keeping. It can also enable faster and more accurate land transactions and promote greater economic activity.
- **Reduction in fraud:** On a national scale, the Union Government, policy think tank NITI AAYOG has been working on building the country's largest blockchain network (India Chain) aiming to reduce fraud and building transparency in the system. India Chain will be linked to India Stack, a set of code developed around India's unique identity project Aadhar.

13 Food Processing Sector

MoFPI is implementing **Pradhan Mantri Kisan SAMPADA Yojana (PMKSY), Production Linked Incentive Scheme for Food Processing Industry (PLISFPI) and centrally sponsored PM Formalization of Micro Food Processing Enterprises (PMFME) Scheme** to increase the level of food- processing industry and encouraging rural entrepreneurship across the country including rural areas.

Status of Food processing industry in India: (infographic)

- The food processing industry has a share of 12.38% in the employment generated in all Registered Factory sector engaging approximately 1.93 Mn people.
- Unregistered food processing sector supports employment to 5.1 Mn workers as per the NSSO 73rd Round report.
- The industry has encountered a growth rate of around 11% in the recent past.
- India is ranked first in the production of milk, pulses and jute second in fruits and vegetables and third in production of cereals.

Significance of food processing industry

- **Essential part of the agriculture value chain:** The sector provides assured markets for agriculture commodities linking the upward and downward

supply chains. Market of processed food is less volatile than raw commodities as well.

- **Very high export potential of the industry:** India has achieved $50bn agriculture export in FY 2021-22 but it is currently dominated by raw materials and rice etc. Food processing sector can help diversify Indian farm exports basket and reach newer markets. India can take lead in horticulture, marine and dairy products among others.
- **Rising demand of processed food across the globe:** Rise in disposable income of consumers coupled with increasing demand for processed food like ready-to-eat cereals, canned food etc. provides additional opportunity to farmers.
- **Incorporation of technology:** The sector incorporates various technologies like food irradiation that increase the shelf life of commodities, especially horticulture, thus helping the commodities reach farther markets.
- **Link with the retail chains:** Online grocery retail in India has seen a CAGR of over 50% and projected to grow to $10 bn to 12 bn by 2025.

Initiatives taken by government:

- **Pradhan Mantri Kisan Sampada Yojana (PMKSY)**: aims at developing modern food processing infrastructure. PMKSY has been envisaged as a comprehensive package which will result in creation of modern infrastructure with efficient supply chain management from farm gate to retail outlet.
- **Pradhan Mantri Formalisation of Micro Food Processing Enterprises Scheme (PMFME):** aims to enhance existing individual micro-enterprises in the unorganized segment of the food processing industry.
- **Production Linked Incentive Scheme for Food Processing Industry (PLISFPI)**: aims to boost domestic manufacturing, increase exports, while supporting food manufacturing entities with stipulated Sales and willing to make investment for expansion of processing capacity and branding abroad to incentivize emergence of strong Indian brands. The scheme is EoI bases.
- **Other steps:** Kisan Rails, 100% FDI in food processing sector etc.

Impact of the policies on the sector

- The sector has been recording CAGR of more than 10% for the last few years on the back of policy support from the government.
- The exports of agricultural and processed food products rose by 13% in the nine months (April-December) of the current Financial Year 2022-23 in comparison to the corresponding period of FY 2021-22.
- The total FDI received in the food processing sector from April 2000 till December 2022 was $11.79 Bn. The FDI equity inflow in the Food Processing Sector for the period of April 2021-March 2022 was US$ 709.72 Million. The total FDI equity inflow in sector from April 2000 to December 2022 is $ 11.79 Bn.
- By 2025 the Indian Food Processing market is estimated to reach USD 535 billion and growing at a compound annual growth rate of 15.2%. Tier-II and Tier-III cities could mirror the trend visible in metropolitan areas, by consuming more processed food in the coming years.

CHAPTER

5

Foreign Trade & Capital

Topic of This Chapter

1	Foreign Trade Policy 2023
2	De-Dollarization
3	Currency Depreciation
4	Forex Reserve
5	A More Connected Global Economy Is a Double-Edged Sword: WTO

1 Foreign Trade Policy 2023

The Union Ministry of Commerce and Industry notified the Foreign Trade Policy 2023.

What is foreign trade policy 2023 about?

- **Motto:** Long term excellence and productivity.
- **Aim:** New policy aims to almost triple India's goods and services exports to 2 trillion dollars by 2030, from an estimated 760 billion dollars in 2022-23.
- The FTP 2023 aims at process re-engineering and automation to facilitate ease of doing business for exporters. It also focuses on emerging areas like dual use high end technology items under **SCOMET (Special Chemicals, Organisms, Materials, Equipment, and Technologies)**, facilitating e-commerce export, collaborating with States and Districts for export promotion.
- To process re-engineering and automation to facilitate ease of doing business for exporters.
- The policy emphasizes the use of automated IT systems with risk management systems for various approvals and codifies implementation mechanisms in a paperless, online environment.
- The policy also reduces fee structures and IT-based schemes to make it easier for MSMEs and others to access export benefits.

What is Foreign Trade Policy?

- Foreign trade policy are a set of guidelines and instructions which are established by **Directorate General of Foreign Trade (DGFT)** related to import and export of goods in India. This is announced after every 5 years.
- It creates various expectations for exporters, traders and manufacturers.
- India's foreign trade policy is guided by the **Foreign Trade (Development and Regulation) Act, 1992**, which was adopted when the economic policy reforms were initiated.
- **Foreign Trade Policy (2023)** is based on continuity of time-tested schemes facilitating exports as well as a document which is nimble and responsive to the requirements of trade.
- It is based on principles of 'trust' and 'partnership' with exporters.
- It replaced the extant policy 'FTP 2015-20'. The new FTP comes into effect from April 1, 2023.

Need for the policy:

India has reached record high Export Performance and India's Merchandise and Services exports are expected to cross record **USD 760 Billion in FY 2022-23**. A clearly demarcated FTP is required for promoting exports through collaboration, ease of doing business, identifying potential areas of trade relations and beneficial integration into the global economy.

What's new?

- The FTP 2023 introduces several new schemes, such as one time Amnesty Scheme for exporters to close old pending authorizations and start afresh.
- It also encourages the recognition of new towns through the Towns of Export Excellence Scheme and the recognition of exporters through the Status Holder Scheme.
- The policy also streamlines the popular Advance Authorization and EPCG schemes and enables merchanting trade from India.
- The policy builds partnerships with **state governments** and takes forward the **Districts as Export Hubs (DEH) initiative** to identify export-worthy products and services and resolve concerns at the district level.
- Another crucial aspect of the FTP 2023 is the promotion of exports from the **district level** and accelerating the development of the grassroots trade ecosystem.
- The policy also aims to prepare district-specific export action plans for each district outlining the district-specific strategy to promote the export of identified products and services.

Issues/Gaps in the policy

- **Ineffective at the present juncture:** India's foreign trade policy continues to be largely structured

on the earlier policy documents, and draws its legal basis from the three-decade-old Foreign Trade (Development and Regulation) Act; its incongruence with the needs of present times is obviously huge.

- **Lack of utilization of FTAs:** The government was unable to use the rules of the multilateral trading system as well as a majority of the 13 free trade agreements (FTA) that India has signed thus far.
  - In most of these agreements, India's trade deficit has ballooned and this is simply because the exporters have been unable to take advantage of the preferential market access that has been offered by the trade partners.
- **Lack of preparedness related to regulatory standards:** There is current pressure with India to devise Indian-specific standards, which is creating barriers to trade in a range of industry sectors. India frequently fails to notify the WTO of new standards and often does not allow time for discussion with its trading partners prior to implementation.

Significance of the scheme:

- **Better partnership:** The Foreign Trade Policy 2023 will achieve better export promotion by fostering partnerships between exporters, states, districts, and Indian Missions.
- **Ease of doing business:** The policy will prioritize enhancing the ease of doing business and targets emerging sectors, such as e-commerce and export hubs.
- **New boost to the Indian foreign trade:** India's exports **were $435 billion in 2015-16** when the previous policy was introduced and have grown nearly **75% to an estimated $760 billion in 2022-23.** New policy will give new boost to this export growth.

2 De-Dollarization

With recent developments in the global landscape like BRICS nations proposal of creating new currency for payments on cross border trade and Malaysia's decision to settle trade in Indian rupees have given fuel to de dollarization.

What is de-dollarization?

- DE-dollarization refers to a process where in countries tend to reduced their dependence on US dollar by replacing it with other currencies as the global reserve currency.
- The concept has gained momentum to undermine the predominance of US and its currency as a medium of exchange driving the world trade.
- BRICS (Brazil, Russia, India, China, and South Africa) nations are major proponents of de-dollarization.

Reasons why US dollar is losing its dominance:

- **The decline of American political influence:** around the world also plays a role here too since other nations no longer feel beholden by Washington's foreign policy dictates. **For Instance,** India (one of the close partners to the US) has been fearlessly trading with Russia, especially for discounted crude oil despite America's sanctions.
- **Rise of BRICS:** as a major economic bloc, working together to create their own currency system that would rival the US dollar as a reserve currency. The idea is to reduce dependence on the dollar and create a more balanced global financial system.
- **Chinese Yuan is becoming an important player in global trade** and investment making it popular to be used as a currency of exchange rather than relying solely on dollar.
- **Rise of Indian Rupee:** The pressure mounts on dollar with **Indian rupee coming up as a globally traded currency** as close to 18 countries has already signed up for the rupee settlement system.
- **Mounting Debt:** The question of America's mounting debt levels which could escalate the possibility of issues if countries hold their foreign reserves exclusively in US dollar.

Advantages of De-Dollarization:

- **Reducing Dependence on the US Dollar:** By using other currencies or a basket of currencies, countries can reduce their dependence on the US dollar and the US economy, which can help to mitigate the impact of economic and political changes in the US on their own economies.

- **Improving Economic Stability:** By diversifying their reserves, countries can reduce their exposure to currency fluctuations and interest rate changes, which can help to improve economic stability and reduce the risk of financial crises.
- **Increasing Trade and Investment:** By using other currencies, countries can increase trade and investment with other countries that may not have a strong relationship with the US, which can open up new markets and opportunities for growth.
- Direct Trade in country's national currency leads to saving on currency conversion spreads,
- **Reducing US monetary Policy Influence:** By reducing the use of the US dollar, countries can reduce the influence of US monetary policy on their own economies.

Challenges of De-Dollarization:

- **Currency volatility:** De-dollarisation can lead to increased currency volatility as countries transition to using new currencies for trade. This can create uncertainty for businesses and investors.
- **Limited acceptance of local currencies:** Local currencies may not be widely accepted outside of their home countries, which can create difficulties for international trade. Lack of liquidity: Local currencies may have limited liquidity compared to the US dollar, which can create challenges for large transactions.
- **Limited use in financial markets:** Local currencies may not have the same level of use in global financial markets as the US dollar, which can limit their usefulness for international trade.
- **Resistance from established players:** Established players in the global financial system, such as the US and other Western powers, may resist de-dollarisation efforts, which can create geopolitical tensions.
- **Implementation challenges:** There may be challenges in implementing de-dollarisation, including developing new payment systems and addressing legal and regulatory barriers.

3 Currency Depreciation

The Indian rupee depreciated by around 10 per cent against the US dollar in 2022 on account of sharp appreciation of the greenback, as the US Federal Reserve tightened its interest rate to check inflation amid the uncertainties surrounding the Russia-Ukraine conflict.

What do you mean by currency depreciation?

Currency depreciation is referred to as decline of a currency's value relative to another currency. Fundamentally, it is considered that currency depreciation provides avenues for more exports but Theory and past experience suggest we can't count on a weaker currency for an export boost until the global economy recovers.

Benefits of currency depreciation:

- Exports become cheaper, more competitive to foreign buyers. Therefore, this provides a boost for domestic demand.
- Travel to India gets cheaper; local industry may benefit.
- Those working abroad can gain more on remitting money to their homeland.
- Ultimately, it assists in reducing the current account deficit (CAD).

A country's exports primarily depend on two factors:

- Customer sensitivity to the export price. If export demand is highly price responsive, then a decrease in export prices raises export quantity more than proportionately, all else remaining the same. Export revenue, which is export quantity multiplied by price, therefore rises. If all other factors do not remain constant, especially if the export prices of competitors also decline, then the increase in our export demand and revenue, if any, would be less.
- Export demand depends on sensitivity to buyers' incomes, namely the income elasticity of exports. All else remaining the same, if the income elasticity of exports is less than one, then a decline in buyers' incomes leads to a reduction in export demand, but not too much. In contrast, a decline in buyers' income would reduce export demand and therefore export revenue significantly if the income elasticity is greater than one.

Recent global events such as Russia-Ukraine war, west driven inflation, spike in crude oil prices, COVID-19 has impacted the demand of commodities in the market due to decline in buying capacity of the customers. Hence, depreciation or weakening of a currency may not lift up the exports due to weak global demand, causing a domino effect where the economy is already hurting due to weakening of currency amid the global scenario and the exports not picking up due to weak global demand resulting in high Current account deficit (CAD) pushing the currency more into the blink of collapse.

Measures to arrest slide of Rupee:

We import crude oil in billions. Hence, the depreciation of the local currency is harmful to the economy. RBI has to intervene to stop the sharp depreciation. Below are some ways RBI can stop the rupee depreciation:

- **Sell forex reserves:** RBI can sell (it is already doing it) a part of its foreign forex reserves to control the falling rupee. In 2021, India's foreign exchange reserves stood at $642 billion. The latest data (September last week) show that the forex reserves have fallen to $545 billion. It had prevented a sharp fall in the Indian rupee, unlike other currencies.
- **Boost capital inflows in NRI accounts:** The RBI can take measures to encourage capital flows in NRI deposits. When the NRIs start to deposit money in India, they would be selling dollars to convert it to a rupee, which will help the cause. RBI can reach out to banks so banks can offer non-residents higher interest rates on deposits and short-term bonds.
- **Buy/sell swap:** In a buy/sell swap, the Indian currency is injected into the banking system, while taking out dollars. The swap will help the RBI keep the currency rates in check, although, in a limited way.
- **Cut non-essential imports and increase exports:** These include steps to curb the import of non-essential goods and encourage the export of domestic goods, which will help in addressing the current account deficit.
- Encouraging Indian borrowers to issue rupee-denominated **'masala bonds'** to facilitate the inflow of dollars and de-risk the economy from fluctuations in the exchange rate.

4 Forex Reserve

India's foreign exchange reserves saw a dip of $2.397 billion, dragging the position to a three-month low of $560 billion as on March 10, 2023 which has impacted the atmosphere of investment in the country.

Significance of Forex reserve:

- **To maintain liquidity in case of an economic crisis:** A central bank can step in and exchange its foreign currency for the local currency ensuring companies can continue to import and export competitively.
- **To meet a country's international finance obligations:** These could include paying debts, financing imports and absorbing sudden capital movements.
- **To fund internal projects:** Infrastructure or industry programmes are sometimes financed this way.
- **To reassure foreign investors:** Wars or internal unrest can spook investors who may look to move their money out of the country. Holding forex reserves can project an air of confidence and calm investors' fears.
- **To diversify their portfolio:** By holding different currencies and assets in reserve, a central bank can diversify its risk and provide protection should one investment decline.
- **Limits vulnerability:** helps limit any vulnerability because of a sudden disruption in foreign capital flows, which could happen during a crisis. Holding liquid forex thus provides a cushion against such effects and gives the confidence that there would still be enough forex to support the country's crucial imports in case of external shocks.
- **Support the domestic currency:** Forex are needed to support, maintain confidence for central bank action, whether monetary policy action or any exchange rate intervention to support the domestic currency.

Ways in which declining forex reserves impacts the investment atmosphere:

The fluctuations in foreign exchange rates first affects the country's central bank i.e. RBI. Mostly all foreign transactions are settled in US dollars and the

more foreign currency a country has, the easier it is to tighten monetary policy to support the domestic economy. But during the decline in forex the central bank has to bring in institutional changes that indirectly impact the investment level in the economy.

- **Erodes investor's confidence:** Declining forex reserves erodes the confidence of the investors in the country facing fluctuations as they become cautious about their returns on investments. Thus, the declining forex reserves play a key role in foreign investment escaping from the market during the time of uncertainties.
- **Balance of Payments:** A country pays for its external obligations in foreign currencies. During the decline of forex a country might not be able to service its debt obligation and might even default on its payment creating a dent on the economy's image in international market. i.e. India's 1991 BOP crisis.
- **Import and export:** in such a scenario, a country might not be able to import sufficiently to meet the domestic demand and after a while there might be a shortage of production of commodities in the domestic market caused due to liquidity crunch as manufacturing requires strong financial base impacting the export as well exports from a country making it much worse to accumulate foreign exchange.
- **Hinders growth and development:** Foreign investment is primarily used for stimulating a target country's economic development and create a more conducive environment for companies, the investor, and stimulates the local community and economy. It also helps create new jobs, build the country's infrastructure that can lead to an increase in income and more purchasing power to locals. But a reduction in foreign exchange impacts the atmosphere of investment which slows down the process of growth and development in a country.

Ways in which a country stabilizes the forex reserves:

- Halt capital outflows: RBI needs to halt the flow of capital outflows, ease norms around external commercial borrowings and introduce non -resident deposit schemes which could be helpful with currency depreciation pressures. Improving policies for the financing of local manufacturing and export of goods.
- Expansionary Monetary policy: In order to increase the exports from the country, RBI opts for expansionary monetary policy to infuse liquidity in the market and incentivize the businesses for production. RBI cuts on repo rates, CRR, SLR to make more money available in the market on low interest rates.
- Settlement of international trades in Indian Rupees: This is a major reform and has the potential to arrest Rupee depreciation in the long term as the country's demand for US dollars would decrease. However, this reform may be more attractive for trade with countries like Russia and Iran, which are facing US sanctions, thus arresting rupee depreciation.
- Encourage Indian corporates to raise foreign currency convertible bonds (FCCBs) and focus on improving the corporate debt market in India (a liquid CDS curve for any India corporate will give much-needed confidence to foreign investors).
- Strategic partnerships with oil exploring sovereigns with settlement done in Indian rupees. Additional steps like staggered payments for commodity imports and forward payment contracts (when macroeconomic conditions are favorable) can be explored. Building infrastructure and promoting the use of electric vehicles to reduced dependency on oil imports.
- Relaxing restrictions (with caution) on current account and capital account convertibility to allow free movement of rupee and other foreign currencies.
- Encouraging global firms to set up and expand workforce in India by providing them tax incentives and easing the rules on land acquisition.

5 A More Connected Global Economy Is a Double-Edged Sword: WTO

In its annual report on the status of global trade, the World Trade Organization finds that the increasing interconnectedness of the world's economies is a double-edged sword.

Background

- Globalizationis a multifaceted concept that describes the process of creating networks of connections around the world.

- It involves the interdependence of national economies and the integration of information, goods, labour and capital, to name a few.
- In recent years, globalization has been the subject of growing discontent and criticism, particularly after the COVID-19 pandemic.

WTO's take on connected world

- **Shock plus recovery:** While this globalization makes individual countries more vulnerable to short-term shocks, also allows them to recover far more quickly.
- **Better crisis management:**
- **Interconnectedness tied to stability**

Understanding 'Globalization'

- Globalization is the term used to describe the growing interdependence of the world's economies, cultures, and populations, brought about by cross-border trade in goods and services, technology, and flows of investment, people, and information.

India and Globalization

- The wake of globalization was first felt in the 1990s in India when the then finance minister, Dr Manmohan Singh initiated the economic liberalization plan.
- The new policy was called as **Liberalization, Privatization and Globalization Policy (LPG Policy)** or the **New Economic Policy, 1991.**

Since then, India has gradually become one of the economic giants in the world.

Components of Globalization

There are three major components of globalization: economic, social and political.

- **Economic globalization**
- **Social globalization**
- **Political globalization**

The changing globalization

- Globalization itself is evolving, with changes in global trade flows, capital flows, and the **Fourth Industrial Revolution.**
- **More trade flow**
- **Increasing trade in services**
- **Technology:** Technology has become a bigger force of globalization, changing cross-border mobility of goods and services, and capital flows.
- New technological revolution has huge spillovers and externalities.
- **Digitalization**

Challenges faced by India

- Demographic dividend
- Rapid technological change
- Technological gap and barrier
- Digital divide
- Socio-economic inequality
- Accessibility and affordability constraints

Positive sides of globalization	Negative side of globalization
◉ Competitive Markets ◉ Growing Economies of developing countries ◉ Diversified workforce ◉ Better Future to skilled manpower ◉ Better Products and services ◉ Sharing of technology and knowledge ◉ Cultural and heritage exchange	◉ Easy spread of vulnerabilities ◉ Occurrence of a catastrophe can affect the whole world. ◉ Confusing local system ◉ Exploitation of manpower ◉ Immigration challenges ◉ Affected culture and language ◉ Rapid urbanization

CHAPTER

6

Miscellaneous

Topic of This Chapter

1	Care Economy via Universal Basic Income
2	Women and Their Role in Economy
3	Widening Economic Inequality
4	Energy Poverty
5	Oil-proofing India's Economy

1 Care Economy via Universal Basic Income

With the recent study by ILO, the care giving economy can be a way for boosting post COVID economy of a country.

- Care giving economy will not only help in economic growth but it will also address several social issues like gender inequality and care for children and elderly in the society.

Universal Basic Income

- The 'care givers and economy' was first highlighted by the **National sample survey of India** by the report of **Family and health survey.**
- **Universal basic income-** To deal with the economic inequality, unemployment and poverty created by the Covid-19 pandemic, many advocated Universal Basic Income (UBI) programme to be a solution.

Will it benefit the Indian economy?

- Providing decent work for all to generate revenue and increase labour force participation.
- Extending social security for women and elderly-
- Gender role balancing
- Reduce burden for Informal work
- Health benefits
- Achieving the silver economy
- **Reduction in unemployment:** Unemployment rate in India reached a 45-year high of 6.1% in 2017-18, as per the recent NSS estimates. Care economy will help to reduce unemployment by giving care jobs in the sectors such as nurses, home care takers, child caring person and elderly cares.
- **Child care:** Child care services came to picture after female or mothers started participating in formal and informal jobs for helping the family income, which must be included in jobs to have gender neutral role in child care, e.g Paternity and maternity leaves

Challenges associated

- Lack of a comprehensive policy
- Poor infrastructure
- Out-of-the-pocket expenditure is increasing
- Introduction of incentives for private firms
- Lack of funds
- Subjectivity of the term 'Care' remains a major societal hurdle

2 Women and Their Role in Economy

Despite gradual gains over the decades, Indian women's economic well-being and financial independence remains a far cry, continually hindered by stubborn structural and societal barriers.

Contribution of women in economy

- Women in India represent 29 percent of the labour force, down from 35 percent in 2004.
- According to the World Bank, Indian women's participation in the formal economy is among the lowest in the world—only parts of the Arab world fare worse.
  - **Agriculture:** Even when they comprise almost 40 percent of agricultural labour, they control only 9 percent of land in India.
  - **Contribution to GDP:** It is therefore unsurprising that at 17 percent, India has a lower share of women's contribution to the GDP than the global average of 37 percent.

Challenges faced by women

- **Unpaid work:** More than half of the work done by women in India is unpaid, and almost all of it is informal and unprotected.
- **Lack of representation**: Women are not well represented in most sectors, including business leaders.
- **Lack of access to financial system:** Women are also shut out of the formal financial system. Nearly half of India's women do not have a bank or savings accounts for their own use, and 60 percent of women have no valuable assets to their name.
- **Physical insecurity:** Women in India also face great physical insecurity. The rate of crimes

against women in India stands at 53.9 percent in India.

Women, Business and the Law 2022

- The World Bank's "Women, Business and the Law 2022" report, outlines the importance of women's economic empowerment and involvement in business.
- The annual study, which looks into "laws and regulations affecting women's economic opportunity," scores and ranks 190 countries in eight areas: mobility, pay, parenthood, assets, workplace, marriage, entrepreneurship, and pensions.
- According to the 2022 report, "nearly 2.4 billion women globally don't have [the] same economic rights as men."

Positive impacts on Indian Economy of women's economic empowerment

- **Impact on GDP:** Around 27% rise in India's GDP with equal participation of women, which can add up to US$700 billion to GDP by 2025.
- Social benefits
- Women spend 90 percent of their income on their families, and economically empowered women boost demand,
- Have healthier and better-educated children, and raise human development levels.
- It has been reported that profits increase when efforts to empower women in emerging markets are made.

Sustainable Development Goals that can be achieved by economically empowering women:

- **SDG 1:** No poverty
- **SDG 4:** Quality Education
- **SDG 5:** Gender Equality
- **SDG 8:** Decent work and economic growth
- **SDG 10:** Reduced inequality

Initiatives by the Government

- Beti Bachao Beti Padhao Scheme
- Working Women Hostel
- Mahila E-Haat
- Mahila Police Volunteers
- STEP (Support to Training and Employment Program for Women)
- SWADHAR Greh
- Mahila Shakti Kendras (MSK)
- Self Help Group
- **India's MUDRA scheme:** The Government of India's MUDRA scheme to support micro and small enterprises and direct benefit transfers under the Jan Dhan Yojana seeks to empower women. (78% of total borrowers are women entrepreneurs)
- **One Stop Centre Scheme:** It is a centrally sponsored scheme and is funded through the Nirbhaya fund.

3 Widening Economic Inequality

Economic inequality in India has widened, with the richest 1 percent of the country owning 22 percent of the total national income, while the top 10 percent own 57 percent of the national income. Half of the population of our country is earning only 13.1 percent.

About economic inequality:

Economic inequality refers to the unequal distribution of income and opportunity between different groups in society. It reflects the disparities in incomes and wealth in a society. In India, the Periodic Labor Force Survey for the years 2017-18, 2018-19 and 2019-20 shows that the top 10% earn approximately equal to the bottom 64%. The top 10 account for one-third of the incomes earned.

Reasons why economic inequality is widening in India:

- **Low female participations:** Inequality of both income and wealth is exacerbated by one of the lowest female participations in the world which is just above 18% in 2021. According to the World Bank, 2021 overall labor force participation rate for India is as low as 46.3.
- **Jobless Growth:** India has had strong economic growth throughout the years, but this prosperity has not led to a reduction in poverty in the

nation. Since 1990, there has been an increase in income disparity between the bottom 50% of the population and the top 10%. It is clear that the services and industrial sectors were unable to produce jobs, despite the strong economic development.

- **Haphazard Transition:** The Inability of the industry and services sector to generate sufficient jobs for people migrating from agriculture is another reason for high economic inequality. Since 1990, there is a 10 percent decline in the workforce in the agriculture sector and subsequently 4 percent and 6 percent increase in industry and services sector respectively. There is not even a 1 percentage point increase in the workforce employed in the industry sector. i.e., it is a stagnant sector now which includes iron and steel, textiles, automobiles, IT, etc. are not sufficiently producing the jobs.
- **Inadequate social sector spending:**
  - **Insufficient education sector spending:** Education's percentage of overall spending has decreased over the past ten years, falling to 10.4 in 2020-2021. A family's ability to afford schooling can also push them below the poverty threshold.
  - **Healthcare as a luxury:** India's spending on public healthcare ranks among the lowest in the world. As a result, decent healthcare is a luxury only available to those who have the money to pay for it. India accounts for 17% of global maternal deaths, and 21% of deaths among children below five years.
- **Inflation:** Also a contributing factor to income inequality. Rising prices make it difficult for those on lower incomes to keep up with the cost of living, while those with higher incomes can afford to buy more goods and services without feeling the same pinch.

It is being considered that modern age technology can bridge the income gap and lead to inclusive growth while keeping up with the needs of the marginalized.

Ways in which emerging technologies can contribute to inclusive growth:

- **Transforming key sectors:** As a powerful enabler for growth, Artificial intelligence is expected to add $967 billion to the Indian economy by 2035, and $450–500 billion to India's GDP by 2025, accounting for 10% of the country's $5 trillion GDP target. Key sectors like healthcare, banking and finance, retail and automotive will double down on AI adoption. For example, in healthcare, AI is already being integrated into diagnostic algorithms for screening for diseases ranging from cancer to cardiovascular disease.
- **Hyper connected India:** The launch of 5G services in India marks a defining moment for both domestic and global 5G markets. It is predicted to contribute up to 2% of India's GDP by 2030. Alongside the rise of 5G, the focus on enabling India's hinterland with over 6, 30,000 villages will gain momentum. Access to broadband connectivity can transform rural communities – youth can leverage online vocational training to get up skilled and enhance their employability, farmers can benefit from technologies to enhance yields and artisans and micro entrepreneurs can tap into larger markets in India or overseas through ecommerce and financing.
- **Industry 4.0:** Digital supply chain, Digital Assistance, etc. are some of the technologies that will aid inclusive growth and development by 2025. Emerging technology on economic development in India is beginning to allow industries to rebuild the country's economic status in a post-Covid world. Under industry 4.0 new and emerging skills will be imparted to labors to and new technologies will be opted for in order to make the economy more productive addressing the capital output ratio.
- **Skill Based:** the evolution of new technologies and industrialization is skill based. With the emerging digitalization coming in the frame, low and semi-skilled workers shall be provided with an opportunity to adopt new skill set which will in turn enhance their productivity leading to increase in income and address economic inequality.

4 Energy Poverty

India's oil import bill soared to $119 billion in the fiscal that ended on March 31, as global energy prices exploded, following the return of demand and the Ukraine conflict.

What is energy poverty?

World Economic Forum defines energy poverty as the lack of access to sustainable modern energy

services and products. To be more precise, it is not only a matter of sustainability: energy poverty can be found in all conditions where there is a lack of adequate, affordable, reliable, quality, safe and environmentally sound energy services to support development.

What has fueled energy poverty?

Supply chain disruptions that emerged in the wake of the pandemic have contributed to output disturbances and the burst of inflation globally. The reach, severity and persistence of supply chain disruptions have far surpassed previous episodes. The future path of disruptions has first-order monetary policy implications, as it influences how quickly inflation can be brought back to target and at what macroeconomic cost.

Recent disturbances in the global supply chain contributing to increase in energy poverty:

- **COVID-19:** The widespread lockdowns in 2020 planted the first seed for today's supply chain disruptions. The abrupt freeze in economic activity crimped supply and depleted inventories, forcing businesses to seek new supplier relationships and reroute supplies, while disrupting the smooth coordination of global production.
- **Rebound in global demand:** The strong rebound in global demand in 2021 ushered in the second, more severe phase of bottlenecks. The demand rotation away from services towards goods proved larger and more prolonged than anticipated, with supply often unable to cope. Critical inputs such as semiconductors became scarce, affecting the production of many downstream industries.
- **Russia-Ukraine war:** The Russia-Ukraine conflict and COVID-19 lockdowns in China have recently exacerbated issues, affecting supply in certain sectors including consumer goods, metals, food, chemicals and commodities.
- **Strains in global production networks:** The lengthening of suppliers' delivery times across advanced economies since the end of 2020 is the most evident manifestation of widespread strains in global production networks.

The stated bottlenecks in global supply chain have created a long lasting impact on price of fuel, essential commodities putting substantial population in under developed and developing countries exposed to adverse effects of energy poverty.

Impacts of energy poverty on Economy and growth:

- **Rising cost of living:** Sky rocketing inflation hits households hard by rising food costs. As per market dynamics customers will have to severely cut back on expenditure putting demand for goods and services into uncertainty.
- **Labor unrest:** the rise in the cost of living will see workers demand wage increase to counteract the impact of inflation on their pay packets. Industrial actions aggressively up the pressure on supply chains. For example: Striking truckers in South Korea disrupted supply chains in summers of 2022.
- **Amplified energy shortages (the ripple effect):** Deficient energy supply not only impacts the present state of economy but also disrupts further manufacturing practices causing inflationary pressures. Further inflation not only impacts the prices of foods and essential commodities but directly effects energy costs. **For example:** Recently, during the wake of Russia Ukraine war rising gas prices and reduced supply from Russia not only impacted Europe which in depended directly on Russia for its energy operations but also less dependent countries like Pakistan which shortened its work week to lower energy demand.
- **Geopolitical uncertainty:** energy poverty creates a dampening impact among the members of the society which gives rise to corruption, increase in crime rates. If the situation goes uncontrolled then it can lead bigger crisis giving rise to geopolitical tensions.

5 Oil-proofing India's Economy

An RBI working paper has laid emphasis on the need to **oil-proof India's economy** with a government policy that promotes energy security and sustainability as extreme changes in global crude oil price are transmitted to sectoral indices of the Indian stock markets.

Background

- The rates of petroleum products are quite high in India and cannot be reduced due to the interest payments that the Indian Government has to do on **Oil Bonds** issued by the **Manmohan Singh regime.**

- Oil bonds were issued by the government between 2005 and 2010 to insulate consumers from price shocks.
- They are issued by the government to compensate oil marketing companies for not passing on the higher costs to consumers.

Oil bonds are issued by the government to compensate **oil marketing companies (OMCs)** to offset losses that they suffer to shield consumers from rising crude oil prices.

Why were the Oil Bonds issued?

- To insulate the consumers from rising prices of petroleum products and to avoid the ballooning of government's **fiscal deficit.**
- As the government of the time wanted to avoid **burdening the consumers** to pay the whole amount, they directed the **Oil Marketing Companies (OMCs)** to sell the petroleum products at cheaper rates (controlled price).
- However, compensating the OMCs for the difference in value between the actual price and the retail price of petroleum products was necessary from the point of view of their **financial viability.**

What would have been done instead of oil bonds?

- Ideally in the above situation, it must have been the government of the time who should have paid for the difference in price but that would have increased the **fiscal deficit** of government and thus constraint it from undertaking welfare measures.
- It has to be also remembered that the global recession came about in **2008** causing economic slowdown all around the world including India.
- The priority of Indian Government therefore at this time was to utilise its limited fiscal resources for the purpose boosting economic activities in the country.
- An alternative path therefore was taken up by the Manmohan Singh government under which Oil Bonds were issued to the OMCs.
- It is prudent to remember that, in essence, these bonds are like **promissory notes** of deferred payment of subsidies that the government owes to oil marketing companies.
- Since the government did not subsidise these companies upfront, these payouts did not show up in budget documents, until the repayment of the principal or interest components took place.
- As a result petroleum products were made available to the people of India without increase seen in the fiscal deficit at that point of time and OMCs being saved from dreadful under-recoveries.

What are the other factors causing high price of petroleum products in India?

- **Dependency on imports**; increased price level in international markets leading to increase in oil price in domestic market.
- **Deregulation Policy:** It means that the retail price of fuel in India will be dictated by their actual price in the market with government providing very little to no subsidy.
- **Ukraine war** has let to economic sanctions been applied on Russia, who is one of the major exporters of hydrocarbon globally, causing the skyrocketing of fuel prices.

What are the effects of high fuel prices on Indian Economy?

- Petroleum products are non-substitutable imports and not buying them is out of question. Their high prices though severely impact the economy of India as a whole.
- Inflation in their cost leads to upswing of the input price of nearly all items of consumption and use.
- These leads to downfall of savings of the people of the country and that in turn negatively effects the capital available for investment in India.

ENVIRONMENT

CHAPTER

1

Biodiversity

Topic of This Chapter

1	The Question of Biodiversity (Relocation of Cheetahs)
2	Human Animal Conflict
3	Joymala's Case Flags Gaps in Private Ownership Norms for Elephants
4	Tiger Census 2022
5	Forest Fires, a Threat to Uttarakhand's Unique Biodiversity
6	A New Global Biodiversity Framework
7	Amendment to Wildlife (Protection) Act and protection of India's Wildlife

1 The Question of Biodiversity (Relocation of Cheetahs)

India is once again home to the majestic presence of cheetah, the **world's fastest land animal,** this has been done under the **'Action Plan for Introduction of Cheetah in India'**. As part of the project, 50 cheetahs are to be introduced (implementation **by Wildlife Institute of India + Wildlife Trust of India + MoEFCC) in over five years.**

Why does India need Cheetah?

- **Ecosystem boost:** Cheetah reintroduction would help restore the country's biodiversity and ecosystem.
- **Balancing the chain**: Cheetahs, as apex predators, play an important role in maintaining the balance of the food chain and can help control the population of prey species.
- **Economic benefits:** The reintroduction of cheetahs could help boost tourism and create employment opportunities in rural areas.

Issues with the Project

- **Adaptability**: African Cheetahs need long open spaces to run. **Indian parks tend to be much smaller than those in Africa, offering less chance for such free movement.** There are concerns related to their breeding issues. 3 Cheetah has died till now has raised concerns about their adaptability.
- **Coexistence of large predators:** Concerns have been raised about the coexistence of 4 big cats like **cheetahs, lions, tigers, and leopards**. Nowhere such case has been found. Studies has shown that leopard has hunted cheetah. While Kuno NP has 50 Leopards.
- **Rehabilitation Concerns:** Many villages has to be relocated to carry successful implementation of the project. This will certainly impact the locals and cause disturbance and migration.

Why Kuno National Park?

- The park has an **adequate prey base and is devoid of human settlements.**
- It forms **a part of the Sheopur-Shivpuri deciduous open forest landscape** and serves as an **important wildlife corridor** thus **very suitable for conservation**.

As India is rich in biodiversity and its wild population, **losing out a significant species like cheetah in the past was not dwelling well and thus the reintroduction project** in all its totality is a step in right direction for conservation of **flagship and umbrella species** like cheetah in India.

2 Human Animal Conflict

The report, titled, **"A future for all - the need for human-wildlife coexistence"**, by the **World Wide Fund for Nature (WWF)** and the **UN Environment Programme (UNEP)** has stated that conflict between humans and animals is one of the main threats to the long-term survival of some of the world's most iconic species.

Highlights of the Report

- Globally, conflict-related killing affects more than 75 per cent of the world's wild cat species.
- Besides, many other terrestrial and marine carnivore species such as polar bears and Mediterranean monk seals as well as large herbivores such as elephants are affected.
- Global wildlife populations have fallen at an average of 68 per cent since 1970.

Factors for Human-Wildlife Conflict

HWC results from a variety of ecological and anthropogenic drivers that exert pressures on landscapes where humans and wildlife share space

- **Ecological drivers:** It includes seasonal changes, natural calamities, and animals' life cycles, as well as the movement patterns of animals.
- **Anthropogenic drivers:** It includes various factors, such as habitat loss, changes in land use, livestock management, expansion of agricultural practices, climate change, resource extraction, infrastructure development, and urbanisation
- **Complex web of interactions** : Each negative impact emerges from a complex web of

interactions between drivers, making it extremely difficult, if not impossible, to view the effect of one driver in isolation

CASE STUDY

- **In Sonitpur district in Assam**, destruction of forests had forced elephants to raid crops, in turn causing deaths of both, elephants and humans.
- In response, WWF India had developed the 'Sonitpur Model' during 2003-2004 by which community members were connected with the state forest department.
- They were given training on how to work with them to drive elephants away from crop fields safely.
- WWF India had also developed a low-cost, single strand, non-lethal electric fence to ease the guarding of crops from elephants.

The means to prevent and reduce HWC have changed relatively little over time, but the socio-cultural, economic, and physical geographies of landscapes where conflict plays out have been radically transformed by ever growing human enterprises. Thus, global community should come together and collaborate to implement and scale up integrated and holistic approaches to HWC management.

3 Joymala's Case Flags Gaps in Private Ownership Norms for Elephants

The on-going dispute between the Governments of Tamil Nadu and Assam over the alleged mistreatment of a temple elephant named ***Joymala*** has brought into focus the prevailing lacunae over private ownership of elephants in India.

Why private ownership of elephants is a concern?

- As per the MoEFCC, it's illegal to hold elephants in captivity without **ownership certificates**.
- **Kerala, Uttar Pradesh, Karnataka, Assam, Tripura and Madhya Pradesh** account for **96%** of elephants in captivity without ownership certificates.
- Captive elephants are provided a poor diet and inadequate food. Due to a limited diet, elephants can suffer from intestinal infections, lung-related injections, or impactions.
- It also leads to an increase in "**black marketing**" of elephants.

Important Animal Rights Organisation

- Animal Welfare Board of India
- People for the Ethical Treatment of Animals (PETA)
- People for Animals
- Federation of Indian Animal Protection Organizations (FIAPO)

What do the rules say regarding Ownership of Elephants in India?

- Rules only allow for elephants to be exchanged or donated to temples or between private individuals.
- However, without an ownership certificate, the keeping of any elephant in captivity by a **private individual is illegal**, as per the new amendments to the **Wildlife Prevention Act.**

Impacts

Important Government Initiatives:

- Project RE-HAB
- Use of LiDAR technology

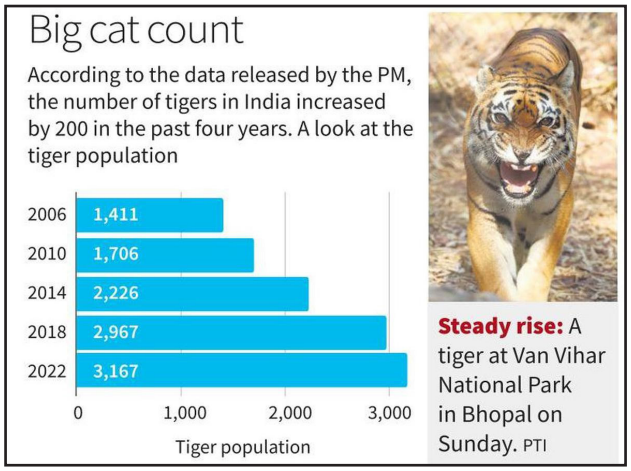
- **Illegal Elephant trafficking & trade**: Elephants are also poached for meat, leather, and body parts with the illegal wildlife trade putting elephants increasingly in danger.
- **Threat to Elephant habitat:** The loss of habitat due to deforestation increases in mining and agricultural activities has become problematic, especially for Asian elephants.

4 Tiger Census 2022

The tiger population numbers were made public by Prime Minister, at an event to mark the **International Big Cat Alliance conference** as well as the **50th anniversary of Project Tiger**.

Key Findings of Tiger Census, 2022:

- According to the recent findings, India has at least **3,167 tigers in total**.



- This is ostensibly an increase since the last census of 2018.
- There were **2,967 tigers recorded in 2018**, and 2,226 in 2014.
- **Regional upgradation**:
  - The tiger population has grown the most in the **Shivalik hills and Gangetic flood plains**, followed by central India, the north eastern hills, the Brahmaputra flood plains, and the Sundarbans.
  - There was a decline in the **Western Ghats numbers**.

International Big Cat Alliance conference (IBCA):

- To commemorate 50 years of Project Tiger, the International Big Cat Alliance (IBCA) was launched for conservation of **seven big cats** namely **Tiger, Lion, Leopard, Snow Leopard, Cheetah, Jaguar and Puma** harbouring our planet.

Need for Tiger Conservation:

- **Barometers of Ecological health**: Tigers are indicators of the ecological wellness of planet earth. Being the dominant predators of the ecosystem, they ensure that the numbers of herbivore like deer are kept balanced
- **Umbrella species**: Tiger is an umbrella species whose conservation eventually leads to the conservation of many other species such as the ungulates, pollinators and other small animals.
- **Carbon storage value**: Poaching or killing of large bodied vertebrates such as tigers results in increase of herbivore population, which in turn results in forests getting decimated
- **Decline in the tiger population**: There is a tremendous decline in the tiger population as compared to the past 100 years and to prevent the deteriorating condition of tigers, it's important to conserve them.

Facts: ***29th July*** is observed as **International Tiger Day (ITD)** to promote the conservation of the striped cat as well as to advocate a global system for protecting its natural habitats.

What are the dangers confronting the tiger population in India?

- **Illegal poaching** – A large number of people across the world take pride in possessing skin, claws, nails, teeth and trophies of the tiger. Every part of the tiger has great market value leading thus promoting hunting by professional poachers, local hunters, trappers, pirates and villagers.
- **Man-animal conflict**– When tigers come in contact with human settlements local antagonism against tigers often erupts into a serious problem.
- **Encroachment**– human encroachment of tiger habitats for livestock grazing, infrastructure expansion and farming is a cause of concern.
- **Peak carrying capacity**– many reserves are approaching the peak of their capacity at sustaining their populations. Depletion of prey in tiger zones is a cause of concern.
- **Small core habitats**– The core habitats of the tigers in the country are very small. It is only with the addition of buffer zones that protection has become possible. Fragmentation of tiger habitats is a major cause of decreasing tiger population by reducing opportunities for these animals to inbreed. Few tiger reserves don't have any tigers left. In the northeast parts of the country their population has fallen significantly.
- **Infrastructural development**– Linear development such as railways and roadways are a serious threat to the tiger habitats.

- **Climate change**-Due to the global rise in temperatures the tigers along with other species are shifting their belts and migrating upwards towards colder regions.

Suggestive measures:

- Creating tiger corridors where the gene pool exchange would to take place is necessary.
- Corridors have to be built between the existing tiger reserves so that their population can freely move.
- Social upliftment of the communities living in and around the forests must be ensured so that their economic dependence on forest resources becomes lesser.
- Pench Kanha tiger reserve is a good example of development with conservation, where elevated national highway passes through the national park, without disturbing the wildlife.
- Involving the local communities into conservation efforts and sensitizing them about the importance of ecological conservation is the key.
- The tiger conservation approach has to be more dynamic and futuristic by mitigating the effects of climate change on wildlife.

5 Forest Fires, a Threat to Uttarakhand's Unique Biodiversity

Forest fires are becoming more frequent and fierce in Uttarakhand.

What's at stake?

- Uttarakhand is home to at least 102 species of mammals, 70 reptiles, 19 amphibians, and 124 species of fish. The state also boasts of **600 species of birds.**
- The **International Union for Conservation of Nature (IUCN)** classifies 55 of the bird species as "threatened", of which six are critically endangered and four are endangered.
- Several mammalian fauna found in the state are also classified as endangered. The list includes the **Asian elephant, tiger, Alpine musk deer, Himalayan musk deer, leopard, snow leopard, blue sheep, Himalayan Thar, leopard cat, Himalayan black bear, sloth bear and pangolin.**
- With 7,000 species of plants, Uttarakhand contributes **31 per cent of the country's floral diversity.** As many as 119 flowering plants are endemic to the state.

How does it impact?

- **Loss and displacement of species:** The impact of recurrent forest fires in Uttarakhand is not limited to the direct loss of trees and wildlife, their displacement and subsequent colonisation of unwanted species.
- **Pushing towards extinction:** Forest fires can meddle with the life cycle of species and push many of the threatened and endemic species closer to extinction.
  - **Affecting growth:** By destroying the leaves and foliage, a forest fire can significantly reduce the photosynthetic activity of surviving trees and thereby affect their growth.
  - **Affected seedlings:** It can also damage the seed bank, both above and below the ground, and wipe out the seedlings and saplings growing on the forest floor.
- **Impact on recovery rate:** The loss of **keystone organisms** in forest ecosystems, such **as invertebrates, pollinators, and decomposers,** can significantly slow the recovery rate of the forest.
- **Serious impact of reproduction:** Forest fires can also interfere with the reproduction and propagation of certain plants and animals. Such recurrent events can be deadly to the species that are native or endemic to the region.

Suggestive measures

The below steps would not only minimise instances of forest fire but also protect biodiversity from such an event.

- **Collect fuel load in time:** Pine needle and dry leaf litter are the common fire materials that occur on the forest floor. These should be cleared by collecting them before January, when the fire season begins in Uttarakhand.
- **Fix fire line:** Creation of fire line is often delayed in Uttarakhand. This pattern needs to be changed and a timely (before February) excavation of the fire line should be ensured.

- **Install fire watch towers:** There is an urgent need for these towers in this hilly state with undulating topography, especially in areas that have a history of a forest fire.
    - **Applying management techniques:** There is also an urgent need to understand management techniques such as promoting habitat-specific research to limit burning especially in biodiversity-rich and water supply areas establish a well-equipped centre for unbiased dissemination of information

6 A New Global Biodiversity Framework

In Montreal, member governments have agreed on a new framework, ***"Kunming-Montreal Global Biodiversity Framework (GBF)"*** to halt the sharp and steady loss of biological species at the **Convention on Biological Diversity (CBD).**

Why to protect biodiversity?

- **Ecosystem Stability**: Different species play vital roles in maintaining the balance of ecosystems, such as pollinating plants, decomposing organic matter, and regulating populations of other organisms thus ensuring the stability of ecosystems.
- **Human Health**: Many medicines, including those used to treat cancer, malaria, and other diseases, are derived from natural compounds found in plants, animals, and microorganisms.
- **Food Security**: A diverse range of plant and animal species is needed to maintain resilient agricultural systems.
- **Economic Benefits**: Many industries rely on diverse ecosystems, such as tourism, forestry, fisheries, and agriculture.
- **Climate Regulation**: Forests, for instance, act as carbon sinks by absorbing carbon dioxide and reducing greenhouse gas emissions.

Threats to Biodiversity

- **Habitat Loss**: Activities such as deforestation, urbanization, agriculture, and infrastructure development result in the loss of ecosystems and the fragmentation of habitats.
- **Climate Change**: Rising temperatures, changing rainfall patterns, and extreme weather events can disrupt ecosystems, affect species distributions, and cause habitat loss.
- **Pollution**: Chemical pollutants, such as pesticides, herbicides, and industrial waste, can contaminate ecosystems and harm various organisms, including plants, animals, and microorganisms.
- **Overexploitation and Illegal Wildlife Trade**: Unsustainable hunting, fishing, and harvesting of wildlife, both legal and illegal, can severely deplete populations of various species.
- **Invasive Species**: Non-native species introduced to new areas can outcompete and displace native species, disrupting ecosystem balance and reducing biodiversity.

What is Kunming-Montreal Global Biodiversity Framework (GBF)?

- The Global Biodiversity Framework is considered equivalent to the Paris Agreement on climate change in terms of its significance for protecting biodiversity.
- The **15th Conference of Parties (COP15)** to the UN Convention on Biological Diversity (CBD) adopted the Kunming-Montreal Global Biodiversity Framework (GBF).
- The **framework has 23 targets** that the world needs to achieve by 2030.

Key Points about Kunming-Montreal Global Biodiversity Framework (GBF):

- Through Kunming-Montreal Global Biodiversity Framework (GBF), **countries agreed to protect 30 percent of the planet by 2030.**
- The countries **pledged to achieve 23 targets to reverse ecosystem degradation** under four overarching goals for the survival of the natural world.
- Under the GBF, **countries also agreed to reduce harmful government subsidies worth 500 billion dollars annually**, while vowing to identify subsidies that are harmful to biodiversity by 2025.
- Its other targets **include reducing the use of pesticides by half** and raising annual international financial flows from developed to developing countries to at least 20 billion dollars by 2025 and to at least 30 billion dollars by 2030.

What funding arrangements are planned?

- **By 2030, the GBF hopes to see at least $200 billion raised per year from all sources** — domestic, international, public, and private — towards the implementation of the national action plans.
- In terms of international funding, **developing countries should get at least $20 billion a year by 2025** and at least $30 billion by 2030 through contributions from developed countries.
- The **Global Environment Facility (GEF),** a multilateral body that partners with countries and agencies, has been asked to establish in 2023, and until 2030, a Special Trust Fund to support the implementation of the GBF.

The GBF is aligned with **UN Sustainable Development Goals**, three of which directly deal with the environment and thus with biodiversity i.e. **Goal 13** (climate action), **Goal 14** (life below water) and **Goal 15** (life on land). Thus the countries should implement the GBF in letter and spirit.

7 Amendment to Wildlife (Protection) Act and protection of India's Wildlife

The **Wildlife (Protection) Amendment Bill, 2022,** which seeks to strengthen the protection of endangered species and enhance punishment for illegal wildlife trade, has been passed in **Rajya Sabha by a voice vote**.

What is the need for Amendment?

- **Threat of blacklisting:** India has been blacklisted by CITES once before, and if a second blacklisting were to happen — then India will no longer be able to trade in important plant specimens.
- **Ambiguous listing:** The rationalization needed to be done because there were many discrepancies in the schedules and they were also ambiguous.
- **Non-uniform listing:** Some species were listed under English names, others under scientific names, some under families, and others under orders.
- **Issues in implementation:** Such a categorization was very confusing for wildlife and forest officials on the ground to implement.
- **Constant threats to wildlife:** There are constant threats to the wildlife like Illegal Wildlife Trade, Habitat Destruction, Human-animal conflict etc.

Significance of the amendments

- **Decentralization:** The Bill aims to decentralise wildlife protection, with the establishment of Standing Committees of State Boards of Wildlife, which can regulate permissions to various projects based on their impact on the wildlife, without having to refer to the **National Board for Wildlife.**
- **Streamlining the legislation**: The bill also aims to streamline the schedules mentioned in the original Act, shrinking them from six to four.
- **Greater protection**: Wildlife Management Plans crafted for wildlife sanctuaries and parks in the country will be brought under the jurisdiction of the Act, thereby increasing the scope for stricter protection for various species.
- **Increased penalty for wildlife crimes:** The Bill increases penalties for wildlife crimes which can act as a deterrence for such crimes. **For example**, offences that attracted a fine of Rs 25,000 now attract Rs 1 lakh.
- **CITES:** There's a new and separate chapter on regulating species involved in international trade according to the **Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)** Specifically, the Bill prohibits possessing, trading and breeding species without prior permissions from CITES authorities.
  - ➤ India became party to CITES in 1976.
- **Invasive alien species**: The Bill also recognises threats that invasive alien species pose. This will address the treats emerging from the alien species. An infamous example is the weed called **mesquite**.

Issues

- **Effect on elephant population:** The bill allows for commercial trade in elephants which is problematic because it effectively gives legal sanctity to commercial trade in live elephants.
  - ➤ Wild Asian elephants are taken from forests, often illegally, to maintain the high demand

for captive elephants. This could affect wild populations of elephants.

- **More power to centre:** Another amendment in the bill has given excessive delegation and unrestricted power to the Central government to declare a species as Vermin
  - Once a wild animal is declared as vermin, it enjoys no legal protection and has the same status as a domestic animal. It can be killed, traded, and tamed.
- **Permission for film shoot: Section-28 (b)** has been amended to grant permission for film-making without causing any adverse impact to habitat/ wildlife. Earlier, Film shooting was banned in **1978 to avoid accidents and tragedies.**
- **Research and habitats**: The bill also lacks to encourage the importance of including research and habitats in the Preamble and creating enabling provisions.

Conclusion

There is a dire need for joint effort of Government furthermore, Stakeholders with NGOs for various projects worry to protection of biodiversity and natural life government assistance. Government ought to endorse enactment for illicit exercises that drives biodiversity to the edge of termination. There ought to be open mindfulness about wildlife conservation significance through social, print and electronic media.

CHAPTER

2

Conservation

Topic of This Chapter

1	Green Hydrogen
2	Indian Solar Power Dream
3	Agroforestry
4	Need of Legal Rights to Animals, Trees, and Rivers
5	E-waste
6	Miyawaki Forests, a Sustainable Way for Ecological Eestoration
7	UN Declares Access to a Clean, Healthy Environment as a Universal Human Right
8	The Energy Conservation (Amendment) Act, 2022
9	Biofuels

1 Green Hydrogen

The Union Government has approved **Rs 19,744 crore for National Green Hydrogen mission** that aims to make India a 'global hub' for using, producing and exporting green hydrogen.

Significance of Green Hydrogen:

- **Meeting INDC targets**: Green hydrogen energy is crucial for India to meet its Nationally Determined Contribution (NDC) Targets and ensure regional and national energy security, access and availability.
- **Energy Storage: Green Hydrogen** can act as an **energy storage option,** which would be essential to meet intermittencies (of renewable energy) in the future.
- **Reducing Import Dependence:** Green hydrogen will reduce **India's import dependency on fossil fuels, which is largely imported from the foreign countries.**

Steel Industry: It is also used in the **steel industry,** a sector which is under considerable pressure in **Europe because of its polluting effect.**

How will Green Hydrogen Mission help India's green hydrogen aspirations?

- **Push to domestic manufacturing of electrolysers:** The lack of domestic electrolysers capacity is the biggest challenge for the industry to take off. The prime goal of the mission is to solve this issue by developing domestic manufacturing of electrolysers through financial allocation.
- **Thrust to R&D activities for the sector:** The Mission focuses on the investments on the research and development in the green hydrogen. This will help in developing **globally competitive technologies** in the country.
- **Export potential: The Mission will help India in becoming** a **leading producer** of green hydrogen in the world and creation of **export opportunities** for it and its derivatives.

Challenges for the adoption of green hydrogen

- **High cost of producing green hydrogen:** Due to low economy of scale currently, there is very high cost associated with the manufacturing and adoption of green hydrogen.
- **Still a nascent technology:** Being relatively **new player in the energy basket,** there are still some apprehensions about the wider adoption of the technology**.**
- **Energy source challenge:** Green hydrogen requires renewable energy as a source of electricity. According to some reports, India will need **additional capacity of 125 GW** of renewable energy to meet its green hydrogen 2030 targets.
- **High demand of water in producing green hydrogen:** It has been estimated that the production of one kg of hydrogen by electrolysis requires around nine liters of water. As several parts of India are already facing severe water stress, uninterrupted supply of the resource will be a challenge.
- **Lack of an ecosystem around the green hydrogen:** Currently, most of the demand for hydrogen comes from the chemical industry to produce ammonia for fertilizers**. Transport industry** around the green hydrogen is yet to be developed.

Green hydrogen has the potential **to maximize de-carbonization** of the energy sector and use of energy in sectors such as **transport, buildings and industry**. It is also crucial to achieve **India's net zero emission** target by 2070. Currently, green hydrogen is where solar energy was 10-12 years ago.

2 Indian Solar Power Dream

The Government of India has aimed to expand India's renewable energy installed capacity to 500 GW by 2030, from which 280 GW is expected to come from '**Solar PV'.** This makes the deployment of nearly **30 GW of solar capacity** necessary every year**.**

India's targets and achievements

- India's total installed renewable energy capacity touched 168.96 GW mark by February 2023-end. Out of the total 168.96 GW-

- 64.38 GW is solar power capacity
- 51.79 GW hydro
- 42.02 GW wind
- 10.77 GW bio power

Significance of Solar Energy

- **Energy security**: India heavily relies on imported fossil fuels to meet its energy demands. By harnessing solar energy, the country can reduce its dependence on foreign oil and gas, enhancing its energy security and reducing vulnerability to fluctuations in global fuel prices.
- **Environment-friendly**: Solar energy is a clean and green source of power. It produces no greenhouse gas emissions or air pollutants during operation, thereby mitigating climate change and reducing environmental pollution.
- **Rural electrification**: A significant portion of India's population, particularly in rural areas, lacks access to reliable electricity. Solar power offers a decentralized solution to meet the electricity needs of remote and off-grid communities.
- **Job creation**: The solar energy sector has the potential to generate substantial employment opportunities in manufacturing, installation, operation, and maintenance of solar power plants.
- **Cost competitiveness**: Over the years, the cost of solar power generation has significantly declined, making it increasingly competitive with conventional sources of energy.

Challenges:

- **Dependence on Imports:** Indian solar companies **depend heavily on imports**, as India presently does not have enough module and cell manufacturing capacity. The demand-supply gap gets widened as we move up the value chain.
- **Limited manufacturing capacity:** India currently manufactures only **3.5 GW of solar cells** and has a **limited solar module manufacturing capacity of 15 GW**.
  - **India has no manufacturing capacity for solar wafers and polysilicon ingots**, and currently **imports 100% of silicon wafers** and around **80% of cells** even at the current deployment levels.
  - **Raw Material Supply:** Raw materials like **silver and aluminium metal pastes** which are crucial for making electrical contacts are **almost 100% imported.** Silicon wafer, the most expensive raw material, is not manufactured in India.
- **Poor investment in research**: India has not invested enough in creating centres to try and test solar technologies in a cost-effective manner. E.g., **IMEC Belgium or the Holst Centre in the Netherlands.**
- **Usage of Older Technology:** Indian manufacturers depend on older Al-BSF technology (Aluminium Back Surface Field Solar Cells), which has low efficiencies of 18-19% at the cell level and 16-17% at the module level.
  - Presently cell manufacturing worldwide has moved to **PERC (22-23%)**, **HJT (~24%), TOPCon (23-24%)** and other newer technologies, yielding module efficiency of >21%.
- **Land Issues:** Producing more solar power for the same module size means more solar power from the same land area. Land is scarce in India — and the Indian industry has no choice but to move towards newer and superior technologies as part of expansion plans.

Government Initiatives:

- **PLI scheme to Support Manufacturing**
- **Levying Custom Duties on Import of Solar Cells & Modules**
- **Domestic Content Requirement (DCR)**
- **Modified Special Incentive Package Scheme (M-SIPS)**
- **Solar Parks Scheme**
- **Central Public Sector Undertaking (CPSU) Scheme**

Way forward

- **Strong industry-academia collaboration**: It will result in the development of home-grown technologies which could assist the industry and its participants in an innovative manner.
- **Boosting Local Manufacturing**: India should move up the value chain by making components

locally that could drive the price and quality of both cells and modules.

- **Creation of PV manufacturing Parks**: India needs to set up industry-like centres to work on specific technology domains with clear roadmaps and deliverables for the short and long term.
- **Solution for land shortages: floating solar plants** offer a great deal of potential by utilizing the surface of water bodies, for example, Ramagundam Floating Solar PV Project at Ramagundam, Telangana.

3 Agroforestry

In order to aid carbon-neutral growth, India needs to stress working extensively toward agroforestry in the country.

Significance of Agroforestry

- **Increased productivity**: Agroforestry systems often lead to increased productivity compared to monoculture agriculture.
- **Climate change mitigation**: Agroforestry plays a crucial role in climate change mitigation by sequestering carbon dioxide from the atmosphere.
- **Soil health and fertility**: Tree roots contribute to soil structure, preventing erosion and improving water infiltration.
- **Water management**: Agroforestry helps in efficient water management by reducing water runoff, enhancing water infiltration, and minimizing soil erosion.
- **Livelihood diversification and resilience**: Agroforestry provides farmers with multiple sources of income and reduces their dependence on a single crop or livestock.
- **Sustainable land use**: Agroforestry promotes sustainable land use practices by integrating trees into agricultural landscapes.

Limitations of Agroforestry:

- **Land and space requirements**: Agroforestry systems generally require more land compared to monoculture agriculture.
- **Time and management requirements**: Agroforestry systems often require longer establishment periods and continuous management compared to conventional agriculture.
- **Knowledge and technical expertise**: Implementing agroforestry effectively requires knowledge and technical expertise in tree management, crop-livestock integration, and ecological interactions.
- **Site-specific limitations**: Agroforestry suitability can vary depending on local environmental conditions, such as soil type, topography, climate, and water availability.
- **Perceived risk and uncertainty**: Uncertainties related to tree establishment, market demand, and long-term returns may discourage farmers from transitioning to agroforestry.

Government steps

- **National Action Plan for Climate Change**: Under NAPCC government of India has launched a sub scheme of Green India Mission where the agro forestry has been a primary focus to increase the farmers' income and increase the forest cover of India.
- **Har Medh Par Ped**: Scheme introduced by government to promote agroforestry. The scheme is for planting trees on all farms' boundaries.

Way forward

- **Government support**: Government should support the agroforestry by Subsidizing or incentivizing the cost of inputs to the farmers.
- **Infrastructure**: Improving the quality of infrastructure growth for storage and transportation of forest products is necessary for promotion of agroforestry.
- **Banking penetration**: Efforts must be made in increasing the penetration of formal banking sector in the rural economy to protect the farmers and agro foresters from viscous cycle of debt.
- **Insurance schemes**: Introduction of insurance schemes for health income and crop yields will help the farmers in promoting agroforestry.

4 Need of Legal Rights to Animals, Trees, and Rivers

The report titled as ***"Law in the Emerging Bio-Age"*** by the Law Society explores the scope of recalibrating

the relationship between humans and mother earth in the future.

Key Questions raised in the report:

- Role of legal structure in improving human relations with living systems and our planet.
- Role of law in supporting the evolution of ethics in the capacity to manipulate living systems.
- Outcomes of granting rights to non-human life forms.
- Articulating legal frameworks to make them fit for the future.
- Legal Practitioner for the **bio age.**

Why it is necessary to grant nature rights?

- **Need to protect nature** — animals, plants, rivers, and beyond — because their existence is more than sustaining human lives. It is the holistic recognition that all life and all ecosystems on our planet are deeply intertwined.
- **Nature has an intrinsic right to exist** free of harm, regardless of the value, it provides humans.
- **Impact of anthropogenic activities:** Impacts from human activity on land and in the water, is influencing nature.
  - ➤ Climate change, ocean acidification, permafrost melting, habitat loss, eutrophication, stormwater runoff, air pollution, and contaminants are a few examples calling for attention.
- **Impact of climate change:** Warmer temperatures over time are changing weather patterns and disrupting the usual balance of nature. They are affecting non-human entities and their right as well.

Few Exemplary Regulations:

- **Ecuador was the first to recognize the rights of nature.** Article 71 begins: "Nature, where life is reproduced and occurs, has the right to integral respect for its existence.
- **Bolivia** adopted a biocentric/biocentric approach through the Law on the **Rights of Mother Earth (2010);** the enumerated rights are the rights to life, diversity of life, water, clean air, equilibrium, restoration, and pollution-free living.

- There is also a campaign to make **ecocide a prosecutable offense** at the international criminal court (ICJ), Hague.

Need to give non-human entities rights:

- **To tackle climate breakdown and biodiversity loss,** countries need to provide the 'rights' to the neglected elements of nature.
- **Something very different has to be done** to leave this planet more survivable to future generations.
- It means **granting legal rights and protections to non-human entities** such as animals, trees, and rivers is essential.
- Human makes up a fraction of this global ecosystem, and an **evolving legal framework** suited for the future requires **assigning rights to non-human entities**.

Existence of Nonhuman Rights:

- **Rights of Nature**: The concept of nature is not currently understood to include individual animals. But the provisions recognizing the **rights of nature** still implicitly acknowledge that a nonhuman can have rights.
  - ➤ It is also important to understand that, theoretically, the rights of nature may be violated even in the absence of any injury to humans.
- **Judicial Recognition:** Rivers have been treated as legal persons in some jurisdictions, notably in Bangladesh, Colombia, Ecuador, India, New Zealand, and the United States.
  - ➤ A **landmark judgment of the Uttarakhand High Court (UHC),** has extended the ***legal personhood*** to the Ganga, the Yamuna, their tributaries, and all other natural objects.
- In another case, the High court of Punjab and Haryana recognized all animals in the animal kingdom, including avian and aquatic species, as legal entities.
- **Banning Jallikattu Practice:** The Supreme Court order of 2014 bans jallikattu, because traditional sports involved the taming or overpowering of bulls.

New Legal Framework:

- **Inclusive Framework:** There is need for a framework that is more eco-centric than anthropocentric.
- **Ethical questions:**
  - Ethics of bringing back species from extinction or eradicating existing ones.
  - Wiping out mosquitoes, which carry malaria and other diseases.
  - Calves are taken away from their mothers and even pets

5 E-waste

The government is planning to revamp the electronic waste policy, focusing on complete lifecycle management of products. This revised policy could allow the industry to take into account the total volume of electronics products recycled instead of the amount of metals and rare earth minerals extracted from these products.

Impact of E-waste

- **Environmental impact**: E-waste contains hazardous substances such as lead, mercury, cadmium, and brominated flame retardants, which can leach into soil and water, contaminating the environment and posing risks to ecosystems.
- **Health risks**: E-waste recycling and dismantling processes often involve informal and unsafe practices like open burning, acid leaching.
- **Resource depletion**: Electronic devices contain valuable and finite resources, including precious metals like gold, silver, and platinum, as well as rare earth elements.
- **Global trade and dumping**: E-waste is sometimes exported illegally from developed countries to developing countries with lax regulations.
- **Data security and privacy risks**: Improper handling of e-waste can lead to the unauthorized access and misuse of personal and confidential data stored on discarded devices.

Provisions of E-waste rules 2022:

Ministry has notified the E-Waste (Management) Rules, 2022 in November, 2022. These rules replaced E-waste (Management) Rules, 2016 and became effective from 1st April, 2023

- **Restrictions:** The government has restricted the use of hazardous substances in manufacturing electrical and electronic equipment (EEE) following deaths due to exposure to radioactive material.
- **Reuse and recycling:** Manufacturers shall use the technology or methods so as to make the end product recyclable and shall ensure that components or parts made by different manufacturers are compatible with each other so as to reduce the quantity of e-waste.
- **Strict monitoring:** The Central Pollution Control Board shall conduct random sampling of electrical and electronic equipment placed on the market to monitor and verify the compliance of reduction of hazardous substances provisions.
- **Extended Producer Responsibility Certificates:** Rules aim to incentivise registered electronic waste recyclers by **introducing EPR or Extended Producer Responsibility certificates** (which was not part of 2016 Rules).
- **E-waste exchange facilities:** The EPR requires producers to set up e-waste exchange facilities to facilitate collection and recycling, and assign specific responsibility to bulk consumers of electronic products for safe disposal.
- **Imports:** Imports or placement in the market for new electrical and electronic equipment shall be permitted only for those which are compliant with provisions laid down by the government.
- **Disposal:** It is the responsibility of the manufacturer to collect e-waste generated during manufacture and to ensure its recycling or disposal.

Way forward

Addressing these issues requires a comprehensive approach, including:

- **Enforcement of rules**: Implementation and enforcement of proper e-waste management

regulations is necessary to solve the issues arising from the e-waste.

- **Recycling facilities**: Establishment of formal recycling facilities with environmentally sound practices should be encouraged by the government to properly treat the e-waste in India.
- **Awareness campaign**: Awareness campaigns and education about proper e-waste disposal among consumers and businesses should be carried by the local government and the non-governmental organisations.
- **Sustainable practices**: Encouraging manufacturers to adopt sustainable practices, such as using eco-friendly materials and minimizing the use of hazardous substances to address the problems evolving from the e-waste.

6 Miyawaki Forests, a Sustainable Way for Ecological Eestoration

There are hundreds of thousands of **Miyawaki forest trees** in India. Also, this method is quickly finding favour in government corridors and corporate boardrooms to restore urban spaces.

About Miyawaki Forest:

- Miyawaki is a technique **pioneered by Japanese botanist Akira Miyawaki**, which helps build dense, native forests.
- It is effective because it is based on **natural reforestation principles**,
- The trees planted by this method **grow much faster, jump starting the forest creation process and capturing more carbon.**
- The approach is supposed to ensure that plant growth is 10 times faster and the resulting plantation is 30 times denser than usual.
- It **involves planting dozens of native species** in the same area, and becomes maintenance-free after the first three years.
- Higher biodiversity has been recorded in Miyawaki forests than in neighbouring woodland.
- Within the context of the current climate change emergency and stark warnings about the global loss of biodiversity, being able to create diverse, **healthy forests quickly could prove vital to meeting international targets and tackling these issues**.

What are the benefits?

- **Effective in the urban environment**: It has some significant benefits over more traditional forestry methods when used in smaller afforestation projects and is **particularly effective in the urban environment**.
- **Faster Growth**: Trees in a Miyawaki forest **grow up to ten times faster** at around a metre per year, reaching a stable multi-layered forest community in **20 to 30 years instead of hundreds of years**
- **More Carbon Absorption**: The growing **trees absorb more carbon in a Miyawaki forest** than in a plantation or in standard afforestation projects because they grow more quickly and there are thirty times as many
- **Resilient to Environmental changes**: Native trees thrive in the conditions to which they are adapted and are **more resilient to environmental changes**
- **Biodiversity**: Miyawaki forests have been found to have **far higher biodiversity** than neighbouring woodland, on average 18 times higher.

Criticism of the Miyawaki Method:

- **Monotonous-looking forests**: Critics have accused him of shilling for corporations like Toyota, which have contributed to deforestation in places such as India, and of creating monotonous-looking forests that are expensive to boot.
- **Questions over efficiency**: Environmentalists have questioned the efficacy of the method that accelerates the growth of trees and claims to match a forest's complex ecosystem.
- **Suitability for tropical region**: The technique was started by the Japanese considering the climate in Japan.
- **Restricted movement of Wildlife**: Miyawaki Forests are very dense, which restricts the movement of any possible wildlife the forest might attract.

It's important to note that while the Miyawaki method has its limitations and potential issues, it can still be a valuable tool for ecological restoration and urban greening when implemented with careful planning, appropriate species selection, and long-term management strategies.

7 UN Declares Access to a Clean, Healthy Environment as a Universal Human Right

The United Nations declares that **every person on the planet has the right to live in a clean, healthy environment in a historic resolution**.

Why should clean, healthy environment be recognized as a universal human right?

- **Human Well-being**: A clean and healthy environment provides the necessary conditions for physical, mental, and social health.
- **Human Dignity**: Every individual deserves to live in an environment that respects their inherent worth and ensures their basic needs are met.
- **Sustainable Development**: Such right promotes a holistic approach that considers the long-term impacts of human actions on the environment and ensures the equitable distribution of resources for current and future generations.
- **Environmental Justice**: Recognizing this right empowers marginalized communities, gives them a voice in environmental decision-making processes, and helps address environmental inequalities and injustices.

Significance of this resolution

- About 50 years after the United Nations Conference on the Environment in Stockholm in 1972; a resolution is placing environmental issues at the global forefront.
- **Encourage countries:** It will **encourage countries to incorporate the right** to **a healthy environment in national constitutions** and regional treaties.
- **Empowering people**: The resolution will also empower people, especially those in vulnerable situations including environmental human rights defenders, children, youth, women, and indigenous people.
- **Environmental injustices**: It will help to **reduce environmental injustices** and plug the protection gaps.
- **Unity**: This landmark development demonstrates that the **member states can unite** in the **collective fight against the triple planetary crisis of climate change, biodiversity loss, and pollution.**
- **Empowering Vulnerable people:** People, particularly those who are vulnerable, such as indigenous people, children, youth, and environmental human rights advocates, can be empowered by it.

Issues with the resolution:

- **Vauge definitions**: The words 'clean', 'healthy', and 'sustainable' lack an internationally agreed definition.
- **No mention of Equity**: The resolution text also fails to refer to the foundational principle of equity in international environmental law.
- **No binding Obligations**: The General Assembly resolutions do not create binding obligations. Only through conventions and treaties do state parties undertake obligations for such rights.

The resolution will help to reduce environmental injustices and plug the loopholes. It is going to give more power in the hands of environmental activists to question environmentally destructive actions and policies.

8 The Energy Conservation (Amendment) Act, 2022

The Energy Conservation Act, 2001, was amended with the Energy Conservation (Amendment) Act, 2022 ("Amendment Act"), recently. The amended Act received the President's assent on December 19, 2022.

- The Energy Conservation (Amendment) Bill seeks to increase India's demand for renewable energy, thereby reducing the nation's carbon emissions.
- The Bill proposes to amend the Electricity Conservation Act 2001, last amended in 2010, to introduce changes such as incentivising the use of clean energy by issuing carbon saving certificates.

The proposed changes in the act:

- **Minimum share of renewable energy**: Defining the **minimum share of renewable energy** to be consumed by industrial units or any establishment.

- **Carbon saving certificates**: Incentivising efforts to use clean energy by issuing carbon saving certificates
- **Strengthening institutions**: Strengthening institutions set up originally under the Act, such as the Bureau of Energy Efficiency
- **Green Hydrogen**: Facilitating the promotion of green Hydrogen as an alternative to the fossil fuels used by industries
- **Carbon credits**: Considering additional incentives like carbon credits for the use of clean energy to lure the private sector to climate action.
- **Sustainable habitats**: Including larger residential buildings under energy conservation standards to promote sustainable habitats.

Objective of proposed amendments:

- The main objective of these proposed amendments is to **reduce India's power consumption via fossil fuels** and thereby minimize the nation's carbon footprint.
- The Centre aims to **develop India's Carbon market** and boost the **adoption of clean technology.**
- India **aims to meet its Nationally Determined Contributions (NDCs)**, as mentioned in the Paris Climate Agreement, before its 2030 target date.

Issues

- **Regulation**: The issue is whether the Ministry of Power is the appropriate Ministry to regulate this scheme. A further question is whether the market regulator for carbon credit trading should be specified in the Act.
- **Ambiguity**: Same activity may be eligible for renewable energy, energy savings, and carbon credit certificates. The Bill does not specify whether these certificates will be interchangeable.
- **Non-fossil energy use obligation**: Designated consumers must meet certain non-fossil energy use obligation. Given the limited competition among discoms in any area, consumers may not have a choice in the energy mix.

With the aim of facilitating the achievement of COP-26 goals, significant changes were made to the 2001 Act. The Amendment Act introduces new concepts such as carbon trading and mandates the use of non-fossil sources by designated consumers to ensure faster decarbonisation and achievement of sustainable development goals.

9 Biofuels

In line with the Ethanol Blending roadmap, Prime Minister launched **E20 fuel** at 84 Retail Outlets of Oil Marketing Companies in 11 States/UTs.

Introduction

- E20 is a blend of 20% ethanol with petrol.
- The Government aims to achieve a complete 20% blending of ethanol by 2025, and HPCL and other oil marketing companies are setting up 2G-3G ethanol plants that will facilitate the progress.
- Any hydrocarbon fuel that is **produced from an organic matter** (living or once living material) in a short period of time (days, weeks, or even months) is considered a biofuel. Biofuels may be solid, liquid or gaseous in nature.

Significance of biofuels

- **Energy Security**: India is heavily dependent on imported fossil fuels to meet its energy needs. By promoting biofuels, India aims to reduce its reliance on fossil fuel imports, enhance energy security, and reduce vulnerability to fluctuations in global oil prices.
- **Greenhouse Gas Emissions Reduction**: Biofuels offer a more sustainable alternative by emitting fewer carbon dioxide (CO2) and other harmful pollutants during combustion.
- **Agricultural Sector Development**: The production of biofuels relies on feedstocks derived from agricultural crops, residues, and waste.
- **Waste Management**: Biofuels offer a potential solution by converting agricutlrual waste materials into usable energy sources.
- **Air Quality Improvement**: The use of biofuels, such as biodiesel or bioethanol, in transportation can help reduce emissions of particulate matter, nitrogen oxides, and other pollutants.
- **Renewable Energy Diversification**: Biofuels contribute to the diversification of India's energy mix, reducing dependence on fossil fuels and promoting renewable energy sources.

Issues with biofuels

- **Land Use Change**: Large-scale cultivation of crops for biofuels can lead to land use change, including deforestation and conversion of natural habitats, which can have adverse environmental impacts and threaten biodiversity.
- **Food Security**: The use of food crops, such as corn, sugarcane, and vegetable oils, for biofuel production can affect food availability and prices.
- **Limited Feedstock Availability:** Relying heavily on traditional food crops for biofuel production can strain agricultural resources and may not be sustainable in the long term.
- **Water Resources**: The cultivation of water-intensive crops for biofuels can lead to increased water stress, depletion of water resources, and competition with other sectors, such as agriculture and domestic water supply.

Addressing these issues requires a holistic approach to biofuel development and implementation. It involves promoting sustainable feedstock, such as non-food biomass and waste materials, implementing robust land use regulations, ensuring water resource management, conducting life-cycle assessments to evaluate environmental impacts, and considering the social and economic implications of biofuel production.

CHAPTER

3

Environmental Pollution & Degradation

Topic of This Chapter

1	Air Pollution in Delhi
2	Black Carbon Deposits on Himalayan Glaciers
3	Methane Emissions
4	Climate Induced Migration
5	Desertification: 'Droughts Reduced India's GDP by up to 5% in 20 Years'
6	Nutrient Deficiency In Soil
7	Emerging Hazards of Radioactive Contamination
8	Stubble Burning

1 Air Pollution in Delhi

India's national capital New Delhi is known for being one of the world's most polluted cities, with the problem getting particularly severe in the winter months.

Causes of sever air pollution in Delhi

- **Growing population of the city** -The pressure and haphazard growth of the population is deteriorating the environment.
- There has been **highly haphazard and unplanned development of industries and factor** Studies have revealed that only about 20% of the industrial units are set up in the approved industrial areas whereas the rest of them are in residential and commercial areas.
- There has been **a huge rise in the vehicular population,** despite the metro railways, aggravating traffic congestion and increasing air and noise pollution.
- There has also been an **ever-increasing number of diesel vehicles** plying on the roads, which are largely responsible for the air pollution.
- It has been reported by the National Environmental Engineering Research Institute (NEERI) that everyday almost **8,000 m tonnes of solid waste is be**ing generated in Delhi. Plus, we also have the **industrial hazardous and non-hazardous waste**.

Major reasons for extremely poor Delhi air in winters

- **Burning of Crop Stubble** – Burning of crop residue by farmers in Northern states of Punjab, Haryana and Uttar Pradesh is considered as the prime reason for a spike in air pollution during the winter months in Delhi and NCR.
- **Winter season** - As the winter season sets in, dust particles and pollutants in the air become unable to move. Due to stagnant winds, these pollutants get locked in the air and affect weather conditions, resulting in smog.
- **Burning crackers** - Despite the ban on cracker sales, firecrackers are usually a common sight every Diwali. It may not be the top reason for this smog, but it contributes to its build up.

Challenges due to Air Pollution

- Air pollution leads to **low birth-weight, tuberculosis, ischemic heart disease, cataracts, asthma and nasopharyngeal a**nd laryngeal cancers
- It might also affect c**ognitive development**.
- Air pollution is linked to diseases and **infections that kill around 600,000 children** under five years of age per year.
- The number of **premature deaths** due to outdoor air pollution is projected to increase from three million people globally in 2010 to a global total of six to nine million people in 2060.

2 Black Carbon Deposits on Himalayan Glaciers

According to a research by scientists from NASA and Chinese Academy of Sciences, soot deposited on Tibetan glaciers has contributed significantly to retreat of the world's largest non-polar ice masses – the Himalayan glaciers.

About

- According to research, **black carbon deposits** on Himalayan ice **threaten earth's "third pole".** Tibet's glaciers are retreating at an alarming rate.
- **The study:** To better understand the role that black soot has on glaciers, researchers trekked high into the Himalayas to collect ice cores that contain a **record of soot deposition that spans back to the 1950s.**

Warming of Tibetan Plateau

- **Temperature increase:** Temperatures on the Tibetan Plateau – sometimes called Earth's "third pole" – have warmed by 0.3°C (0.5°F) per decade over the past 30 years, about **twice the rate of observed global temperature increases.**
- **The retreat of glaciers:** Fifty percent of the glaciers were retreating from 1950 to 1980 in the Tibetan region; that rose to **95 percent in the early 21st century.**
- **Black soot is the cause:** Black soot is responsible for as much as **half of the glacial melt**, and **greenhouse gases** are responsible for the rest.

Reason for black carbon increase:

Black carbon, which is **caused by incomplete combustion**, is especially prevalent in **India and China.** The main reason for the increase in black carbon in the region is **accelerated economic activity** in India and China over the last 20 years

Mechanism of black soot related warming:

- **Atmospheric aerosols** are tiny particles containing **nitrates, sulfates, carbon and other matter,** and can influence the climate. Unlike other aerosols, **black carbon absorbs sunlight, similar to greenhouse gases**.
- **It warms only the atmosphere.**
- **Deposition of the black carbon on a white surface**, which produces an **albedo effect that accelerates melting**. Dirty snow absorbs far more sunlight—and gets warmer faster—than pure white snow.

Other issues caused by black carbon increase:

- It contributes to the **decrease in rainfall over central India**.
- Because black carbon heats the atmosphere, it **changes the local heating profile**, which **increases convection**, one of the primary causes of precipitation
- While this results in more intense rainfall in some regions, it leads to less in other regions.

3 Methane Emissions

The leaking of the Nord Stream natural gas pipeline under the Baltic Sea is the biggest single event that led to the massive release of climate-damaging methane.

Anthropogenic causes of methane emissions

- **Agricultural Emission:** Methane is emitted from **Paddy rice cultivation** – in **which flooded fields prevent oxyge**n from penetrating the soil, **creating ideal conditions for methane-emitting bacteria**. It accounts for another 8 per cent of human-linked emissions**.**
- **Livestock emissions: Methane is emitted from manure and gastro enteric releases, which accounts for roughly 32 per cent** of human-caused methane emissions.
- **Industrial sources of pollution and waste/ Landfills:** Methane enters the atmosphere due to **leaks in oil and gas industries and the decomposition of waste in landfills** which emits the harmful methane gas.
- **Thawing of permafrost region-** Arctic methane release is the release of methane from seas and soils in permafrost regions of the Arctic.

Natural causes

- **Wetlands, termites and the oceans**: With breakdown or decay of organic material it can be introduced into the atmosphere by either natural processes – such as the decay of plant material in wetlands, the **seepage of gas from underground deposits** or the digestion of food by cattle.
- **Arctic region:** The Arctic region is one of the many natural sources of the greenhouse gas methane.
- **Biomass burning:** Biomass burning, which includes forest fires, charcoal combustion, and firewood burning releases methane naturally.

The "Big deal" about methane emissions and its impact on climate change

- **Erratic weather phenomenon: Methane is naturally present in atmosphere to** keep global temperature balanced, however any further increase results in excessive warming of climate and **resultant erratic weather phenomenon**.
- **Human and environment health: The above tolerance limit concentration of methane in atmosphere wreaks havoc on human and environment health** by causing disturbance in production, food security, and environmental sustainability.
- **Ground level ozone: Methane is the primary contributor to the formation of ground-level ozone,** a hazardous air pollutant and greenhouse gas, exposure to which causes approximately 1 million premature death globally.

- **Affect the GHG**: The **presence of methane in the atmosphere can also affect** the abundance of other **greenhouse gases, such as tropospheric ozone, water vapor and carbon dioxide.**

Global/International and national efforts/policies to control and curb methane emissions

- **Global Methane Initiative (GMI):** It has aim of reducing barriers to the recovery and use of methane as a valuable energy source and givingcost-effective, near-term **methane abatement** and recovery and use of methane as a valuable energy source.
- **Global Methane Pledge**: **the Global Methane Pledge**, which was launched at COP26, aimed to catalyze action to reduce methane emissions.
- **India's reduction and control strategies: India's Ministry of New and Renewable Energy (MNRE) is investing heavily in a national strategy** to increase biogas production and reduce methane emissions.

Way forward

- **Rethink: The world needs to begin by "rethinking our approaches** to agricultural cultivation and livestock production." That includes leveraging new technology, shifting towards plant-rich diets and embracing alternative sources of protein.
- **Reduction:** New agricultural practices should be adopted to curb increasing methane concentration. **For example**, **Rather than continuous flooding of fields**, paddies could **be irrigated and drained two to three times throughout the growing season,** limiting methane production without impacting yield.
- **Livestock management:** Further Improved manure management and animal feed quality, Promoting farm-scale anaerobic digestion to control methane emissions from livestock.
- **Fossils and fuel based control measures:** Carrying out **pre-mining degasification** and recovery and oxidation of methane from ventilation air from coal mines. Further reducing the leakage **from long-distance gas transmission and distribution pipelines and Extending recovery and utilization from gas and oil production.**
- **Waste management:** Up-gradation of wastewater treatment with gas recovery and overflow, **control Improve anaerobic digestion of solid and liquid waste by food industry** bringing up gradation in primary waste water treatment would lessen the emissions.

Recognizing the importance of need to limit global warming and thus halving resultant changes in climate, dedicated efforts and awareness is **required in reduction and control of methane emissions in current agricultural and livestock managemen**t along with apt and targeted policy measures at global and national level.

4 Climate Induced Migration

Recently, **International Institute for Environment and Development (IIED)** and **Anti-Slavery International** released a report named **Climate-Induced Migration and Modern Slavery.**

Increased Migration (major reasons)

- **Economic reasons:** People are being driven to migrate within and across borders in search of resources and income.
- **Climate change:** As many as 55 million people were internally displaced within their countries due to extreme weather events in 2020.

Impact (Modern Slavery):

- Climate change-induced extreme weather events put women, children and minorities at risk of modern slavery and human trafficking. The phenomenon is on the rise in India, among other countries.
- 40.3 million People are living under slavery in the world.
- Drivers of vulnerability to modern slavery are complex and impacted by many layers of risk. While several socio-economic, political, cultural and institutional risks shape vulnerability, they are increasingly considered to be made worse by climate change impacts and environmental degradation.
- **Increasing Inequality:** Climate change is devastating the planet, leading to intensifying

global inequality as well as disputes over land, water and scarce resources.

SUGGESTIONS:

- **Recognise the Impact of Climate Change:** Climate and development policy-makers urgently need to recognise that millions of people displaced by climate change are being, and will be, exposed to slavery in the coming decades.
- **Committed Funding:** G 20 should commit to providing long-term funding to address anti-slavery efforts in the context of recurring displacement due to climate impacts.
- **Coordination of Ongoing Initiatives:** Several ongoing initiatives — including the **Warsaw International Mechanism Task Force on Displacement (WIM TFD), the Sendai Framework**, etc. — should be coordinated to increase understanding of, and response to, growing risks of climate-induced migration / displacement and exposure to modern slavery.

5 Desertification: 'Droughts Reduced India's GDP by up to 5% in 20 Years'

According to the **Drought in Numbers, 2022 report** released at the **15th Conference of Parties (CoP15) to the United Nations Convention to Combat Desertification (UNCCD),** the frequency and duration of drought is increasing at an alarming rate across the world since the onset of the 21st century.

Background

- According to **Desertification and Land Degradation Atlas of India**, released by the **Space Applications Centre of the Indian Space Research Organisation**, some 97.85 million hectares (mha) — nearly 30 per cent of India's total geographical area (TGA) — underwent land degradation during 2018-19.
- In 2003-05, 94.53 mha (28.76% of the TGA) underwent land degradation. This number increased to 96.40 mha (29.32% of the TGA) in 2011-13.
- The level of desertification increased in 28 of 31 states and Union territories between 2011-13 and 2018-19.
- In eight states—**Rajasthan, Delhi, Goa, Maharashtra, Jharkhand, Nagaland, Tripura, and Himachal Pradesh**—around 40 to 70 per cent of land has undergone desertification.
- Around 23.79% of the area undergoing desertification/land degradation in the country was contributed by **Rajasthan, Maharashtra, Gujarat, Karnataka, Ladakh, Jharkhand, Odisha, Madhya Pradesh and Telangana.**

6 Nutrient Deficiency In Soil

According to a report released by the **Centre for Science and Environment (CSE),** most Indian soils are deficient in organic carbon and macronutrients.

Key highlights of report:

- About 85 per cent of the samples were found to be deficient in **organic carbon**; 97 per cent samples were deficient in available **nitrogen**; 83 per cent were deficient **in phosphorus**; and 71 per cent in **potassium**.
- Soils were deficient in **micronutrients** as well: About 47 per cent, 39 per cent, 37 per cent and 36 per cent soil samples were deficient in **boron, zinc, iron and sulphur**
- At least **half of the soil samples** in 24 states and Union territories were **deficient in organic carbon.**
  - Of them, seven states have more than 90 per cent deficient samples.
  - Haryana's soils are the most deficient in organic carbon, followed by those of Punjab, Uttar Pradesh, Rajasthan, Tamil Nadu, Mizoram and Andaman and Nicobar Islands, in that order.
- As many as 27 states and UTs recorded nitrogen deficiency in over 90 per cent samples.
  - **15 states had nitrogen deficiency in almost all (99-100 per cent) of their samples.**
- In 2019, India was the second highest producer and consumer of chemical fertilizers in the world.
- **Chemical fertilizer consumption**: In 2020–21, the chemical fertilizer consumption in India, excluding single super phosphate (SSP), was 62.98 million tonne, with a growth of more than 82.5 per cent since 2000–01.

- **Carrier-based solid bio-fertilizers:** In 2020–21, India produced about 1,34,323 tonne of carrier-based solid bio-fertilizers.
- **Liquid bio-fertilizers**: In 2020–21, the total production of liquid bio-fertilizers in India was about 26,442 kilolitre (kl).

Importance of fertilization for nutrient replenishment in soil:

- Crops extract nutrients from soil. Replenishment of nutrients is crucial if crop production is to continue in the long run.
- Soil replenishment can be done through several ways, for example, by recycling organic matter or biomass in soil or through practices that help regain and rejuvenate soil nutrients or by application of external fertilizers.
- Recycling of organic matter or biomass can be done through application of organic fertilizers and practices like growing green manure crops or mulching.
- Some other practices that help regain nutrients include crop rotation, inter-cropping and mixed cropping.
- Biofertilizers can enable nutrient mobilization and solubilization in soil.

7 Emerging Hazards of Radioactive Contamination

As per the latest data, **radioactive materials or contaminated devices** are entering into the booming scraps recycling chain, posing a grave health hazard.

About the data:

- **Released by**: The annual data on ***illicit trafficking of nuclear and other radioactive material*** released by the **International Atomic Energy Agency (IAEA).**
- For this database, participating members report **three groups of incidents**.

Radioactive waste and Pollution:

- Water and air contamination caused by radioactive elements is known as **radioactive pollution**. It can produce dangerous pollution if radioactive waste is not disposed of properly.
- Radioactive elements are naturally found in the earth's crust.
- **Uranium, thorium and actinium** are three NORM (Naturally Occurring Radioactive Materials) series that contaminate water resources.
- A small amount of radiation is found in all types of water but the extended amount of radiation is harmful to human health.

> **Note:** Radioactivity in drinking water can be determined by **a gross alpha test.**

- Radioactivity is measured in **Becquerel (SI unit) or in Curie**. The unit Sievert measures the quantity of radiation absorbed by human tissues.

Sources of Radioactive waste generation:

- **Atmospheric Deposition of Cosmogenic Radionuclides:** Atmospheric deposition (both dry and wet) of **cosmogenic radionuclides** adds radioactive nuclei in the surface water.
  - Cosmogenic radionuclides are radioactive isotopes which are produced by natural processes and distributed within the Earth system.
- **Nuclear Reactors and Warheads: Nuclear reactors and nuclear warhead** experiments are the key sources of human-induced radionuclides discharge.
  - Nuclear reactors produce **radioisotopes (Cobalt-60, Iridium-192, etc.)** that hand out as sources of gamma radiation in radiotherapy and numerous industrial appliances.
  - Nuclear power plants placed at the coastal regions add to the radiological contaminants in the marine water by releasing atomic wastes.
- **Dumping of Radioactive Waste:** The application of radioactive elements in **nuclear weapons, X-rays, MRI and other medical equipment causes their exposure to human beings.** Dumping of these radioactive **wastes in surface water bodies causes water pollution.**
- **Mining:** Mining activities of radioactive elements like uranium and thorium also pollute surface and groundwater.

Health Impacts and concerns:

- **Radiation Syndrome:** Human tissues absorb radiation through polluted water and foodstuff, which can cause serious health risks. High doses of radiation can cause acute radiation syndrome or dermal radiation injury.
- **Disorders in Human Physiology:** Exposure to radiation causes various disorders in human physiology, including cancer, leukaemia, genetic mutations, cataracts, etc.
- **Mutation and Structural Alteration:** Genetic effects ionizing **radiation induces mutations in germ cells** (male sperm cells and female egg cells), resulting in **structural alteration in germ cell DNA** that are passed on to off springs. Hereditary disorders can lead to **premature death and severe mental illness.**

8 Stubble Burning

Stubble burning in Punjab and Haryana is old but important issue for the safety of the public health.

Factors for Stubble burning

- **Paucity of time with farmers**: Paucity of time forces farmers to burn residue to clear the farms early for preparing them for sowing of wheat in the Rabi season.
- **Shortage of labour**: Mechanization and employment guarantee schemes like MGNREGA have led to shortage of farm labourers to carry on seasonal migration from UP and Bihar to Punjab and Haryana, as was prevalent earlier.
- **Inadequate technological support**: Availability, affordability and awareness regarding crop residue management machines like 'Happy seeder' and 'Super SMS attachment' is inadequate.
- **Lack of awareness**: Farmers in this region have a traditional belief that burning crop residue will restore nutrients back to the soil.
- **Changes in cropping pattern**: **Due to a slight shift in the cropping pattern in these** states, there is now very little time between the harvesting of one crop and the planting of the next crop.

Alternatives to Stubble Burning:

- **In-Situ Treatment of Stubble**: For example, crop residue management by zero-tiller machine and Use of bio-decomposers.
- **Ex-Situ (off-site) Treatment**: For example, Use of rice straw as cattle fodder.
- **Use of Technology**:
  - **Turbo Happy Seeder (THS) machine**, which can uproot the stubble and also sow seeds in the area cleared. The stubble can then be used as mulch for the field.
  - **Bio-Decomposer:** It accelerates the decomposition process of stubble by turning it into manure over a period of 15-20 days, thereby reducing the need to clear the fields of stubble by burning.

Impact of stubble burning:

- **Health**: Crop Residue Burning (CRB) has been identified as a major health hazard and a reason for breathing illness, irritation of eyes and respiratory tract diseases.
- **Air pollution**: Stubble burning releases toxic pollutants like Methane, Carbon Monoxide (CO), Volatile organic compound (VOC) in air.
- **Smog**: Clouds of ash and smoke from stubble burning can travel more than thousand kilometers aided by the Westerly winds coming from the Mediterranean region and create an obstinate and non-clearing clouds.
- **Soil nutrition**: Burning husk on ground destroys the nutrients like nitrogen, phosphorus, sulphur and potassium from the topsoil, making it less fertile.
- **Economic loss**: Crop residue holds high productive value in biofuel and fibre industry. Burning it deprives the farmers of higher economic returns.

Government steps

- **Penalty**: Crop residue burning was notified as an offence under the Air Act of 1981, the Code of Criminal Procedure, 1973 and various appropriate Acts. In addition, a penalty is being imposed on any offending farmer.

- **GRAP**: EPCA has rolled out the Graded Response Action Plan which includes efforts like banning construction activities, diesel generators, etc.
- **Technology**: Remote sensing technology, use of satellite imagery and a team comprising local officials has been deployed to monitor incidences of crop burning in the states of Punjab and Haryana.
- **Procurement**: Marketing and procurement of crop residue like husk is also being carried out in these states. Government should collaborate with cement, packaging, textiles, etc. industries for husk/hull or stubble collection to use it proficiently.
- **Awareness**: Youth clubs, Kisan camps, radio and television campaigns have been started to spread awareness on scientific crop residue management.
- **Subsidising machines**: Government has been providing subsidies ranging from 50-80% to farmers to buy crop residue disposal machines like happy seeders.

Thus, stubble burning is not a new and surprising phenomenon and has been occurring since decades now. Considering the predictability of occurrence of problem and available initiatives in place, tackling the issue is the urgent need of the day given its severe consequences and associated problems.

CHAPTER

4

Environmental Governance

Topic of This Chapter

1	Carbon Capture, Utilization and Storage (CCUS)
2	Wind Project Addition to Peak by 2024
3	Green Investments and Sustainability
4	Fly Ash
5	Government Plans to Develop Indian Carbon Market (ICM)
6	G7 Vows to Zero Carbon
7	Guiding Peri-Urban Transformation
8	River Interlinking Projects: Boon or Bane for India
9	Recycling Heat Generated by Datacentres
10	Organic & Natural Farming
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12	Global Carbon Budget
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15	Environmental Governance & the case of India
16	Biotransformation Technology
17	Lab Grown Diamonds and Environmental Impacts
18	Environmental Impact Assessment (EIA)

1 Carbon Capture, Utilization and Storage (CCUS)

India's decisive march towards a sustainable future can be shaped by the adoption of **Carbon Capture, Utilization and Storage (CCUS) technology.**

Carbon Capture, Utilization and Storage (CCUS)

- Carbon capture and storage, also known as CCS or carbon sequestration, describes the technologies designed to tackle global warming by capturing CO2 at power stations, industrial sites or even directly from the air and permanently storing it underground.

There are number of technologies under investigation for sequestering carbon from the atmosphere. Some of these are:

- **Ocean Sequestration***:* Carbon stored in oceans through direct injection or fertilization.
- **Geologic Sequestration***:* Natural pore spaces in geologic formations serve as reservoirs for long-term carbon dioxide storage.
- **Terrestrial Sequestration***:* A large amount of carbon is stored in soils and vegetation, which are our natural carbon sinks. Increasing carbon fixation through photosynthesis, slowing down or reducing decomposition of organic matter, and changing land use practices can enhance carbon uptake in these natural sinks.
- **Geologic Sequestration trapping mechanisms**
- Geologic Sequestration is thought to have the largest potential for near-term application.

Geologic Sequestration trapping mechanisms include:

- **Hydrodynamic Trapping***:* Carbon dioxide can be trapped as a gas under low-permeability cap rock (much like natural gas is stored in gas reservoirs).
- **Solubility Trapping***:* Carbon dioxide can be dissolved into a liquid, such as water or oil.
- **Mineral Carbonation***:* Carbon dioxide can react with the minerals, fluids, and organic matter in a geologic formation to form stable compounds/ minerals; largely calcium, iron, and magnesium carbonates.

2 Wind Project Addition to Peak by 2024

According to a report released by the **Global Wind Energy Council (GWEC) and MEC+** (a consulting firm that specialises in renewable energy), annual installation of new wind power projects in India will peak by 2024 and likely decline thereafter.

Introduction:

As part of its transition away from fossil fuels, India has committed to sourcing half its electricity in 2030 from non-fossil fuel sources and installing 60 gigawatt (GW, or 1000 MW) of wind power by 2022. This showcases importance of the Wind power in the Indian energy scenario.

Significance of wind power

- **Renewable energy transition:** Wind power is a crucial component of India's renewable energy transition. As the country aims to reduce its dependence on fossil fuels and mitigate the impacts of climate change, wind power offers a clean and sustainable source of electricity generation.
- **Securing Energy independence:** It offers a domestic and indigenous source of energy, promoting energy independence and reducing vulnerability to price fluctuations and supply disruptions in fossil fuel markets.
- **Mitigation of air pollution:** The use of coal for electricity generation and other fossil fuel-based activities contributes to high levels of air pollution and associated health hazards.
- **Potential for large-scale power generation**: India has a vast wind energy potential, particularly along its coastline, in hilly regions, and in some inland areas.
- **Economic growth**: The development, installation, operation, and maintenance of wind farms create jobs across various skill levels. The growth of the wind power industry also attracts investments, boosts local economies.
- **Decentralized energy:** Wind power projects, especially small-scale and decentralized installations, have played a crucial role in electrifying remote and rural areas of India.

Limitations of wind energy

- **Intermittency and variability**: Wind energy production is intermittent and dependent on wind availability, which can vary over time and across locations.
- **Land and visual impacts**: Wind turbines require significant land area, and large-scale wind farms may result in land use conflicts, especially in densely populated areas
- **Noise**: Wind turbines can generate noise, especially at close proximity, which may cause disturbance to nearby residents.
- **Impacts on Environment**: the construction and operation of wind farms can have environmental impacts, such as bird and bat collisions, habitat disruption, and potential effects on local ecosystems.
- **Infrastructure and transmission challenges**: Building wind power infrastructure, including transmission lines, can face challenges related to land acquisition, permitting, and grid connection.
- **Technological limitations**: Technological limitations, such as the height and size of turbines, may pose challenges in areas with low wind resources or limited space for installation.

Way forward

To address these limitations and pave the way forward for wind energy, several strategies can be pursued:

- **Energy storage**: Investing in energy storage technologies, such as batteries or pumped hydro storage, can help mitigate the intermittent nature of wind energy and ensure a more stable power supply
- **Site selection and planning**: Careful site selection, considering wind resources, environmental impacts, and social acceptance, can minimize conflicts and optimize the performance of wind energy projects.
- **Technological advancements**: Continued research and development in wind turbine design, materials, and control systems can improve efficiency, increase power output, and reduce costs.
- **Policy support and market mechanisms**: Governments can provide long-term policy support, incentives, and stable regulatory frameworks to encourage investment in wind energy.

3 Green Investments and Sustainability

As the world aims to bring the **Greenhouse gas emissions** to sustainable levels by 2050 to prevent irreversible damage to the environment, the Companies have to work for **Environment, Social and Governance (ESG) factors** for making its impacts more sustainable in all aspects.

What are ESG Goals?

- **Environmental, Social, and Governance (ESG) goals** are a set of standards for a company's operations that force companies to follow better governance, ethical practices, environment-friendly measures and social responsibility. These includes:

Environmental	Social	Governance
Environmental is all about an enterprise focus and action leadership around energy usage, waste management, and natural resources conservation.	Social deals with an enterprise relationship and reputation with its employees, customers, stakeholders, institutions and the larger community.	Governance is all about how an enterprise manages with the proper management structure, executive compensation and ensuring stakeholder rights, especially employees, shareholders and customers.

ENVIRONMENTAL
Focuses on a company's environmental disclosure, environmental impact, and any efforts to reduce pollution or carbon emissions.

SOCIAL
Refers to the workplace mentality (e.g. diversity, management, human rights) as well as any relationships surrounding the community (e.g. corporate citizenship and philanthropy).

GOVERNANCE
Accounts for compensation, shareholder rights, and the relationship between shareholders and management.

- It focuses on **non-financial factors** as a metric for guiding investment decisions wherein increased financial returns is no longer the sole objective of investors.
- Ever since the introduction of the **United Nations Principles for Responsible Investing** (UNPRI) in 2006, the ESG framework has been recognised as an inextricable link of modern day businesses.

Europe has been a pioneer in ESG norms with some countries initiating ESG investment mandates.

India and ESG norms:

- ESG as a concept is not new to India.
- SEBI requires top **1,000 listed companies** to issue Business Responsibility and Sustainability Report that includes ESG concepts in its disclosures.
- India also has a **green bond market**, proceeds of which are used to fund renewable energy projects.

What Initiatives have been taken to Ensure ESG Compliance?

- **National Voluntary Guidelines:** One of the initial milestones towards identifying ESG disclosure requirements for companies was the release of **the National Voluntary Guidelines on Social, Environmental and Economic Responsibilities of Business (NVGs)** in 2011 by the **Ministry of Corporate Affairs (MCA).**
- **Business Responsibility Reports**: In 2012, the SEBI formulated the Business Responsibility Reports (BRR) which mandated top 100 listed entities (which was extended to top 500 listed entities in 2015) by market capitalization to file BRR as part of their annual report.
- **Business Responsibility and Sustainability Report:** In 2021, SEBI replaced the existing BRR reporting requirement with a more comprehensive integrated mechanism, the Business Responsibility and Sustainability Report (BRSR).
  - ➤ It will be mandatorily applicable to the top 1,000 listed entities (by market capitalization) from FY 2022-23 onwards.
- The BRSR seeks disclosures from listed entities on their performance against the nine principles of the '**National Guidelines on Responsible Business Conduct'** (NGBRCs).

Persistent Challenges:

- **Lack of standardisation** of reporting requirements across borders pose difficulties in harmonising ESG principles, frameworks and considerations.
- **Lack of transparency**, consistency, and materiality of ESG standards pose roadblocks in the seamless implementation of ESG reporting framework ahead.
- **Requirement of high capital costs** and/or lack of expertise in implementing ESG measures.

4 Fly Ash

Spheroidal carbonaceous particles (SCP), a component of fly ash, have been identified for the first time in an Antarctic ice core, according to a new study.

What are the applications?

- In the commercial and industrial sectors, fly ash has a wide variety of applications and uses, though it is primarily known for improving the durability and workability of concrete mixes.
- Fly ash is also a filler in paints, adhesives, and metal and plastic composites.
- It's commonly used as structural fill for road construction and fly ash can be used to make bricks, ceramic tiles, plaster, Portland cement, and ready-mix cement.

India has over 200 coal power plants that generate an enormous amount of fly ash. According to the Central Electricity Authority, India's coal plants generated 232.56 million tonnes of fly ash in 2020-2021. Although 93 per cent of it was utilised, millions of tonnes accumulated over the years lie unused.

Hydropower in India: Balancing global carbon benefits with local environmental costs

The crisis in **Joshimath** has led to conversations on the relevance of hydropower in the Himalayan region. Two years ago, a glacier burst led to question marks over the Rishiganga hydroelectric project in Uttarakhand.

Background

- In 2022, hydropower capacity accounted for roughly 7 percent of total capacity.

Increasing development of hydropower projects

- The Himalaya are a major water source for much of South Asia. Most countries in the region, including **India, China, Nepal, Bhutan, and Pakistan**, have built or are planning to build hydropower projects in the Himalaya.
- **India:** In India, the government has identified hydropower as a key renewable energy source.
  - Many hydropower projects are under construction or in the planning stages in the Indian Himalaya, including the **Subansiri Lower Hydroelectric Project** in Arunachal Pradesh and the **Teesta Low Dam Hydroelectric Project** in Sikkim.
- **Nepal** has also identified hydropower as a major source of energy. It has many hydropower projects in the planning and development stages, including the **Arun III Hydroelectric Project** and the **West Seti Hydroelectric Project.**
- **Bhutan:** In Bhutan, hydropower is the main source of revenue, and the government has set a target to export surplus electricity to India. The country has built several hydropower projects, including the **Chukha Hydropower Project and the Tala Hydropower Project**.

Impacts

- The Himalaya is a fragile ecosystem and home to a diverse range of flora and fauna. It is already threatened by deforestation, overgrazing, and construction activities that harm the environment and local communities that depend on it.
- The construction of dams can disrupt the flow of rivers, leading to changes in water temperature and chemistry.
- It can also cause erosion, landslides, and sedimentation which can have a negative impact on the local environment.

The Alternative

Micro hydro is a small-scale hydroelectric power generation system that typically generates up to 100 kilowatts (kW) of electricity. These systems use the energy of falling water to turn a turbine, which, in turn, generates electricity. They can be used for various applications, including powering homes, businesses, and small communities.

- Dams also disrupt the migration patterns of fish and other aquatic species and impact the local

wildlife, particularly if the dam's construction leads to habitat loss.

- Large-scale hydroelectric dams displace local communities, affecting their livelihoods and cultural heritage and impacting the overall well-being of the local population.

5 Government Plans to Develop Indian Carbon Market (ICM)

The **Union Ministry for Power** is going to develop a **Carbon Credit Trading Scheme (CCTS)** for decarbonisation in partnership with the **Ministry of Environment, Forests and Climate Change.**

What is the need?

- The government plans to develop the **Indian Carbon Market (ICM)** where a national framework will be established with the objective to decarbonise the Indian economy by pricing the **Green House Gas (GHG) emission** through trading of the carbon credit certificates.
- Even as an **Indian Carbon Market (ICM)** is being developed to decarbonize the economy and greenhouse gas (GHG) emissions are being priced through **trading of carbon credit certificates**, the CCTS will aim at enhancing India's energy transition efforts by **covering potential energy sectors.**
- The **Bureau of Energy Efficiency** under the **Ministry of Power** along with the **Ministry of Environment, Forest & Climate Change** are developing the **Carbon Credit Trading Scheme.**

What is the current system?

- Currently, India has an **energy savings-based market mechanism**.

What Indian Carbon Market (ICM) will do?

- The new avatar scheme will enhance the **energy transition efforts** with an increased scope that will cover the **potential energy sectors.**
- For these sectors, the GHG emissions intensity benchmark and targets will be developed, which will be aligned with **India's emissions trajectory** as per **climate goals.**
- The trading of carbon credits will take place based on the performance against these **sectoral trajectories.**
- **Voluntary mechanism:** Further, it is envisaged that there will be a development of a **voluntary mechanism** concurrently, to encourage GHG reduction from non-obligated sectors.
- The ICM will develop **methodologies** for the estimation of **carbon emissions reductions** and removals from various registered projects, and stipulate the required validation, registration, verification, and issuance processes to operationalise the scheme.
- **Monitoring, Reporting, Verification (MRV) guidelines** for the emissions scheme will also be developed after consultations.
- **Structure:** A comprehensive institutional and governance structure will be set up with specific roles of each party involved in the execution of the ICM.
- The ICM will mobilise new mitigation opportunities through demand for **emission credits** by private and public entities.
- **Significance:** A well-designed, competitive carbon market mechanism would enable the reduction of GHG emissions at the least cost, both at the level of entity, as well as the overall sector and drive faster adoption of clean technologies, in a growing economy like India.

6 G7 Vows to Zero Carbon

Energy and environment ministers of the **Group of Seven** wealthy nations vowed to work to hasten the shift toward cleaner, renewable energy, but set no timetable for phasing out coal-fired power plants.

Key excerpts

- The **Group of Seven** industrialised nations, which also includes **Germany, Italy, Canada and the EU**, all target net-zero emissions by 2050 or sooner after signing the Paris Agreement to cap warming at well under 2 degrees Celsius, and ideally 1.5C.
- **Reducing carbon emission:** The leaders reiterated the need to urgently reduce carbon emissions and

achieve a "predominantly decarbonized power sector" by 2035.

- **Phasing out fossil fuel:** The group is committed to accelerate the phase-out of unabated fossil fuels so as to achieve net zero in energy systems by 2050 at the latest.
  - ➤ But they offered no new deadlines beyond last year's G7 pledge.
- **Hydrogen and Ammonia:** The group recognised low-carbon and renewable hydrogen and its derivatives such as ammonia should be developed and used where they are impactful as effective emission reduction tools to advance decarbonisation.
- **Critical mineral:** The group is committed to maintain products containing critical minerals and raw materials in the economy as long as possible
- **Plastic pollution:** The group is committed to end plastic pollution, with the ambition to reduce additional plastic pollution to zero by 2040.

Why is this move significant?

- The G-7 nations account for 40% of the world's economic activity and a quarter of global carbon emissions.
- Their actions are critical.

7 Guiding Peri-Urban Transformation

The rural characteristics of many **peri-urban areas (PUAs)** adjoining large cities are undergoing a transformation with in-migration of population. The rapid urbanization of peri-urban areas across India requires targeted and planned intervention to allow cities to grow in a sustainable manner.

What are peri-urban areas (PUAs)?

- As the name indicates, peri-urban areas (PUAs) are areas at the periphery of cities.
- In India's PUAs, different forms of settlement structures can be found, such as hamlets, villages, urban villages, slums, unauthorized colonies, and census towns.
- In addition, numerous planned housing colonies and townships have come up in PUAs due to availability of vacant land.
- People who are unable to live in cities due to high living costs or non-availability of houses reside here.
- PUAs are inhabited by the native population that is engaged in agro-based activities, as well as migrants, who pursue non-farm interests.

How PUAs are transforming the region?

The transformation occurring in PUAs is seen in the form of:

- Increasing population densities
- Changes in land use and occupational patterns
- Reduced farmlands
- Growth of built structures (residential, commercial, institutional, and industrial)
- Many people living in PUAs benefit from this transformation
- There is exchange of knowledge and ideas
- New income generating activities come up

Fundamental problems observed in peri-urban areas:

When an **ecosystem's carrying capacity** is pushed to the limits, it is bound to be affected. This is exactly what is happening in several peri-urban areas of India. These areas are under tremendous stress due to pressures created by urbanization.

- **Indiscriminate conversion of land use:** Open spaces, green areas, and farmlands are reducing, with the coming up of built structures and non-farm economic activities.
- **Occurrence of unregulated development:** There is haphazard growth of built structures due to high demand. Many buildings do not meet safety norms.
- **Emergence of informal/unplanned slums in PUAs:**
- **Inferior quality of life:** In view of their illegal status, slums and unauthorized colonies remain uncovered by formal service delivery systems, such as water and sanitation.

- **Issue of drainage and Waste disposal:** While there is uncontrolled construction of built structures, no provision is made for drainage.
- **Women safety:** Frequent incidents of harassment reduce their ability to contribute to city life and limits opportunities available to them.
- **Population displacement:** At times, the so called 'unauthorized occupants' living in slums and unauthorized colonies are evicted due to implementation of government infrastructure projects, such as regional road/rail corridors.
- **Lack of access to good and reliable public transport:** Due to their peripheral location, many PUAs are not served properly by public transport.

Government Initiatives at state levels:

- In **Delhi**, the Development Authority's land pooling policy aims to ensure planned development in PUAs. At the regional level, some metropolitan regions have formulated spatial plans for PUAs.
- Amongst the states, the government of **Uttarakhand**, with support from the World Bank, has launched a water supply programme to improve access for peri-urban residents.
- Projects have been initiated in PUAs of **Dehradun, Roorkee, Haridwar, Haldwani**, etc.
- In **Haryana**, the government aims to introduce the concept of peri-urban agriculture for supplying essential commodities, such as fresh vegetables, fruits, milk, and fish, to residents in neighbouring cities. For this purpose, the Russian government has sought cooperation from Haryana.

At the national level:

- **Metropolitan Planning Committees** (MPCs) proposed under the Constitution (74th Amendment Act) are required to look into matters of common interest between municipalities and panchayats, including coordinated spatial plans of the metropolitan area, which includes PUAs.
- **The Ministry of Housing and Urban Affairs** (MoHUA) has requested state governments to take steps towards constituting municipalities in census towns, which are presently governed by rural governments to ensure better governance.
- **The Union Ministry of Agriculture and Farmers Welfare** (MoAFW) has taken steps to promote food production and diversification in PUAs to improve supply of food to cities.
- Under the **National Rurban Mission**, in the PUAs of Chhattisgarh, women have been empowered by way of training in activities such as handloom, bee keeping, poultry/pig rearing, amongst others. This has helped in employment generation.

8 River Interlinking Projects: Boon or Bane for India

Environmental groups in Karnataka have criticised the project to link the **Bedti and Varada rivers** in Karnataka, calling it **'unscientific'** and a '**waste of public money'**.

This issue has aroused questions on several river interlinking projects across the country, and brought them under scrutiny.

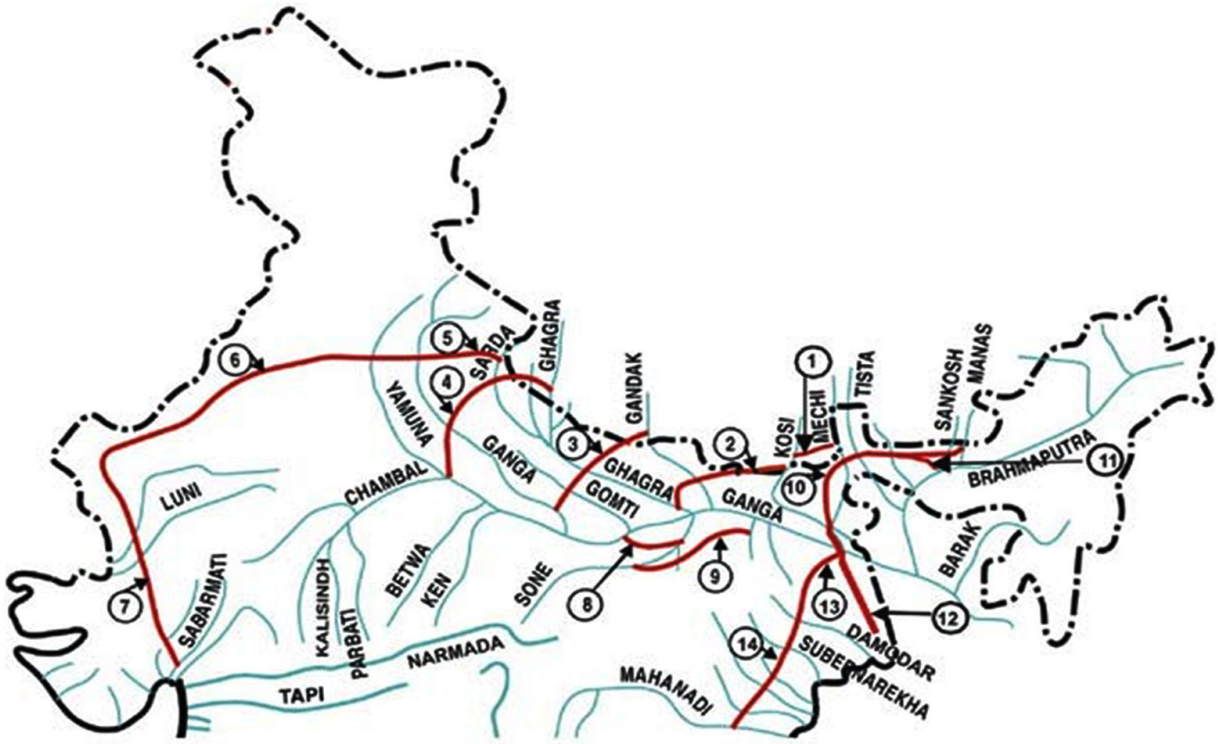
What was the issue raised under 'Bedti- Varada river project'?

- The issue highlighted the government's planning of interlinking two opposite directional flowing rivers with each other that lack sufficient source of water in them.
- The investigating group has made allegation on government for using river interlinking project for their benefit and corruption, making profit to contractors, builders and wasting valuable resources in the region.

National River Linking Project (NRLP)

- NRLP, formerly known as the **National Perspective Plan**, proposes to connect **14 Himalayan** and **16 peninsular rivers** with 30 canals and 3,000 reservoirs to form a gigantic **South Asian Water Grid**.
- NRLP includes two components:
- **Himalayan component:** This component aims to construct storage reservoirs on the Ganga and Brahmaputra rivers, as well as their tributaries in India and Nepal. It will connect-
  - The Ganga and Brahmaputra basins to the Mahanadi basin
  - The Eastern tributaries of the Ganga with the Sabarmati and Chambal river systems.

- **Peninsular component**: It includes 16 links that propose to connect the rivers of South India. It envisages linking
  - The Mahanadi and Godavari to feed the Krishna, Pennar, Cauvery, and Vaigai rivers
  - The Ken river to the Betwa, Parbati, Kalisindh, and Chambal rivers
  - West-flowing rivers to the south of Tapi to the north of Bombay
  - Linking some west-flowing rivers to east-flowing rivers
- The NRLP is managed by **National Water Development Agency (NWDA)** under the **Ministry of Jal Shakti.**
- Recently, it has been reported that the Centre is deliberating on creation of a **National River Interlinking Authority (NIRA).**
- It will have powers to set up SPV for individual link projects.



1. Kosi – Mechi
2. Kosi – Ghagra
3. Gandak – Ganga
4. Ghagra – Yamuna *
5. Sarda – Yamuna *
6. Yamuna – Rajasthan
7. Rajasthan – Sabarmati
8. Chunar- Sone Barrage
9. Sone Dam – Southern Tributaries of Ganga
10. Manas –Sankosh - Tista - Ganga
11. Jogighopa – Tista – Farakka (Alternate)
12. Farakka – Sunderbans
13. Ganga (Farakka) – Damodar – Subernarekha
14. Subernarekha – Mahanadi

* FR Completed

Are there previous examples of river-linking in India?

- In the past, several river linking projects have been taken up.
- Under the **Periyar Project**, transfer of water from Periyar basin to Vaigai basin was envisaged. It was commissioned in 1895.
- Similarly, other projects such as **Parambikulam Aliyar, Kurnool Cudappah Canal, Telugu Ganga Project**, and **Ravi-Beas-Sutlej** were undertaken.
- **Godavari River** has also been formally interlinked with the **Krishna River** at Ibrahimpatnam (near Vijayawada) in Andhra Pradesh in September 2015.

What are the advantages of interlinking Rivers?

- **Reduce dependence on Rainfall**
- **Used for Navigation**
- **For Agriculture purposes**
- **Power Generation**
- **Other benefits:**
  - **Water supply:** The project envisages a supply of clean drinking water amounting to 90 billion cubic meters. It can resolve the issue of drinking water scarcity in India.
  - Similarly, interlinking of rivers has the potential to provide 64.8 billion cubic meter of **water for industrial use**.
  - Apart from that, interlinking can help the survival of **fisheries**; **protect wildlife in the summer months** due to water scarcity. It can also reduce forest fires occurring in India due to climatic conditions.
  - India can also **explore an additional line of defence** in the form of waterline defence.

What are the challenges associated with River-Interlinking?

Despite the many benefits that are associated with the river interlinking project, the project is yet to take off because of the many hurdles it is facing. Some of the challenges in this regard are as follows:

- **Project feasibility**: There is a requirement of huge structures which requires a great engineering capacity. So, the cost and manpower requirement is immense.
- **Environmental impact**: The huge project will alter entire ecosystems. The wildlife, flora and fauna of the river systems will suffer because of such displacements and modifications.
- Many national parks and sanctuaries fall within the river systems.
- **Can lead to displacement**: Building dams and reservoirs will cause the displacement of a lot of people. This will cause a lot of agony for a lot of people.
- They will have to be rehabilitated and adequately compensated.
- **Myth of controlling floods**: There have been instances where big dams like Hirakud Dam, Damodar Dam, etc. have brought flooding to Odisha, West Bengal, etc.
- **Inter-state disputes:** River water has no boundary and flows across different states. Hence River water remains a matter of dispute between the states normally.
- Interlinking of those already disputed rivers can further worsen the situation between the states.
- **International disputes**: In the Himalayan component of the project, the effect of building dams and interlinking rivers will have an effect on the neighbouring countries. This will have to be factored in while implementing the project.
- Bangladesh has opposed the transfer of water from the **Brahmaputra to the Ganga.**

9 Recycling Heat Generated by Datacentres

Global cybersecurity firm Kaspersky estimated that in winter, a datacentre can provide heating up to 85 degrees Fahrenheit, similar to a gas boiler, with better energy efficiency than a heat pump in a new house.

Background

- Microsoft has partnered with Fortum, a Finnish energy company to heat homes, services and businesses in Finland with sustainable waste heat from a new datacentre region that Microsoft has planned to build.
- The software giant claims the waste heat recycling concept from the datacentre region to be the world's largest scheme to recycle waste heat from data centres.
- The joint project takes place at the intersection of two megatrends: digitalisation and energy transition.

What is a datacentre?

- A datacentre is a physical facility that organizations use to
  - Store their critical applications and data
  - Process data
  - Disseminate them to users

- It is designed based on a network of computing and storage resources that enables delivery of shared applications and data.
- The key components of a datacentre are routers, switches, firewalls, storage systems, servers, and application-delivery controllers.
- Many large datacentres are located in dedicated buildings. Smaller datacentres may be situated in specially designed rooms within buildings constructed to serve multiple functions.
- Since datacentres consume large amounts of energy, it's important to ensure the physical structures that house them are well-designed and insulated to optimize temperature controls and energy efficiency.

How much heat datacentres generate?

- The temperatures recorded in the hot aisles of a datacentre hover between 80 and 115 degrees Fahrenheit.
- Global cybersecurity firm Kaspersky estimates over 75% of a datacentre's electricity becomes waste heat.
- It noted that in winter, a datacentre can provide heating up to 85 degrees Fahrenheit, similar to a gas boiler, with better energy efficiency than a heat pump in a new house.

10 Organic & Natural Farming

The Centre is planning to enhance the subsidy on "natural farming" by 50 per cent by re-launching the scheme on a mission mode in select blocks without hampering the food security.

- Under the plan, now under consideration, one cluster (of 500 hectares), each in 1-2 blocks will be taken up to motivate farmers.

Significance of organic and natural farming

- **Minimized Cost of Production:** It is considered as a **cost- effective farming practice** with scope for raising employment and rural development.
- **Ensures Better Health:** As Natural Farming **does not use any synthetic chemicals, health risks and hazards are eliminated.** The food has higher nutrition density and therefore offers better health benefits.
- **Employment Generation:** It generates employment **on account of natural farming input enterprises, value addition, marketing in local areas,** etc. The surplus from natural farming is invested in the village itself.
- **Environment Conservation:** It ensures **better soil biology, improved agro biodiversity** and a more judicious usage of water with much smaller carbon and nitrogen footprints.
- **Reduced Water Consumption:** By working with diverse crops that help each other and cover the soil to prevent unnecessary water loss through evaporation, **Natural Farming optimizes the amount of 'crop per drop'.**
- **Rejuvenates Soil Health:** The most immediate impact of Natural Farming is on the biology of soil—on microbes and other living organisms such as earthworms. Soil health depends entirely on the living organisms in it.

11 Sustainable Farming

A sustainable natural farming system adopted in **southern Rajasthan's Banswara district,** which has created new livelihood sources and brought food security to indigenous tribal communities, has impressed the **Chief Minister's Economic Transformation Advisory Council.**

Benefits of Sustainable Farming:

- **Contributes to Environmental Conservation:** Sustainable agriculture helps to **replenish the land as well as other natural resources such as water and air.**
- **Public Health Safety:** Sustainable agriculture **avoids hazardous pesticides and fertilizers**. As a result, farmers are able to produce fruits, vegetables and other crops that are safer for consumers, workers, and surrounding communities.
- **Prevents Pollution:** Sustainable agriculture means that any waste a farm produces remains inside the farm's ecosystem. In this way, the waste cannot cause pollution.
- **Prevents Soil Erosion:** Our continued ability to produce adequate food has been a serious threat

to soil erosion. Therefore, numerous practices have been developed to keep soil in place, which includes **reducing or eliminating tillage, managing irrigation to reduce runoff, and keeping the soil covered with plants or mulch.**

- **Reduction in Cost:** Sustainable agriculture lessens the overall costs involved in farming. **Smarter farming and moving food from farm-to-fork in a more efficient manner have helped everyone involved with the agriculture industry.**
- **Biodiversity:** Sustainable farms produce a wide variety of plants and animals, resulting in biodiversity. During **crop rotation, plants are seasonally rotated, and this results in soil enrichment, prevention of diseases, and pest outbreaks**.

12 Global Carbon Budget

With a lot of debate on India's dependence on coal, the Government of India has for the first time made a commitment to achieve the **net zero target by 2070.**

Carbon budget framework

- India has neither historically emitted nor currently emits carbon anywhere close to what the global North has, or does, in per capita terms.
- If anything, the argument goes, it should ask for a higher and fairer share in the global carbon budget.
- There is no doubt that this carbon budget framework is an excellent tool to understand global injustice but to move from there to our 'right to burn' is a big leap.
- However, the question is do the countries in the global South necessarily need to increase their share in the global carbon budget?

Justification for continuing the dependence on coal

- The crux of the theoretical argument is that India needs to develop, and **development requires energy.**
- However, since India has neither historically emitted nor currently emits carbon anywhere close to what the global North has, it has no reason to commit to reduce dependence on coal at least in future.
- The argument is that it should ask for a **higher and fairer share in the global carbon budget.**

Why India doesn't/shouldn't need to depend on coal for its future energy requirements?

- **Alternative forms of energy**: Normally the argument in favor of coal is on account of its **cost**, **reliability,** and **domestic availability**. But a deeper analysis reveals the truth.
  - **Cost**: The recent data shows that the levelised cost of electricity from renewable energy sources like the solar (photovoltaic), hydro and onshore wind **has been declining sharply** over the last decade. It is already less than fossil fuel-based electricity generation.
  - **Reliability:** With technological progress, the reliability issues are being addressed by the frontier renewable tech.
  - **Domestic availability**: As for the easy domestic availability of coal, it is a myth. According to the Ministry of Coal, India's net coal import went up from ₹782.6 billion in 2011-12 to ₹1,155.0 billion in 2020-21. India is among the largest importers of coal in the world.
- **The abundance of renewable natural resources** in the tropical climate can give India a head start in this competitive world of technology.
- **South-South collaboration:** This type of collaboration can help India avoid the usual patterns of trade between the North and the South, where the former controls technology and the latter merely provides inputs.
- **Benefits of a greener development path**: The high-employment trajectory that the green path entails vis-à-vis the fossil fuel sector may help address the issue of surplus labor, even if partially. Such a path could provide decentralised access to clean energy to the poor and the marginalised, including in remote regions of India. So, it simultaneously addresses the issues of employment, technology, energy poverty, and self-reliance.
- **Arguing for burning more coal will make the situation worse** for developing countries like India. Due to its tropical climate and high population density along the coastal lines, India

remains vulnerable to climate change. Hence, burning more coal is not the solution.

- **Moral high ground**: If the global south including India takes an independent and greener approach to development, then it affords it a moral high ground. This will allow developing countries to push for a more inclusive carbon budget framework, like **South Africa at Glasgow**. It'll force the global north to come to the table for negotiations on climate finance.

13 The UN High Seas Treaty Drafted

Recently a draft international agreement referred to as the '**UN High Seas Treaty'** was finalised to govern the conduct of governments in '**open seas'.**

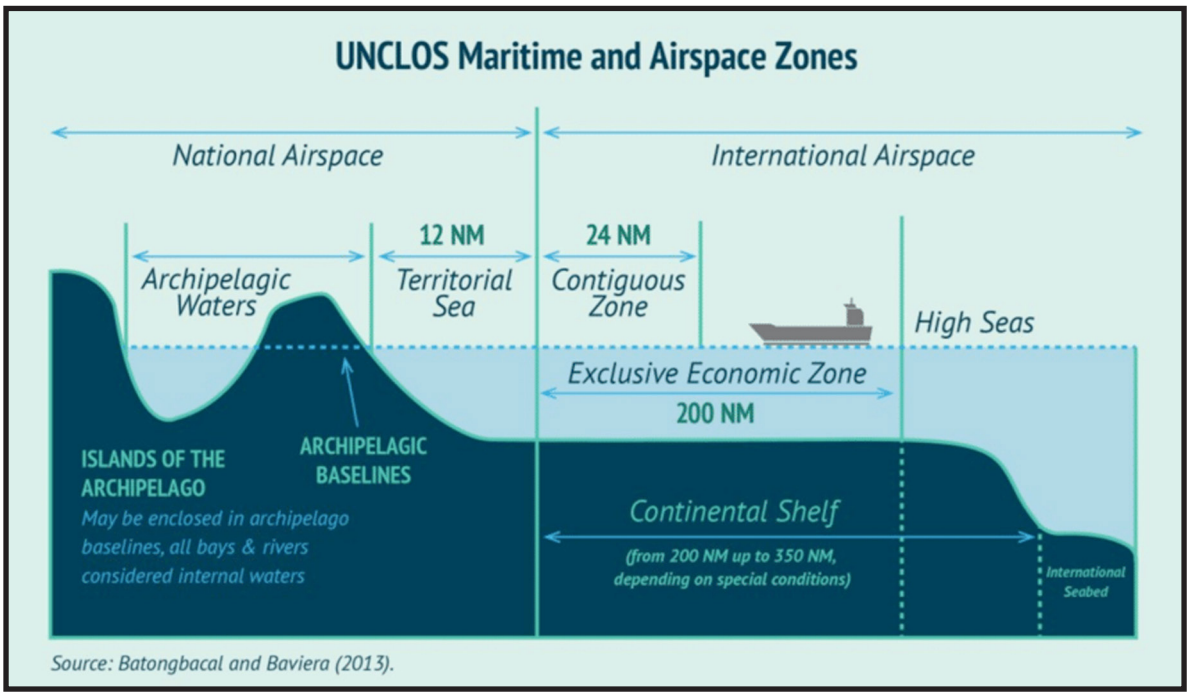
Background:

- The **UN general assembly** had decided to convene an **Intergovernmental Conference (IGC)** in December 2017 to elaborate on the text of the **legal instrument** for protecting biodiversity in areas **beyond national jurisdiction (BBNJ).**

Need of a universal Law:

The draft treaty was negotiated under the **United Nations Convention on Laws of the Sea (UNCLOS)** of 1982 which governs the **rights of countries regarding marine resources**. Till now, there was **no treaty** for conserving the open earth's oceans.

- **Biodiversity conservation**: The high seas are home to a rich array of marine biodiversity, including vulnerable ecosystems, unique species, and genetic resources.
- **Overfishing and depletion of fish stocks**: The high seas are subject to extensive fishing activities, often characterized by weak regulation and insufficient enforcement.
- **Marine pollution and plastic waste**: The high seas are also subjected to pollution from various sources, including plastic waste, chemical runoff, and oil spills.
- **Climate change and ocean acidification**: The high seas play a crucial role in regulating the Earth's climate and absorbing carbon dioxide.
- **Technology and benefit-sharing**: The high seas hold potential for the development of new technologies, such as deep-sea mining and bioprospecting for genetic resources.



About the draft treaty:

- **Objective:** To ensure the **conservation and sustainable use** of marine biological diversity of areas beyond national jurisdiction through the Convention and to further **international cooperation**.

30 by 30 goals:

- This round of treaty negotiations comes on the heels of the adoption, by the U.N. Convention on Biological Diversity, of a target to protect 30% of Earth's land and coastal and marine areas by 2030.
- This agreement, known as 30 by 30, is intended to halt and reverse biodiversity loss to help put nature on a path to recovery.
- The new high seas treaty would enable protections that would contribute greatly to the 30 by 30 goal.

- The draft often mentions a **clearing-house mechanism** that will be a centralised platform to **enable parties to access, provide and give information on** activities taking place in relation to the agreement.

Key highlights of the Treaty:

- **The polluter-pays principle**: It means those causing pollution in a particular region are responsible for its reduction, such as a factory owner having to compensate for air pollution.
- **Building ecosystems' resilience** against adverse effects of climate change and ocean acidification, and also maintaining and restoring ecosystem integrity.
- **Parties should take legislative**, **administrative or policy measures** with the aim of ensuring that traditional knowledge associated with marine genetic resources in areas beyond national jurisdiction held by Indigenous Peoples and local communities shall only be accessed with their free, prior and informed consent.
- **Full recognition of the special circumstances of Small Island** developing States and of least developed countries; Acknowledgement of the special interests and needs of landlocked developing countries.
- Parties are to promote **international cooperation in marine scientific research** and in the development and transfer of marine technology.

The treaty is significant in achieving the 30x30 target set at UN CBD (Convention on Biological Diversity) COP15 under which the countries agreed to protect 30% of oceans by 2030.

14 Circular Plastic Economy

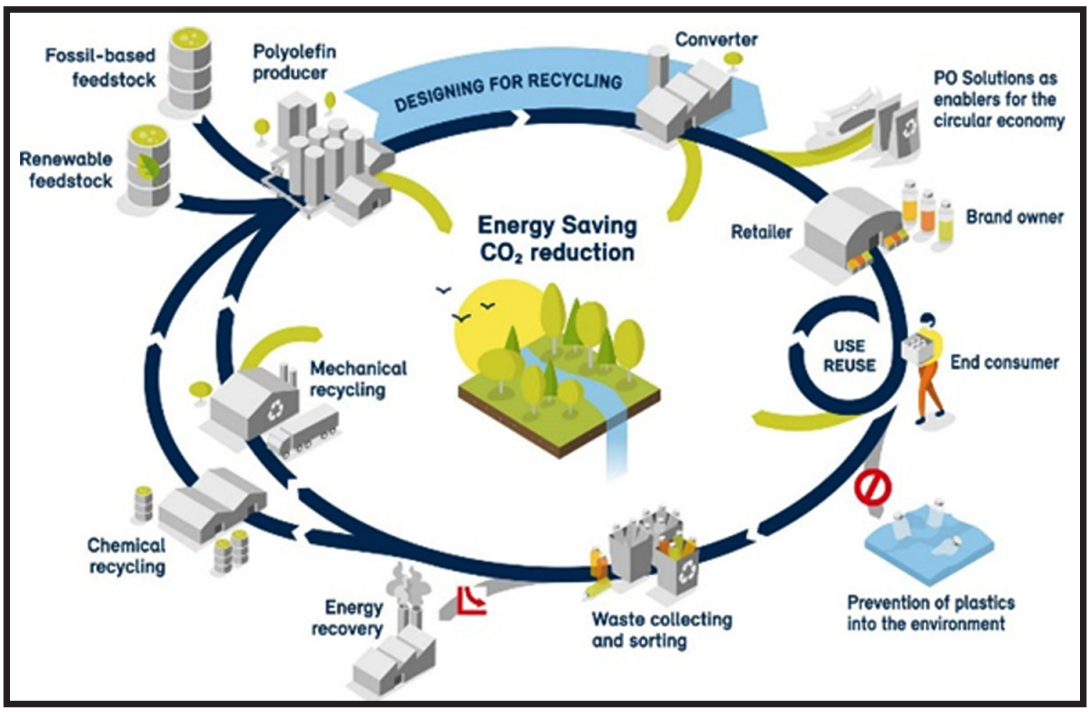
Plastic waste is one of the most rapid-growing waste streams in municipal solid waste all over the world and India as well. The **unchecked flow** of the plastic waste into the environment has threatened the terrestrial and marine life adversely affecting humans, wildlife and their habitat. To restrict the ever increasing threat of plastic, the idea of **circular plastic economy** has come into prominence.

Significance of the circular plastic economy:

- **Economic benefits:** Research shows that the circular plastic economy offers huge economic opportunities by reducing waste, stimulating innovation and creating employment.
- **Prevention of soil degradation:** The traditional practice of dumping plastics in the landfill sites results in **leaching of toxic chemicals** into the soils.
- **Protection of marine environment:** Plastic waste has accumulated in the oceans over the years creating gyres of marine debris ex. Great Pacific garbage patch, affecting the marine life in numerous ways.
- **Limiting the air pollution:** Due to a lack of processing facilities, especially in the middle and low income economies, the plastic is disposed through burning in open releasing the toxic gas in the air. This can be checked through a circular plastic economy.
- **Creation of additional employment:** Additional jobs can be created by participation in the plastic value chain.

Challenges in plastic recycling in India:

- **Very high production of single use plastic:** The plastic consumption in India has grown at a significant pace over the past few years, and so has its waste output.
- **Low waste segregation at the source:** This is caused by poor implementation of rules and low awareness among the citizen. Lack of segregated waste makes recycling even more difficult.



- **Capacity deficit and high informalization of the sector:** Collection of plastic waste at the local level is mostly **fragmented and informal** in India. Manual sorting of the waste makes the process inefficient. This coupled with **lack of capacity** is the reason for low levels of recycling of plastic in India.
- **Lack of proper expertise:** India lacks proper expertise because of developing status and low financial resources.

Measures taken by the government:

- **Plastic Waste Management Rules:** It mandates the generators of plastic waste to take steps to minimize plastic waste, prevent littering, and ensure waste segregation at source. responsibility on the producer for the environmentally sound management of the product.
- **Solid Waste Management Rules:** The Rules also focus on efficient disposal of municipal solid waste in sustainable manner.
- **Ban on single use plastic:** The government imposed **a ban on 'single-use plastics'** items ranging from straws to cigarette packets to combat worsening pollution in the country.

It is clear that the circular plastic economy is **indispensable** for fighting the challenge of plastic waste. The most efficient way to achieve that is by focusing primarily on the overarching **principle of the 3Rs**, "**reduce**," followed by "**reuse**" and then "**recycle**." Creating additional capacity, awareness generation etc. are the ways to complement the efforts and to achieve the **SDGs** related to the environment protection like **climate action, life below water and lie on land**.

15 Environmental Governance & the case of India

The Environmental crisis faced by India compels us to have relook at the Environmental governance in India.

Case study: Inadequacy of Environmental Governance:

- In the aftermath of the **Bhopal Gas Tragedy in 1984**, environmental activism in India increased drastically. **This was a landmark event in the environmental history of India**.
- **This was one of the major factors contributing to the formation of The Environmental Protection Act of 1986** in tandem with the formation of a central authority: the Ministry of Environment and Forests (MoEF), now the Ministry of Environment, Forests and Climate Change (MoEFCC).
- This was followed by numerous legislations and acts to further strengthen environmental policy and law in India. Along with the previous policies, the MoEF also launched the **National Environmental Policy (NEP) in 2006.**

Key Environmental Issues and Challenges:

- The biennial global **Environmental Performance Index** report has consistently put India at the bottom of its rankings. We were an alarming **168th out of 180 countries in 2020**, faring badly on virtually all indicators of environmental health policy, biodiversity and habitat, air and water pollution and climate change.
- **Compliance**: It is hard to find an answer to a question on the extent of compliance with environmental laws. Measuring environmental compliance requires proper **recordkeeping and monitoring system**
- **Enforcement**: There is ample evidence to show that enforcement of environmental laws tends to act weak if the enforcement is not right. The lack of proper enforcement by the regulatory agencies further aggravates the problem.
- **Judiciary ignored:** More than two-thirds of the states/union territories in the country have neither bothered to comply with the orders passed by the Supreme Court nor complied with the directions given by the MoEF&CC.
- **Coal based power plants**: I**ndia has several rules and guidelines to control air pollution, but they aren't put to good use.** Coal-based power plants continue to be the major source of air pollution in the country as more than 300 coal thermal power plants still violate emission standards.
- **Co-ordinations issues**: SC pointed out that there was no effective coordination amongst various Ministries/institutions regarding the integration of environmental concerns.
- **Other problems**: Poor coordination across government agencies, weak institutional capacity, lack of access to information, corruption and stifled civic engagement are the key factors behind the poor effectiveness and implementation of environmental regulations.
- **Debilitating smog** : The **North Indian plains** and the National Capital Region are **engulfed in a debilitating smog** year after year. Yet, there has been a lack of concerted action to address this public health emergency.

Two major and vital Indian environmental laws, namely, The **Air [Prevention and Control of Pollution] Act of 1981** and The **Environmental [Protection] Act of 1986,** have been enacted under these Constitutional provisions.

Unless **implementation and enforcement are strengthened**, even rules that appear to be rigorous are destined to fail and the fundamental human right to a healthy environment will go unfulfilled. **We need to shift its focus from the development of policies and institutions to implementation and enforcement.**

16 Biotransformation Technology

A UK-based start-up claims to have developed **Biotransformation technology** that can alter the state of plastics and make them **biodegradable** without leaving behind any **microplastics.**

Why do we need it?

- **Huge plastic waste**: the country is generating 3.5 billion kgs of plastic waste annually and that the per capita plastic waste generation has also doubled in the past five years. Of this, a third comes from packaging waste.
  - According to Statists, in 2019, plastic packaging waste from e-commerce firms was estimated at over a billion kilograms worldwide.
- **Freshwater and marine ecosystems as pollution**: Amazon generated nearly 210 million kgs of plastic from packaging waste in 2019. They also estimated that up to 10 million kgs of Amazon's plastic packaging ended up in the world's **freshwater and marine ecosystems as pollution** in the same year.

Applications:

- Food packaging and health care industries are the two prime sectors that could use this technology to reduce waste.
- "The increase in cost is relatively small compared to conventional plastic that does not contain" this technology.

Alternatives to reducing plastic waste:

- A switch to **jute or paper-based packaging** could potentially cut down plastic waste. This could also build sustainability within the paper industry, and save on the import bill on ethylene solutions.
- The **wooden packaging** is yet another alternative, but that will make the packaging bulkier and increase cost.
- Some other alternatives can be like coir, bagasse, rice and wheat bran, plant and agricultural residue, banana and areca leaves, jute and cloth.

17 Lab Grown Diamonds and Environmental Impacts

Traditionally, diamonds have been assessed based on the **four Cs: cut, color, clarity, and carat.** However, a fifth C, **Climate Neutrality,** is now emerging as a factor for judging diamonds

How environment-friendly are Lab-grown diamonds?

	Natural Diamonds	Lab-grown diamonds
Carbon Footprint	The process of mining natural diamonds involves significant energy consumption and carbon emissions	Lab-grown diamonds, on the other hand, require less energy and have a considerably lower carbon footprint. This is because they are produced in controlled laboratory environments using advanced technologies.
Ecological Disruption	Diamond mining often involves extracting large quantities of earth, leading to habitat destruction and ecosystem disruption.	Lab-grown diamonds eliminate the need for such environmentally harmful mining practices, minimizing ecological damage and preserving natural habitats.
Water Conservation	Mining diamonds typically requires extensive water usage for various purposes, including extraction, processing, and washing.	Studies and reports claim that 1 carat of a lab grown diamond can save upto 250 tonnes of land and gallons of water.
Pollution	Diamond mining can lead to pollution through the release of hazardous chemicals, sediment runoff, and soil erosion.	Lab-grown diamonds eliminate the associated pollution risks, as they are produced without the use of harmful mining practices, thereby reducing environmental contamination.

18 Environmental Impact Assessment (EIA)

With the **rise in developmental projects and emergent trend** of utilization of available resources and landscape for large projects, tourism etc. the need for **efficient EIA and adherence to its tenets** in project clearance has become more critical.

What is Environmental Impact Assessment (EIA)

- **Environmental Impact Assessment or EIA** is the process or study which predicts the effect of a proposed industrial/infrastructural project on the environment.
- It prevents the **proposed activity/project** from being approved without proper oversight or taking adverse consequences into account.
- **Under the Environment (Protection) Act, 1986**, India notified **its first EIA norms in 1994,** setting in place a legal framework for regulating activities that access, utilise, and affect (pollute) natural resources.
- The **1994 EIA notification was replaced with a modified draft in 2006.** Earlier this year, the government redrafted it again to incorporate the

amendments and relevant court orders issued since 2006, and to make the EIA "**process more transparent and expedient."**

EIA: Core philosophy and precautionary principle

- **Estimation of impact: EIA** is basically about gauging or estimation of the '**Impact' any project, program, or policy may have** on the surrounding 'Environment,' during or after its implementation.
- **Balancing economic and environment goals: EIA** has evolved and become part of major developmental project requirements. It was first introduced as regulatory requirement to balance economic development and environment protection to minimize the impact.
- **The methodology adopted: Self-assessment by the project proponent** followed by review and project **approval by the regulators** created by law like state government, expert committees and Central government.
- **Evolution as precautionary principle of environmental jurisprudence:** It is a method to assess pro-cons on the environment and ecology prior to clearance is given to a project. **As precautionary principle it also advances the environmental justice**.
- **Foresee possible impacts: It aims to foresee the environmental impacts** in the preliminary phase of planning, discover strategies and provide the decision-makers with predictions and options.

How much Important EIA is?

- **Cost-effective method**: EIA provides a cost-effective method to eliminate or minimize the adverse impact of developmental projects.
- **Effect of developmental activities**: EIA enables the decision makers to analyse the effect of developmental activities on the environment well before the developmental project is implemented.
- **Mitigation strategies**: EIA encourages the adaptation of mitigation strategies in the developmental plan.
- **Sustainable development**: It is considered an effective tool to ensure sustainable developmental planning and minimize any irreversible or prolonged damage to the environment.
- **Environmentally sound policies**: EIA makes sure that the developmental plan is environmentally sound and within the limits of the capacity of assimilation and regeneration of the ecosystem.

Application of precautionary principle through EIA:

- **The SC in 2020 set aside the National Green Tribunal order issued by MoEFCC in 2002,** stating that **"Ex post facto" Environmental Clearance is not in compliance** with the primary principles of environmental jurisprudence. It said that the environmental law cannot approve/ support the concept of ex post facto clearance.
- The **Supreme Court in the Vellore Citizen Welfare Forum's case** had laid the principle of the **"Polluter Pays"** principle which means the polluter has to pay substantial amount in accordance with damages it caused and amount required to mitigate those damages.
- In the case of **Common Cause v. Union of India (2017) SC held** the **granting of EC cannot be considered as a mechanical exercise**. It can only be permitted **after due diligence and care**, as damage to the environment can have long-lasting effects.
- **In Sterlite Industries ltd v UOI, The SC** discussed the **grounds on which grant of environmental approval can be challenged.** They are illegality, irrationality and procedural impropriety.
- In **another case SC held that the decision making shall not only be transparent but also must be arising out of a reasoned conclusion** which is reflective of due application of mind to the diverse conditions arising out of a project.

Case Study: Sethusamudram Ship Channel

- All the ships from west to east and from Tuticorin Port to the east have to go round Sri Lanka entailing an additional distance of more than 254-424 nautical miles and 21-36 hours of additional sailing time.
- The Ministry of Shipping in 1997, identified the Tuticorin Port Trust (TPT) as the nodal agency for the implementation of the Sethusamudram Ship Channel Project (SSCP).

- The Tuticorin Port Trust retained National Environmental Engineering Research Institute (NEERI), Nagpur, India to conduct the EIA study for the project.

Environmental impact assessment (EIA) has evolved and become part of major developmental project requirements in many countries including India. The significance and relevance of EIA are often subjected to congenialities of economic development and ecological values.

The adherence shall be on **main objective** of protecting the **environment and also to achieve an alternative objective** that focuses on the convenience of carrying out a business with ease and serving developmental needs.

CHAPTER

5

Climate Change

Topic of This Chapter

1	Joshimath: The Sinking Land
2	World Likely to Breach 1.5C Climate threshold by 2027: WMO
3	Threats To Coral Reefs
4	Heat Stress More Dangerous to Corals Than Ocean Acidification
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6	India's Cost of Adapting to Climate Change Needs seen at $1 Trillion: RBI
7	Climate Smart Agriculture
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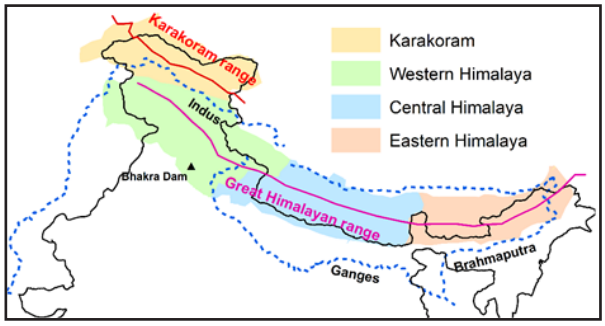
9	Artificial Intelligence and its Climate Cost
10	Carbon Border Adjustment Mechanism
11	Balancing Global Nutrition and Climate Change
12	Himalayan Ecosystem
13	Environment Driven Taxes

1 Joshimath: The Sinking Land

Joshimath, the ancient Uttarakhand town has become a cause of concern. The sinking has against highlighted the vulnerability of the Himalayan ecosystem.

The Himalayan ecosystem:

- The rapid growth of tourists in the region has brought about extensive land-use changes in the region, mainly through the extension of cultivation and large-scale deforestation.
- This irrational land transformation process has not only disrupted the ecological balance of the Himalayan watersheds through reduced groundwater recharge, increased run-off and soil erosion, but has also adversely affected the ecology and economy of the adjoining Indo-Gangetic plains by recurrent floods and decreased irrigation potential.



Sustainable tourism in Himalayas: Recommendations

- **Regulated tourism practice**: There is need to establish regulated tourism practices with promotion of sustainable agendas for the Indian Himalayan region (IHR).
- Also, there is need of maintenance of proper tourist capacity in every tourist place.
- **Vigilance and patrolling**: Protected areas require vigilance and regular patrolling to reduce unwanted wildlife-tourist interaction as well as habitat destruction due to off-road driving and encroachment.
- **Early Warning System:** It is important to have early warning and better weather forecast systems in order to forecast the disaster and alert the local population and tourists.
- **Regional Cooperation**: There is a need for a trans-boundary coalition of Himalayan countries to share and disseminate knowledge about the mountains and preservation of the ecology there.
- **Area Specific Sustainable Plan**: What is most critical is to review the area's present status and draw up a sustainable plan that respects the specific requirements of this fragile region and the impact of the climate crisis.
- **Promote Ecotourism**: Initiating a dialogue on adverse impacts of commercial tourism and promoting ecotourism.

2 World Likely to Breach 1.5C Climate threshold by 2027: WMO

The world is almost certain to experience new record temperatures in the next five years, and temperatures are likely to rise by more than 1.5C above pre-industrial levels, scientists have warned.

Key-highlights of the Report

- The report found there was a 66% likelihood of exceeding the 1.5C threshold in at least one year between 2023 and 2027.
  - For each year from 2023 to 2027, the global near-surface temperature is predicted to be between 1.1C and 1.8C above the pre-industrial average, taken from the years 1850 to 1900.
- **Heat waves:** New record temperatures have been set in many areas around the world in the heatwaves of the past year, but those highs may only be the beginning, as climate breakdown and the impact of a developing El Niño weather system combine to create heatwaves across the globe.
- **El Niño and La Niña:** El Niño is part of an oscillating weather system that develops in the Pacific. For the past three years, the world has been in the opposing phase, known as La Niña, which has had a dampening effect on temperature increases around the world.

As La Niña ends and a new El Niño develops, there is a 98% likelihood that at least one of the next five years will be the hottest on record, the scientists found.

How would it impact?

- This will have far-reaching repercussions for **health, food security, water management and the environment.**
- There is likely to be less rainfall this year in the **Amazon, Central America, Australia and Indonesia.**
  - That could have calamitous consequences for the planet, which relies on rainforests as **massive carbon sinks.**

Way Forward

This November, governments will meet for the Cop28 UN climate summit, where they will assess progress towards meeting the goals of the Paris agreement. Known as the "global stocktake", this assessment is likely to show that the world is far off track to reduce greenhouse gas emissions by the 43% this decade that is required to have a good chance of limiting temperature rises to 1.5C.

3 Threats To Coral Reefs

Recently, coral reefs are facing new threats due to rising marine heat waves.

Causes of coral bleaching

- **Warm Sea Temperature:** Coral species prefer to live in waters close to the warm temperatures which they can tolerate but a slight increase in ocean temperature can harm corals.
- **Extreme low tides:** Extreme events of low tides exposes the corals to solar and ultraviolet radiations which can induce coral bleaching.
- **Ocean Acidification:** Oceans are the carbon sinks, but more carbon dioxide increases the acidity of the ocean. This increase in the acidity of ocean water inhibits the coral's ability to create calcareous skeletons, which is essential for their survival.
- **Diseases:** Species of bacteria like ***vibrio shiloi*** inhibits the photosynthesis of zooxanthellae. These bacteria become more potent at higher sea temperatures.
- **Ocean Pollution:** The increasing nutrient concentrations leads to excessive phytoplankton growth, and attracts more and more marine life, which may cause strain on the reefs.
- **Sedimentation:** High rates of land erosion causes silt and other sediments to leach into ocean waters which causes sedimentation and water turbidity. The siltation tends to smother corals and turbidity reduces light availability potentially reducing coral photosynthesis and growth.
- **Anthropogenic threat:** Over-fishing, pollution from agricultural and industrial runoff, coral mining, development of industrial areas near coral ecosystems have adverse impacts on coral reefs.
- **Predators:** Acanthaster planci, also known as Crown-of-Thorns Starfish, eats corals during the night. They may destroy the entire coral reefs if found in huge numbers.
- **Plastic pollution:** 8 million tonnes of plastic rubbish enters the world's oceans every single year. Such plastic is now found in all corners of the ocean, from the deepest – the Marianas Trench – to sea ice and coral reefs.

4 Heat Stress More Dangerous to Corals Than Ocean Acidification

Global warming poses a more significant threat to coral growth and reef accretion than ocean acidification (OA), according to a new study.

How heat stress affects corals more than ocean acidification?

- Ocean acidification slows the rate at which coral reefs generate calcium carbonate, thus slowing the growth of coral skeletons.
- Heat stress directly affects coral performance in hospite exacerbation of light stress in the symbionts, whereas ocean acidification induces moderate effects on coral metabolism, some of them even positive.
- As temperatures rise, mass coral bleaching events and infectious disease outbreaks are becoming more frequent.

Required measures:

- A better understanding of the underlying mechanisms that enable corals to tolerate heat can significantly improve coral reef conservation and restoration efforts.

5 Carbon Footprint for Marine Industry

According to a research by the Indian Council of Agricultural Research's (ICAR) **Central Marine Fisheries Research Institute (CMFRI),** the carbon footprint of the **marine fisheries sector in India** is much lower than the global figure.

About the study:

- **Objective**: This is the assessment of the **greenhouse gas (GHG) emissions** from total activities in the sector, from pre-harvesting to marketing, by converting it into CO2 equivalent.
- The study was presented at a review meeting of the fisheries component of the network research project **National Innovations in Climate Resilient Agriculture (NICRA)** of the ICAR held in Kochi.
- The CMFRI identified **cyclone proneness, flood proneness, shoreline changes, heat waves and sea level rise** as **major hazards** that could affect coastal lives.
- Works on a **Coastal Climate Risk Atlas** that marks **areas of risk**, including **hazards and vulnerabilities** in all coastal districts in India, are in progress.

India's Marine sector:

- The importance and the role of the fisheries sector were officially recognized in India, through the enactment of the '**Indian Fisheries Act' in 1897.**
- The **first Five-year plan** (1951—56) of the Government of India, drew the canvas of the Fisheries sector (both Marine and Inland Fisheries sector).
- It was followed by the creation of an independent Ministry of Fisheries, Animal Husbandry & Dairying in 2019.

Highlights of the Fisheries Sector:

- The **culture of Pangassius and mono-sex Tilapia**, native catfishes, and freshwater prawns are picking up due to culture-based production being adopted at a faster pace.
- **Three Major Carp (IMC) species**- Catla, Rohu, and Mrigal together contribute a lion's share in production.
- In the **shrimp segment**, most of the production comes from vannamei.
- Rainbow trout culture and rehabilitation of **native Mahaseer** in cold waters of the Himalayan corridor are promising ventures.

Government Policies:

- **Pradhan Mantri Matsya Sampada Yojana (PMMSY):** PMMSY is a flagship scheme for focused and sustainable development of the fisheries sector in the country as a part of the Aatmanirbhar Bharat Abhiyan.
- **Livelihood and nutritional support:**
  - It has been provided for 13.99 lakh (FY 2020 to date) **socio-economically backward active traditional fishers' families** during the seasonal fishing ban/lean period.

6 India's Cost of Adapting to Climate Change Needs seen at $1 Trillion: RBI

India needs to spend an estimated 85.6 trillion rupees ($1.05 trillion) by 2030 to adapt its various industries to be compliant with climate change norms, a report by the Reserve Bank of India.

The Report

- **Title:** Reserve Bank of India's (RBI) Report on Currency and Finance
- **Report theme:** Towards a Greener Cleaner India
- The report is written by contributors from the **Department of Economic and Policy Research**.

Key-highlights of the Report

- India's goal of achieving the **net zero target** by 2070 would require-

- an **accelerated reduction** in the **energy intensity of GDP** by about 5% annually
- a significant improvement in its **energy-mix in favour of renewables** to about 80% by 2070-71

- **Financing requirement:** The green financing requirements in India could be at least **5% of GDP** annually to address the infrastructure gap caused by climate events.
- **Vulnerability of financial institutions:** Results of a climate stress-test reveal that public sector banks (PSBs) may be more **vulnerable** than private sector banks. Globally, however, measurement of climate-related financial risks remains a work in progress.
- **Requirement of sector-centric approach:** Different sectors of the economy have different emission intensities, it is advisable to not have a uniform climate mitigation strategy across sectors.
- Without any policy action, India's carbon dioxide emission levels may rise to 3.9 gigatonnes by 2030, from 2.7 gigatonnes in 2021.

India's Climate Finance Strategy

- **Long-Term Low Emission Development Strategy (LT-LEDS):** In November 2022, at COP27, India submitted its Long-Term Low Emission Development Strategy (LT-LEDS) to the United Nations Framework Convention on Climate Change.
  - **Issue:** This requires trillions of dollars of investment. Yet India currently lacks a comprehensive climate finance strategy for mobilizing the capital required to execute on the LT-LEDS.
- **Green Bonds:** India's maiden issue of green bonds, within the broader green bonds framework outlined by the government is commendable.
  - **Issue:** India may issue $3 billion of green bonds in financial year 2023–2024, but still this will amount to only 1.6 percent of its overall annual borrowing.

7 Climate Smart Agriculture

Climate change, one of the most pressing issues, is already having a significant impact on agriculture, and this impact is only going to get worse in the years to come. However, climate-smart farming can help farmers adapt to climate change and mitigate its effects.

Need for Climate smart Agriculture

- **Enhanced resilience:** Indian agriculture is prone to drought and other climate related shocks heavily dependent on Monsoon. Climate change will further reduce farm productivity. CSA will **reduce vulnerability to drought, pests, diseases and other climate-related risks and shocks**.
- **Nutrition security and Farm income:** India, whose population is increasing, need higher agricultural productivity to address the issues of malnutrition. CSA will help produce more and better food to **improve nutrition security and boost incomes**.
- **Reduce emissions:** As per the national GHG inventory, the **agriculture sector emits 408 MMT of carbon-dioxide equivalen**t. CSA will help pursue lower emissions for each kilo of food produced, avoid deforestation from agriculture and identify ways to absorb carbon out of the atmosphere.
- **Improving sustainability:** Agriculture practices have become unsustainable in many parts of India due to over-use of fertilizers, over-exploitation of water etc. This has reduced fertility of soils and groundwater level. CSA will make agriculture sustainable.

Climate smart strategies

- Many agricultural technologies and practices such as minimum tillage, different methods of crop establishment, nutrient and irrigation management and residue management can improve crop yields: nutrient and water use efficiency and reduced greenhouse gas (GHG) emissions from agricultural activities.
- Similarly, the use of improved seeds, rainwater harvesting (RH), Information and Communication Technologies (ICTs) -based agro-advisories and crop/livestock insurances can also help farmers to reduce the impact of climate change and variability.
- In general, the CSA options integrate innovative and traditional technologies, practices and services that are relevant for particular location and reduce

the effect of climate change and provide the opportunities to stand such changing scenario.

- Adaptation and mitigation are complementary strategies for reducing and managing the risks of climate change.
- Substantial reduction in GHG emission over the next few decades can reduce the occurrence of climatic variability in the twenty-first century and beyond, increase prospects for effective adaptation, reduce the costs and challenges of mitigation in the longer term and contribute to climate-resilient pathways for sustainable agriculture.
- Climate smart strategies like choice of suitable crop and cultivars, residue management, intercropping with legume, agro-forestry and crop diversification can help minimize negative impacts and strengthen farmers by sustainably increasing productivity and income.

8 Heat Wave

Heatwaves have fuelled devastating wildfires and affected millions of people around Europe. From India and Pakistan to Tunisia and Europe, numerous countries have suffered heat waves

What is a Heat wave?

- **A Heat Wave** is a **period of abnormally high temperatures** (**hot and humid** weather) more than the normal maximum temperature that **occurs during the summer season** in the **North-Western parts of India.** Heat Waves typically occur between March and June, and in some rare cases even extend till July. **According to The Indian Meteorological** Department, **Heat Wave** occur **40°C for Plains and at least 30°C for Hilly regions.**

The reasons behind increase in frequency and intensity of heat wave:

- **Global rise in temperature:** Concurrent heat waves are becoming more common as global temperatures rise. World must cut greenhouse-gas emissions that are causing temperatures to rise.
- **Lock-in effect:** Heat waves occur due to the **high pressure in the atmosphere that forces hot air** d**ownward** and traps it near the ground. This **high-pressure system acts like a lock** that **prevents the hot air from rising.** Consequently, rain cannot form and the hot air gets hotter.
- **Loss in natural balance:** Owing to the **higher temperature, the rate of evaporation gets intensified and results in less forming of clouds and resultant rains to keep weather cool**. Further the **shrink in water levels** and **disturbance in natural cycle of heat and pressure** transfer results in both intensity and frequency of heat waves.
- **Compounding impact:** Climate change **exacerbates the factors causing more extreme** and frequent heat waves.

Impact on Health

- The **scale and nature of the health impacts** of heat **depend on the timing, intensity** and duration of a temperature event, the level of acclimatization, and the adaptability of the local population.
- **Disability: Exposure to excessive heat has wide ranging physiological impacts** for all humans, often amplifying existing conditions and resulting in **premature death and disability**.
- **Diseases:** It Compromises the body's ability to regulate temperature and can result in a cascade of illnesses, including heat cramps, heat exhaustion, heatstroke, and hyperthermia.

Impact of Heat waves on Environment

- Heat waves poses huge **risk to agriculture, energy, and infrastructure** due to the imbalances it caused. There would be adverse impact on irrigation **potential, agricultural productivity and a threat to food security too.**
- **Increasing energy demands**: With rise in heat waves, **demand for cooling systems would also magnified** resulting in huge **energy demand**. Air conditioning is constantly used where accessible, **leading to power shortages in many place**s during extreme heat events.
- **Increased GHGs: Coal and fuel consumption**, the main resources for electricity generation in South Asia, has been ramped up due to heightened energy demands. The **increased greenhouse gas emissions** exacerbate climate change impacts in the long term, triggering more heat waves.
- **Impact on Flora and Fauna**: With increase in frequency it **impacts the flora and fauna in their adaptation** and cause disturbance in their ecosystem and habitat.

- **Natural disasters**: Heat waves can also **trigger other natural disasters such as drought, bushfires, and forest fires** which consequently damage crops and livestock.

Government Initiative Regarding Heat Waves

- **National action Plan for Climate Change (NAPCC):** There are 8 national missions forming the core of the NAPCC which represent comprehensive strategies for achieving key goals in climate change.
- **India Cooling Action Plan (ICAP)**: Goals of ICAP is to reduce cooling demand by 20-25% and refrigeration demand by 25-30% by the year 2037.

Way forward

- **Afforestation**: More and more plantation of plants can help address the problem of heat waves across the space.
- **Infrastructure**: Increasing use of permeable materials in civic infrastructure can diminish the negative impact of heat waves.
- **Clean fuels**: Encouraging cleaner cooking fuels such as Biogas, Compressed Natural Gas, liquified Petroleum Gas will help in diminishing indoor air pollution. .
- **Green Buildings**: Promoting the use of **green roofs and cool roofs** in residential or commercial buildings, can help the increasing temperatures.
- **Agricultural adaptation**: Agroforestry, crop rotation, cover cropping, drip irrigation and sprinkler systems can be help in reducing the negative impacts of heat waves.

9 Artificial Intelligence and its Climate Cost

While there is an allure to national dreams of economic prosperity and global competitiveness, underwritten by AI, there is an environmental cost to it.

Positive impact of AI on Ecology	Negative impact of AI on ecology
◉ **Conservation and Biodiversity**: AI can aid in the monitoring and management of wildlife and ecosystems. For example, AI-powered image recognition algorithms can analyze satellite imagery or camera trap photos to identify and track species.	◉ **Energy Consumption and Carbon Footprint**: The computing power required for AI algorithms can lead to significant energy consumption and carbon emissions. The infrastructure supporting AI, including data centers and high-performance computing systems, can have an environmental impact if not powered by renewable energy sources.
◉ Ecological Modeling and Predictions: AI techniques, such as machine learning, can analyze large datasets and complex ecological systems to develop models and predictions. This can assist researchers in understanding ecosystem dynamics, species interactions, and the impacts of environmental changes.	◉ **Data Privacy and Ethical Concerns**: The use of AI in ecological research and monitoring involves the collection and analysis of large amounts of data, raising concerns about data privacy, security, and potential misuse.
◉ Ecological research: AI can help identify patterns, detect trends, and make forecasts, thereby supporting ecological research and decision-making.	◉ **Bias and Accuracy**: Biases present in training data can lead to biased outcomes, potentially impacting ecological research and decision-making. It is crucial to address these biases and ensure accuracy and fairness in AI applications.

◉ Environmental Monitoring and Pollution Management: AI-based sensors and monitoring systems can continuously collect and analyze environmental data, such as air and water quality, temperature, and weather patterns. This can facilitate real-time monitoring of ecosystems.	
◉ Wildlife Protection and Anti-Poaching Efforts: Intelligent surveillance systems equipped with AI algorithms can identify and track suspicious activities, detect poachers, and alert authorities in real-time, enhancing wildlife protection efforts.	
◉ Precision Agriculture: AI can optimize agricultural practices by analyzing data from sensors, drones, and satellites to provide insights into crop health, soil conditions, and water usage. This can help farmers make informed decisions, reduce resource wastage, and minimize the environmental impact of farming practices.	

To maximize the positive impacts of AI on ecology and minimize potential negatives, it is important to develop and deploy AI technologies in an environmentally conscious and ethically responsible manner. This includes promoting transparency, addressing biases, ensuring data privacy, and integrating AI with other approaches for comprehensive ecological research and management.

10 Carbon Border Adjustment Mechanism

The European Union (EU) proposes to introduce a framework for levying a carbon tax on imports of products that rely on non-green or sub-optimally sustainable processes and where carbon emissions are deemed to have not been adequately priced.

What is Carbon Border Adjustment Mechanism (CBAM)

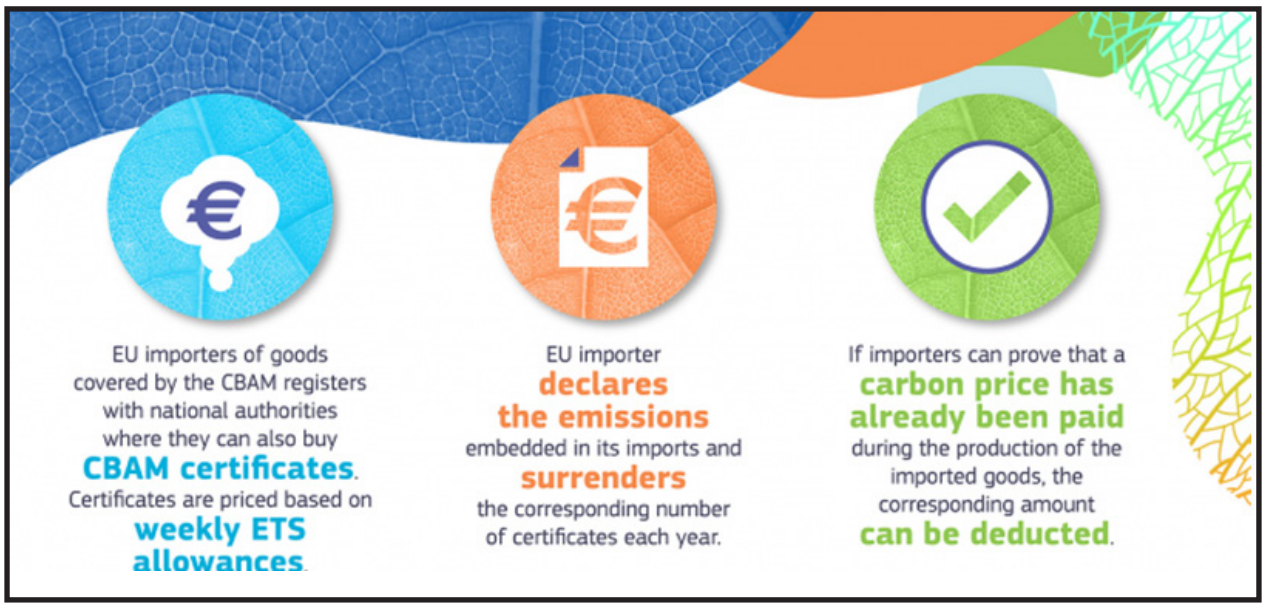
- The EU's Carbon Border Adjustment Mechanism (CBAM) is a landmark tool to put a fair price on the carbon emitted during the production of carbon intensive goods that are entering the EU, and to encourage cleaner industrial production in non-EU countries.
- The gradual introduction of the CBAM is aligned with the phase-out of the allocation of free allowances under the EU Emissions Trading System (ETS) to support the decarbonisation of EU industry.

Significance

- **Reduce carbon emissions**: It may persuade non-EU nations to implement stricter environmental laws, which would cut down on global carbon emissions.
- **Prevent carbon leakage**: By deterring businesses from moving to nations with laxer environmental standards, it can stop carbon leakage.
- **Fund EU climate initiatives**: The money made through CBAM will be used to fund EU climate initiatives, which other nations can use to promote green energy.

Impact on India

- **Impacting exports**: India's exports of metals including iron, steel, and aluminium goods to the EU may suffer as a result of the mechanism because these will be subject to increased scrutiny.
- **Higher carbon tariffs**: India is quite concerned about the direct and indirect emissions from iron, steel, and aluminium since increased emissions would result in higher carbon tariffs to be paid to the EU.



11 Balancing Global Nutrition and Climate Change

It is high time for India to develop technologies that not only fulfill food and nutritional needs but also addresses climate change.

Impact of Climate on the Nutrition

- **Agriculture**: Climate change can disrupt agricultural systems, leading to reduced crop yields and lower nutritional quality of food.
- **Food security**: Extreme weather events can destroy crops, livestock, and fisheries, leading to food shortages and reduced access to diverse and nutritious diets.
- **Water resources**: Changes in precipitation patterns can lead to water scarcity, affecting irrigation systems and crop growth. Water stress can reduce agricultural productivity and limit the availability of fresh water for drinking and hygiene, further compromising nutrition.
- **Nutritional content of crops**: Studies have shown that higher CO2 concentrations can reduce the protein, zinc, and iron content of staple crops like wheat, rice, and legumes. These changes can contribute to nutrient deficiencies and negatively impact human health.
- **Food safety and hygiene**: Climate change can increase the risk of foodborne illnesses. Warmer temperatures can promote the growth of pathogens, such as bacteria and fungi, in food production, processing, and storage.
- **Nutrition of vulnerable populations**: Climate change disproportionately affects vulnerable populations, including children, pregnant women, the elderly, and those living in low-income communities.

Addressing the impacts of climate change on nutrition requires a comprehensive approach involving sustainable agriculture practices, improved water management, climate-resilient food systems, and social safety nets to support vulnerable populations.

12 Himalayan Ecosystem

The recent report stated that loss of forest is much more pronounced in the Himalayan states when compared to rest of India.

Introduction:

The Himalayan Mountains are the highest mountain range in the world sometimes referred to as the **Third Pole**. These ranges are the source of some of **Asia's major rivers** and also help to regulate our planet's climate **making them crucial** for the human well-being and ecosystem health.

The extensive mountain ecosystem is **highly vulnerable** to climate change, warming faster than the rest of the world. **Unchecked deforestation** is adding to the challenges making the region even more fragile.

Importance of Himalayas

- **Critical role in controlling the weather:** The Himalayan range work as a barrier blocking the cold and dry winds of Central Asia. They also **trap the monsoon winds** of the Indian Ocean leading to good rainfall in Northern India.
- **Source of fresh water:** Some of the most important rivers of Asia like **Ganga** and **Brahmaputra** originate from the Himalayan region providing **fresh water for millions of people in South Asia.**
- **Ecosystem services:** The Himalayas provides significant ecosystem services such as **carbon sequestration, water storage, maintenance of,** and food security to pastoral communities making them **essential for human as well as flora and fauna** in the region.
- **Ecosystem health: The Himalayas region is one of the global biodiversity hotspots housing huge biodiversity** and species population which are important for ecological functions and food chain.
- **Medicinal resources**: The Himalayas are home to a diversity of medicinal resources. Plants from the forests have been used for millennia to treat several conditions. Research and new discovery**. E.g. Ayurveda.**
- **Agriculture in hilly regions**: The **local community** in the region is involved in growing several crops like amaranth, buckwheat, high altitude rice, etc. They are critical to the food security of these mountain communities.
- **Tourism and recreation**- Hill stations or duns in Himalayan ranges provide a range of tourism opportunities to the visitors while **economic benefits** to the local population. The region is also home to numerous **pilgrimage sites**.

Impacts of deforestation and climate change on Himalayan ecosystem

- **Shrinking Himalayan glaciers:** Climate change poses a growing threat to the glaciers found in the Himalayan mountain ranges. Over the next few decades, according to **2019 IPCC report**, the Hindu Kush Himalayas faces the risk of **losing over 60% of its glaciers** by 2100.
- **Reduced water availability:** Studies conducted by the **ISRO** show that approximately **75% of the Himalayan glaciers** are retreating at an alarming rate. Reduction of ice cover will also **reduce the albedo** effect thus trapping the heat and **accelerating the glacier melting**.
- **Rising frequencies of disasters:** Deforestation and climate change together are disturbing the **stability of the Himalayas** resulting in increasing frequency of disasters like landslide, floods etc. The **Chamoli disaster of 2021** was the direct manifestation of this change.
- **Decline in biodiversity:** Deforestation has caused the **loss of the habitat** of the Himalayan species. **Snow Leopard** and **Red Panda** are some of the species facing severe threat in the last couple of decades.

Himalayas have played an essential role in sustaining the life in the region and the country as whole. But due to **population pressure** and over-exploitation of natural resources, the range is becoming increasing fragile leading to frequent disasters. Ecologically responsible development, cooperation of countries falling in the range, and arresting the causes of global warming are some of the ways to reverse the trend.

13 Environment Driven Taxes

Recently, there has been growing awareness of the imposition of 'environmental taxes', and a very large basket has already been designed in different countries.

Introduction

Environment-driven taxes, also known as environmental taxes or green taxes, are fiscal measures imposed by governments to encourage environmentally friendly behavior and discourage activities that have a negative impact on the environment. These taxes are typically designed to internalize the environmental costs associated with specific activities or products.

According to the **OECD** (2006), there are about **375 environmentally related taxes** in the OECD countries.

Factors for imposing of environmental taxes

- **Internalizing Environmental Costs:** Environment-driven taxes aim to internalize these costs by assigning a price to environmental degradation, pollution, and resource depletion.

- **Encouraging Sustainable Behaviour**: By making environmentally harmful activities more expensive, these taxes encourage the adoption of cleaner technologies, energy efficiency, waste reduction, and the use of renewable resources.
- **Funding Environmental Initiatives**: The revenue generated from environment-driven taxes can be directed toward projects such as renewable energy development, environmental research, conservation efforts, and the development of sustainable infrastructure.
- **Promoting Innovation**: As the cost of polluting activities increases, businesses are incentivized to invest in research and development to find more environmentally friendly alternatives.
- **Reducing Externalities**: Environment-driven taxes help reduce these externalities by making polluting activities more expensive. This helps address market failures and ensures that the costs of environmental damage are borne by those responsible for it.
- **Supporting International Commitments**: Environment-driven taxes can assist in meeting international commitments (like **INDC**) by providing a domestic policy tool to incentivize emissions reduction, energy transition, and sustainable development.

Eco-tax in India:

Some examples of "ecotax" in India at a regional level are

- **Clean energy tax** by the Government of India introduced in 2010, imposed on coal, peat and lignite
- **Gujarat Green Cess** imposed on electricity, presently stayed by the courts.
- **Vehicle entry tax** introduced in Himachal Pradesh in 2004
- **Tax on old vehicles** introduced by 6 States in India for discouraging old vehicles which impact ecological balance.
- **Cess on non-biodegradable substances**, introduced by Sikkim State in 2005
- **Goa Green Cess** imposed by Goa in 2013.

The main objective of environment-driven taxes is to internalize the environmental costs associated with various activities, creating economic incentives for individuals and businesses to adopt more sustainable practices. By pricing environmental externalities, these taxes encourage the conservation of resources, the reduction of pollution, and the transition to a greener economy.

DISASTER MANAGEMENT

CHAPTER

1

Biodiversity

Topic of This Chapter

	The Basics: India's Preparedness for Disaster Management
1	**Role of Science and Technology in Disaster Management**
2	**Pandemic Preparedness Fund**
3	**Disaster Induced Displacement**
4	**Urban Flood Management to Tackle Frequent Floods**
5	**India's G20 Presidency and Disaster Risk Financing**
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14	**Incidents of Man Made & Natural Disasters in India**
15	**Prime Minister Ten-Point Agenda on Disaster Risk Reduction**
16	**The Sendai Framework for Disaster Risk Reduction**
17	**Coalition for Disaster Resilient Infrastructure (CDRI)**
18	**National Policy on Disaster Management**

The Basics: India's Preparedness for Disaster Management

- **National Disaster Management Authority of India (NDMA):** India's apex statutory body for disaster management, **National Disaster Management Authority of India (NDMA)** is responsible for coordinating a response to natural disasters or man-made disasters.
  - The organisation also works for capacity-building in disaster resiliency and crisis response. It lays down policies, plans and guidelines for disaster management.
  - NDMA is headed by the **Prime Minister** as its chairperson.
- **Creation of NDMA:** Recognizing a comprehensive approach towards natural calamities, the central government set up a **High-Powered Committee (HPC)** in August 1999 and a **National Committee** after the devastating Gujarat earthquake of 2001.
  - The committees were given a task of making recommendations on the preparation of Disaster Management plans along with suggesting mitigation plans. Which ultimately lead into government of India, enacting Disaster Management Act, and creation of **NDMA.**
- **National Policy on Disaster Management, 2009: It** is a national level policy prepared in accordance with the **Disater Management Act, 2005**.
  - The policy lays down a framework/roadmap to deal with disaster in a comprehensive and holistic manner.
  - It states that the primary responsibility of handling a disaster rests with the concerned state government.
- **Disaster Management Authority:** The Disaster Management Authority is being established at 3 levels- National, State and District.
  - The State Disaster Management Authority of a state is headed by the **Chief Minister** of the concerned state.
  - The District Magistrate/ District Collector / Deputy Commissioner head the District Disaster Management Authority.
- **National Disaster Reaction Force (NDRF):** NDRF is considered to be the world's largest rapid reaction force solely dedicated towards disaster response. NDRF carries out a holistic disaster management approach by preparing plans and policies along with carrying out relief measures.
- **Subhash Chandra Bose Aapda Prabandhan Puraskar:** Constituted in 2022, the award recognises and honours the invaluable contribution and selfless service performed by individuals and organisations in the field of disaster management.
- **Adoption of modern technologies:**
  - Space technology
  - Satellite monitoring of the weather conditions
  - Timely and accurately identification of the affected areas
  - **NESAC:** In the North-Eastern states, North Eastern Space Applications Centre (NESAC) an organisation which utilises space technology and satellite services to help the North East states in efficiently manage floods, help in road alignment and infrastructure construction based on the flow and course of water.
- **Disasters related applications**
  - *Weather app* focuses on things like cyclones, heavy rain, heat and cold wave
  - *Meghdoot App* targets farmers to make them conduct weather based agriculture management
  - *Damini App is* for lightning alerts.

Aapada Mitra Programme – Community-Based Disaster Management: The scheme is based on the framework of a community-based disaster management system.

1 Role of Science and Technology in Disaster Management

Science and technology play an important role in disaster management. It helps to better understand the causes of disasters and how to prepare for and respond to them. It also helps to monitor and predict the impacts of disasters, so that we can reduce their impact on people and communities.

How innovation can be utilised in the disaster management process?

Science and technology can provide information and tools that can be used at each stage of the disaster management process.

- **Preparation: -** Science and technology can be used to identify potential hazards and develop plans and procedures for dealing with them. **For example**, computer modelling can be used to predict the path of a hurricane or the spread of a wildfire.
- **Response: -** Science and technology can also be used during a disaster to assist emergency responders. **For example,** satellite imagery can be used to assess damage after a hurricane or earthquake. **GPS tracking** can be used to locate people who are stranded or lost.
- **Recovery:-**: After a disaster has occurred, science and technology can help with the recovery effort. **For example**, **Geographic Information Systems (GIS)** can be used to map damage from a hurricane or earthquake.
- **Mitigation:**-Finally, science and technology can be used to mitigate the effects of future disasters. **For example**, engineering can be used to design structures that are resistant to earthquakes or hurricanes.

Technology Resource for disaster management:

- **Robots and drones for rescue operations:** They gather the information with the cameras installed and live video recordings. Robots can be remotely sent into the crakes' collapsed buildings to find and locate the victims.
- **Earthquake Warning System:** It measures the magnitude of an earthquake by the combined work of a seismometer that measures the motions of the earth and an accelerometer that measures the acceleration of the earth's movement.
- **Forest fire preparedness:** Remote sensing and thermal images and heat signatures from the above-using helicopters or satellites.
- **GPS:** GPS locates the area of disaster very quickly and communication technology provides the flow of information in real-time.
- **WEATHER RADAR**: Weather radar built along the coastal belt estimates rainfall and wind speed for a region, as well as likely tornado sites and cyclone central locations before the disaster, a cyclone warning or alert is given.
- **NASA finder:** Created in response to the 2015 Nepal Earthquake. It is NASA suitcase size tool that can detect human heartbeats through 30 feet of rubble and 20 feet of solid concrete.

2 Pandemic Preparedness Fund

A new financial intermediary fund (FIF) for pandemic prevention, preparedness, and response (PPR) has been established internationally, with financial commitments from multiple countries including India.

What is the structure of the PPR FIF?

PPR FIF will have four main elements:

- **Governing board** - the decision-making body of the FIF that sets the overall work program and makes funding decisions;
  - A **secretariat performing administrative functions**, including support to the governing board in the delivery of its responsibilities,
- **Financial trustee** served by the World Bank, and
- The FIF implementing entities to carry out the FIF's work program at the country, regional and global levels.

Why is there a need for a FIF on pandemic prevention, preparedness, and response (PPR)?

- **Lack of investment:** Pandemic preparedness and response are quintessential "global public goods". Despite these facts, investment in pandemic preparedness and response has been insufficient.
- **Panic-neglect cycle:** The frequency of pandemic events has increased in the past decades and the global pandemic response has typically followed cycles of panic followed by neglect.

How would this new fund help?

- **Saving resources:** Investing now will save lives and resources for the years to come.
- **Bridging of financial gaps:** The fund will provide **long-term financing to low or middle-income countries** to bridge the gaps that they face during a pandemic.
- **Strengthening of the health system:** The **new FIF on PPR will help focus and sustain much-needed high-level attention on strengthening health systems.**
- **Building capacity:** As per the WHO, FIF will help in building PPR capacity in zoonotic disease surveillance, emergency communication, management, laboratories, community engagement, critical health workforce, etc.

3 Disaster Induced Displacement

The death toll from the recent earthquakes in Turkey and Syria has concerned the entire globe. Over 23 million people have been affected and millions have been **displaced** from their homes.

What are the implications of such displacements?

- **Livelihood crisis:** Unlike traditional refugees, climate refugees may be sent back to their devastated homeland or forced into a refugee camp, leading to livelihood crisis.
- Climate change may also trigger conflict amongst the population as climate change may enhance the competition for resources like food, water and grazing lands.

What could be done further?

- **Proper definition**: The global community should endeavour to expand the definition of a **"refugee**." This may help them in getting access to **financial grants, food aid, tools, shelter, schools or clinics**. Providing **legal recognition** to them must be the top priority.
- **Adaptation techniques:** The affected countries and regions may endeavour to adapt to climate change-driven extreme events by making a series of cost-benefit decisions. These adaptation techniques may help them in reducing their vulnerability to climate change events.
- **Immigration policies:** Those countries which are less affected may formulate immigration policies on climate refugees.
- **Drawing communities into the process of managing ecological resources, processes** and services, could help more effectively mitigate the impact of climate change, forecast need for migration and ease the process, while minimising distress.

Policies in India

- Disaster induced displacement in India is currently looked after by the **National Disaster Management Authority (NDMA)** and their state level counterparts.
- Current national policies primarily address the **short-term and sudden onset of climatic disasters**.

4 Urban Flood Management to Tackle Frequent Floods

Flood-related catastrophes have increased by 134 per cent since 2000, compared with the two previous decades, according to the **World Meteorological Organization (WMO).** As a 2021 report from the Intergovernmental Panel on Climate Change (IPCC) underscores, rising global temperatures are dramatically affecting the water cycle, making floods and droughts more extreme and frequent

Major threats that Urban Floods poses:

- **Economic**: Urban areas are also **centres of economic activities** with vital infrastructure

which needs to be protected 24x7. In most of the cities, damage to vital infrastructure has a bearing not only for the state and the country but it could even have global implications. Therefore, management of urban flooding has to be accorded top priority.

- **Urban Planning**: Increasing trend of urban flooding is a universal phenomenon and poses a great challenge to urban planners the world over. Problems associated with urban floods range from relatively localized incidents to major incidents, resulting in cities being inundated from hours to several days.

Reasons for Urban Flooding:

- Urban flooding is caused by three main factors – meteorological, hydrological and human factors.

Other reasons

- **Urbanisation**: Rapid urbanization combined with a **lack of efficient waste disposal systems** have left several water bodies in the cities in poor condition. **Blocked waterways and reduced width and depth** of canals, while the speed and scale of construction reduces the permeability of the ground.
- **Improper Drainage**: In Indian cities and towns, large habitations are coming up in low-lying areas, often **encroaching over drainage channels**. Encroachment in the immediate upper catchments of hilly urban area has also caused serious flooding in the flood plains of cities surrounded by hills.
- **Population Growth**: Most of our cities have now reached a **saturation point in terms of population growth** and accommodation, and the developmental activities have now shifted to low-lying areas and areas next to the riverbanks. So, whenever a city experiences a large amount of rainfall within a short time, there are chances it gets flooded.

Measures to prevent Urban Flooding:

- **Early Warning System and Communication**: Dissemination of flood warnings must be carried out, using a wide range of latest technologies.
- **Design and Management of Urban Drainage System**: Proper management of drainage system is necessary to ensure that the water does not get stored in one place.
- **Rainwater Harvesting**: Due to urbanisation, groundwater recharge has decreased and the peak runoff from rainfall and consequent flooding has increased.
- **Conservation of Water Bodies**: Urban water bodies like lakes, tanks and ponds also play a very important role in the management of urban flooding by reducing the stormwater run-off by capturing it.

Issues in Urban Flood Disaster Risk Management:

- **Improper Risk Assessment**: Risk assessment has not been done properly by the concerned departments.

Solution-This can be achieved by improving institutional capacities and operational abilities based on local scale vulnerability analysis and risk assessment.

- **Improper designing of drainages**: Storm water drainage systems in the past were designed for rainfall intensity of 12 – 20 mm.
- **Encroachments**: Encroachments have led to the decrease in natural capacities of natural drains.
- **No Community Participation**: Flood control measures planned without participation of affected community are unsustainable as they do not meet the needs of relevant stakeholders.

Way Forward:

- **Mainstreaming Disaster Management into Development**: All existing and new developmental programmes and projects shall **incorporate disaster resilient specifications in design and construction**.
- **Role of Nodal Ministry**: The nodal ministry should evolve its disaster management plans for **holistic and coordinated management of urban flood emergency**.
- **Implementing the Guidelines**: Implementing the Guidelines at the national level should begin with preparing the National Plan.
- **Financial Arrangements for Implementation**: According to WMO, US $1 invested in disaster mitigation can prevent about US $7-worth of disaster related economic losses.

5 India's G20 Presidency and Disaster Risk Financing

The endorsement of a **new working group** on **disaster risk reduction** by the G20, under India's presidency, presents an opportunity to prioritize disaster risk financing and achieve the targets set by the **Sendai framework for 2030.**

The Role of the G20 in Strengthening Financial Risk Management

- **Enhancing Risk Understanding and Integration:** The G20 can support countries in enhancing their understanding of disaster risks and integrating them into government planning and budget processes.
- **Strengthening Regulation and Supervision in the Insurance Industry:** Effective regulation, legislation, and supervision are crucial for the insurance industry to play a proactive role in managing disaster risks.
- **Facilitating Public-Private Partnerships:** Public-private partnerships are essential for managing and financing disaster risks effectively.
- **Shifting from Ex-post to Ex-ante Financing Mechanisms:** Traditionally, financial resources for disaster response, recovery, and reconstruction have been mobilized after an event occurs (ex-post financing).
- **Encouraging Investment in Disaster Risk Reduction:** There is a scarcity of investment in a development-oriented approach that focuses on reducing disaster risks.

How India can guide G20's disaster management initiatives?

- **Setting the Agenda:** India, as the G20 president, can prioritize disaster management on the agenda of G20 meetings and discussions.
- **Knowledge Sharing and Capacity Building:** India can lead efforts to facilitate knowledge sharing and capacity building among G20 member countries in the field of disaster management.
- **Policy Advocacy:** India can advocate for policy measures that strengthen disaster management capabilities.
- **Financial Commitments:** As the G20 president, India can encourage member countries to allocate financial resources towards disaster risk reduction and resilience-building initiatives.
- **Public-Private Partnerships**: India can promote partnerships between governments and the private sector to enhance disaster management efforts.
- **International Cooperation:** India can leverage its position as G20 president to strengthen international cooperation in disaster management.

6 India achieving Atmanirbhar in Disaster Management

The world is constantly facing adverse weather conditions, with floods, heat waves, and droughts becoming more frequent than ever. Hence, there is a need for Atmanirbhar in disaster management.

What India is doing towards 'self-reliance' in disaster management?

India is one of the world's most disaster-prone countries, exposed to many natural hazards, including **floods, cyclones, droughts, and earthquakes**.

- **Active role in global initiatives:** India plays an **active role** in global initiatives on disaster management. India is a signatory to the **Sendai Framework for Disaster Risk Reduction** and is committed to achieving the priorities and objectives through systematic and institutional efforts.
- **Cooperation: It** had signed several bilateral/ multilateral Agreements/MoUs with several countries for cooperation in disaster management, like the **Swiss Confederation, Russian Federation, Germany, Japan, Tajikistan, Mongolia, Italy, Bangladesh, etc.**
- **Coalition for disaster resilient infrastructure (CDRI):** During the **2019 UN Climate Action Summit** in New York, PM Modi launched an international partnership, the **coalition for disaster resilient infrastructure or CDRI,** to help build infrastructure around the world that is resilient to natural disasters.

- **Increased budgetary location:** The budgetary provision for disaster management has increased by 122 per cent in the last eight years.
- **From Relying on Foreign Aid to Providing Foreign Aid**: India, the world's fifth largest economy with established, well-tested organisational structures, is no longer a net recipient of humanitarian aid, but has transitioned to a position of being a *'provider of assistance in international disasters'*.
- **Technological advancements fuelling efficient Disaster Management System:** Space technology and satellite monitoring of the weather conditions, timely and accurately identification of the affected areas along with various such measures have led the government to lower down the effects of disaster.

7 India's Disaster Management Model Through Turkey's Case Study

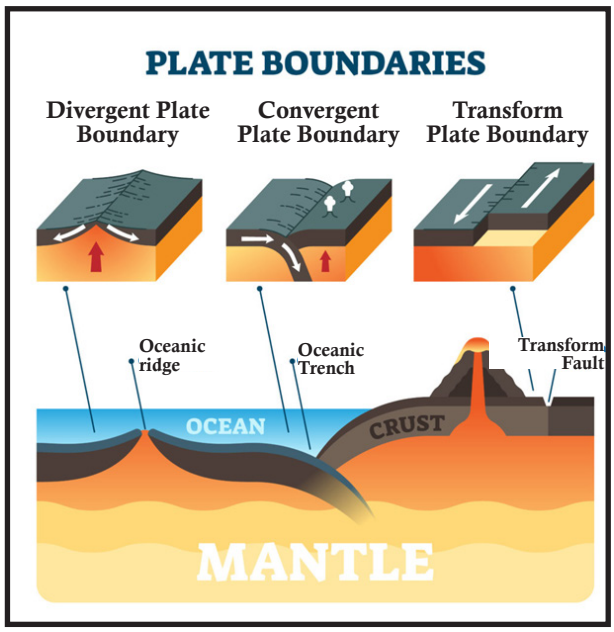
Recently, Turkey witnessed a **7.8 magnitude earthquake** which is one of the most powerful earthquakes in the past two decades.

India's disaster management model:

- **Disaster diplomacy :-** By **Operation Dost**, an **ongoing rescue operation** initiated by India to rescue Turkey from devastation of earthquake, Indian Army prepared its rescue teams with relief materials within 12 hours after disaster struck (much before the Turkish Army was mobilised).
  - **Rescue operations:-**To combat the menace of disaster in Turkey, NDRF has sent more than 100 rescue workers along with dog squads to help with efforts, using specialised CSSR (Collapsed Structure Search and Rescue) equipment and techniques.
  - **Doctors' dispatch:-** A military medical contingent has set up a field hospital in Turkey for a 30-bed facility and specials, x-ray machines, ventilators, generators and ambulances
  - **Relief material:-** About 25 Tonnes of relief material, protective gear, clothes, emergency medicines, medical items have already reached, more to follow
  - **Tech support:** -India provided Garuda Aerospace's drones to the most affected areas to identify those trapped under rubble, along with modified Kisan drones carrying medications, food, and supplies.

What makes Turkey a hotbed of seismic activity?

- Turkey is frequently shaken by earthquakes.
- Turkey's proneness to earthquakes comes from its **tectonic location**.
- Turkey, a hotbed of seismic activity, sits on the **Anatolian Plate**, which borders two major faults as it grinds northeast against Eurasia.



Is India ready?

- India is well-prepared to deal with the fallout of large-scale earthquakes as it has a dedicated, well-equipped and trained force in the form of the **National Disaster Response Force (NDRF).**

8 Disaster Resilience

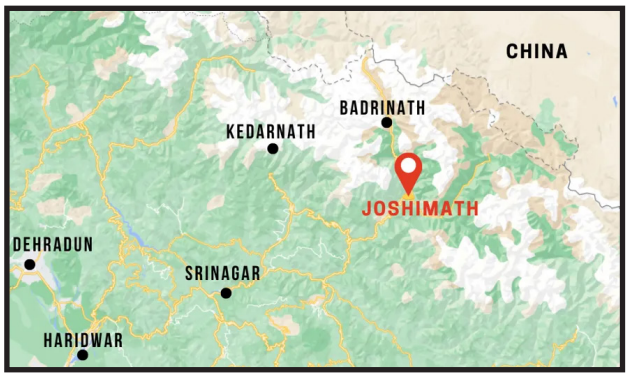
In the past, businesses prioritized sales over environmental impact and product longevity, leading to the reckless use of resources and the production of short-lived goods. However, as climate change intensifies, the demand for **resilient infrastructure** has grown, emphasizing the need for sustainable business practices.

How India is preparing to develop a disaster resilient infrastructure?

- **Hydrogen economy:** India is focusing on **hydrogen infrastructure** that could revolutionise the future sustainability practices in infrastructure development.
- **CDRI:** Launched in 2019, CDRI is a multi-stakeholder global partnership of national governments, UN agencies and programmes, multilateral development banks, the private sector, academic and knowledge institutions.
- CDRI is led and managed by national governments, where knowledge is generated and exchanged on different aspects of disaster resilience of infrastructure.

9 India's Disaster Management: Joshimath Crisis

Joshimath, the ancient Uttarakhand town has become a cause of concern. Though the town of Joshimath has been witnessing cracks emerging for the past two decades.



Reasons for Vulnerability of region:

- Joshimath is built on the deposits of an **old landslide**, which means the slopes can be destabilised even by slight triggers.
- The town is also in **Zone V,** denoting highest risk, in India's seismic zonation scheme.
- It lies between two thrusts, the **Main Central Thrust (MCT) and the Vaikrita Thrust (VT),** and thus occupies a seismically active terrain.

The M.C. Mishra **committee's report of 1976** warned against heavy and unscientific construction in the town mentioning that, "Joshimath is a deposit of sand and stone, hence was not a Suitable place for the coming up of a township. Vibrations produced by blasting and heavy traffic Will also lead disequilibrium in natural factors."

Contributing factors for disasters in the region:

- **Role of NTPC:** Locals have blamed the **NTPC's 520-MW Tapovan Vishnugad hydropower project**, under construction in the area, for exacerbating the Joshimath land subsidence.
- Recently, NTPC has punctured a tunnel to connect Auli, near Joshimath for supply of water.
- **Char Dham project:** The 6-km **Helang-Marwari bypass**, being built by the Border Roads Organisation (BRO), is also under scrutiny for weakening slopes and further destabilising the local topography.
- The bypass is part of the 825-km Char Dham highway expansion project in Uttarakhand, which experts have already questioned for unscientific slope-cutting, which resulted in several landslides.
- **Inadequate drainage and wastewater disposal:** The 2022 USDMA report pointed to a lack of drainage and wastewater disposal systems as being part of the subsidence problem.
- About **85% of buildings** in the town, including those owned by the army aren't connected to a sewerage system and have soak pits instead.

10 Flood Management

In a short period of time, two floods devastated Assam. Approximately 31 districts, more than 2,000 villages, 7 lakh people, and 95,000 hectares of land were impacted during the height of the flooding.

Paradigm shift in Flood management:

- **Hazard prevention to minimization of disaster risk:** Floods, fluvial and pluvial are triggered by the extreme weather events, but they transforms into a disaster by the anthropogenic factors. Thus,

it becomes important to take the focus towards reducing the risk of turning into disaster.

- **Addressing the underlying factors:** Anthropogenic intervention shares a complex relation between biophysical and social vulnerability. In order disintegrate the relationship; the focus needs to be shifted from structural intervention and river engineering towards addressing the underlying factors that contributes to multiple dimensions of vulnerability.
- **Focus on lives and livelihoods:** Reducing the vulnerability and building people's resilience requires inclusion of riparian population and their and livelihood at the centre of planning process of flood management.
- **Convergence and integration of departments:** The overall flood risk management strategy cannot be done only by water resource department; rather it includes convergence of various departments like, agricultural, animal husbandry and health etc.

What should be the strategy?

- **Round the year developmental activities:** The strategies should include a round the year developmental activities to reduce the risk of the disasters.
- **A national programme:** A national programme with a mission mode and ensuring community involvement will improve the efficacy of the risk management strategy.
- **Developmental intervention:** Various developmental interventions, including new models of embankment management, necessary for improving the livelihood of the rural people.
- **Resilience building:** The management strategy should ensure redundancies at the community level to contribute to the resilience building.
- **Warning system:** Increasing frequency and intensity of extreme weather events has also increased the importance of the warning system. It should be integrated with the community institutions to provide a comprehensive warning system and can act as a response force in the disaster prone areas.

What can be done more?

- **Dedicated trained professionals:** The floss risk management requires a dedicated and trained group of professionals who understand the multi disciplinarily of the flood management strategy.
- **Cooperation with district level management:** Dedicated district disaster management should cooperate with the district administration for better prevention and mitigation measure, and also reducing the risk factors.
- **Aspirational District Programme:** has assigned a key role to its fellows in catalysing development actions.

11 Cyclones

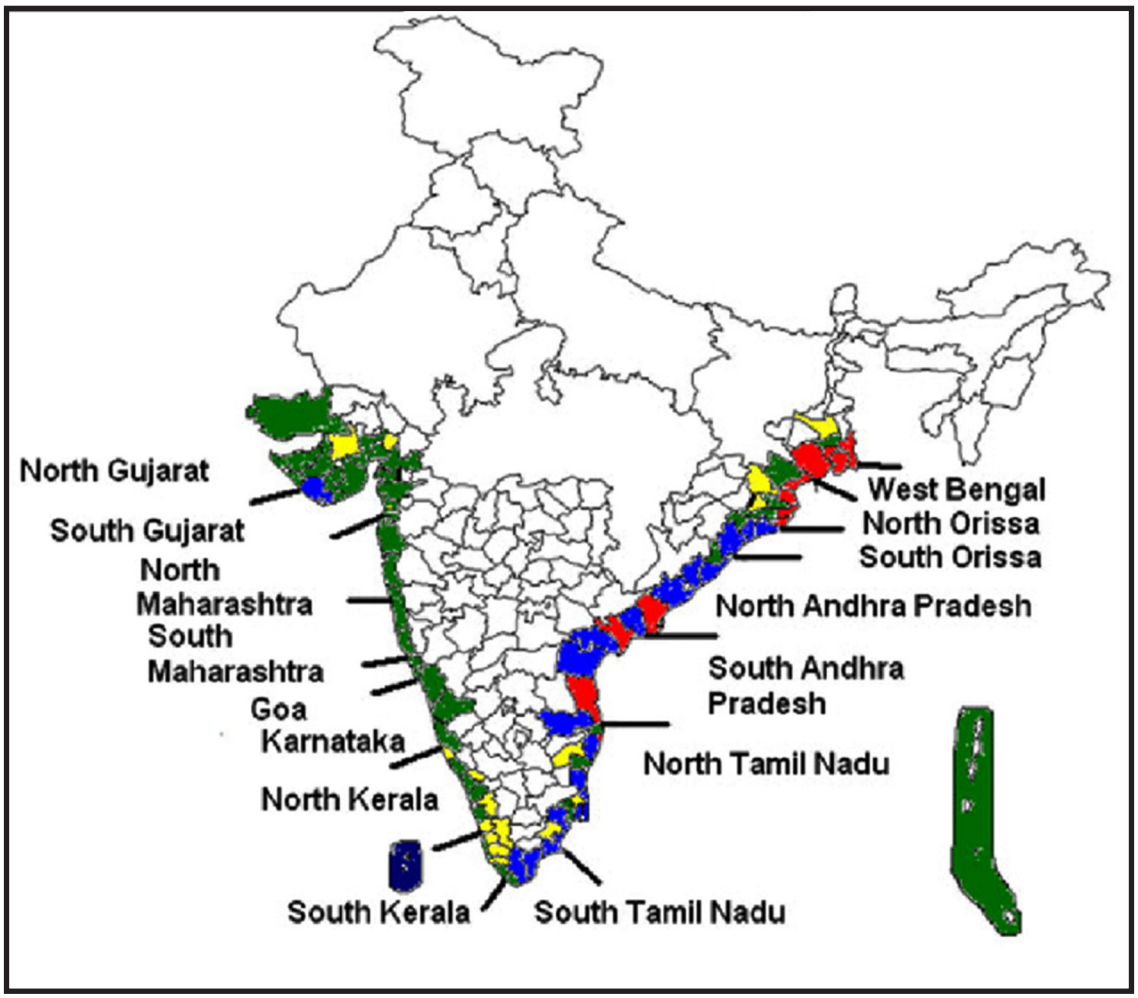
Climate change has impacted the frequency and ferociousness of cyclones around the world, and especially in India. Cyclones account for nearly half of India's deaths due to climate-related disasters.

Hazards associated with Cyclones

There are three hazards associated with a cyclone, which cause destruction

- **Storm surge:** A storm surge is an abnormal rise of sea level near the coast caused by a severe tropical cyclone; as a result, seawater inundates low lying areas of coastal regions drowning human beings and livestock, etc.
- **Strong wind**: The most destructive force of a cyclone comes from fierce winds. These winds are strong enough to easily topple fences, sheds, trees, power poles and communication systems, while hurling helpless people through the air.
- **Flood**: Heavy and prolonged rains due to cyclones may cause floods and submergence of low-lying areas causing loss of life and property. Floods and coastal inundation due to storm surges pollute drinking water sources causing outbreak of epidemics.

District identified as Vulnerable to tropical cyclone in India



Mitigation measures for cyclone

Mitigation means measures taken prior to the impact of a disaster to minimize its effects. Mitigation measures for cyclone include both structural and non-structural measures.

- **Hazard mapping:** A hazard map will illustrate the areas vulnerable to the cyclone, and associated storm surge and flood in any given time. It will be useful to estimate the severity of the cyclone and potential damage intensities in the region.
- **Land use planning:** Land use planning should be systematically considered for cyclones so that least critical activities are placed in vulnerable areas. Location of settlements in the flood plains is of utmost risk. Siting of key facilities must be marked in the land use.
- **Engineered structures:** Structures need to be built to withstand wind forces. Good site selection is also important.
- **Retrofitting Non-engineered Structures:** A large portion of Indian people lives in self-designed non-engineered buildings. The knowledge on how to strengthen non-engineered buildings should be shared with the community.
- **Cyclone Shelters:** Cyclone Shelters are necessary for areas vulnerable to recurrent cyclones
- **Flood management:** Flooding will result from a cyclonic storm. Storm surges will flood the coastal areas. Heavy rains will bring in flash floods.
- **Improving vegetation cover:** Improvement of the vegetation will increase water infiltration capacity of the soil. The roots of the plants and trees will keep the soil intact and prevent erosion and slow runoff to prevent or reduce flooding.
- **Mangrove plantation:** Mangroves protect the coastal area from storm surge and wind which accompanied with cyclones.
- **Saline embankments:** Another activity that can be taken up as part of the community-

based mitigation are construction of saline embankments to protect habitation, agriculture crop and important installations along the coast from sea water inundation due to storm surge.

- **Raised embankment or levees:** Raised embankments above high flood or storm surge level need to be identified or constructed within an easily accessible place which can serve as an assembly point for various activities in normal weather and as good shelter in stormy weather and high violent floods

12 Tsunami

Odisha has achieved another milestone in disaster management. Venkatraipur in Ganjam and Noliasahi in Jagatsinghpur have been recognised by UNESCO-IOC as Tsunami-Ready Communities.

About Tsunami Ready

- Tsunami Ready is a community performance-based programme.
- Initiated by the Intergovernmental Oceanographic Commission (IOC) of UNESCO to promote tsunami preparedness through the active collaboration of public, community leaders, and national and local emergency management agencies.

About the Intergovernmental Oceanographic Commission (IOC):

- IOC-UNESCO was established in 1960 as a body with functional autonomy within UNESCO and is the only competent organization for marine science within the UN system.
- The purpose of the Commission is to promote international cooperation and to coordinate programmes in research, services and capacity-building, in order to learn more about the nature and resources of the ocean and coastal areas and to apply that knowledge for the improvement of management, sustainable development, the protection of the marine environment, and the decision-making processes of its Member States.

The IOC is recognized through the United Nations Convention on the Law of the Sea (UNCLOS) as the competent international organization in the fields of Marine Scientific Research and Transfer of Marine Technology.

13 Wild Fire

Forest fires continue to scorch several hectares of green cover in the Uttarakhand and Himachal Pradesh.

What causes forest fires?

- The forest fire season in India lasts between Novembers to June. Several factors like temperatures, precipitation, vegetation, and moisture contribute to the scale and frequency of these fires.
- According to the Forest Survey of India, nearly 36 per cent of India's forests are prone to frequent fires.
- Higher fire incidents are reported in March, April and May due to ample availability of dry biomass (fuel load) following the end of winter and the ongoing summer season.

Causes of Forest fire

More than ninety five percent forest fires are caused either by negligence or unknowingly by the human being. The rest of the fires are caused by natural reasons i.e. lightning, extreme rise in the temperature etc., which are very rare.

Natural Cause	Anthropogenic Cause	
	Deliberate	**Accidental**
Lighting	Shifting Cultivation	Collection of Non Timber Forest Produce
Friction of rolling stones	To flush growth of tendu leaves	Burning farm residues
Rubbing of dry bamboo clumps	To have good growth of grass and fodder	Driving away wild animals
Volcanic explosion	To settle score with forest department or personal rivalry	Throwing burning bidi/ cigarettes
	To clear path by villagers	Camp fires by picnickers
	To encroach upon the forest land	Sparks from vehicle —exhaust
	For concealing illicit felling	Sparks from transformers
	Tribal traditions/ customs	Uncontrolled prescribed burning
		Resin tapping
		Making charcoal in forests
		Extracting wine in forest
		Sparks from cooking near the forest
		Heating coal tar for road construction in forest

Damage caused by Forest Fire

- **Loss of valuable timber resources**
  - Forest fires cause indispensable loss to timber and deteriorate its quality. Valuable timber species like teak, sal, chir, deodar, sheesam, rosewood etc. are adversely affected by fire

14 Incidents of Man Made & Natural Disasters in India

India is a diverse country in terms of climate, terrain and relief and thus is prone to different types of disasters which include manmade disasters as well as natural disasters.

A. Industrial Disasters

- **Chasnala Mining Disaster (1975):** The Chasnala mining disaster occurred on December 27, 1975 in a coal mine near Dhanbad in present day Jharkhand.
- **Bhopal Gas Tragedy:** Bhopal disaster was essentially a chemical leak which occurred in 1984 in the city of Bhopalthe capital city of Madhya Pradesh.
- **Korba Chimney Collapse:** The 2009 Korba chimney collapse occurred in the industrial town of Korba in Chhattisgarh on 23 September 2009. The chimney was under construction under contract for the ***Bharat Aluminium Co Ltd (BALCO).***

B. Earthquakes

- **Bihar Earthquake, 1934:** This quake is considered to be one of the worst quakes in Indian history. ***The magnitude of the earthquake was 8.1.*** The epicentre of the earthquake was located in eastern Nepal. Extensive damage was caused to life and property.
- **Maharashtra Earthquake, 1993:** Magnitude of the earthquake was recorded at 6.4 and the epicenter was located at Killari village in Latur district.
- **Assam Earthquake, 1950:** Earthquake of magnitude 8.6 struck Assam with its epicenter at Rima in Tibet. The quake caused widespread destruction in both Assam and Tibet.
- **Uttarkashi Earthquake, 1991:** Magnitude 6.1 earthquake hit the Uttarkashi, Chamoli and Tehri in Uttarakhand and caused extensive damage to property.
- **Gujarat Earthquake, 2001:** Magnitude 7.7 earthquakes hit the Bhuj district of Gujarat on January 26, 2001 causing death of over 20,000 people.

C. Cyclones

- **Odisha Super Cyclone, 1999:** The Orissa cyclone in the year of 1999 was the strongest storm to hit the Indian coast and was also the strongest tropical cyclones that affected India.
- **Bhola Cyclone (1970):** Although the cyclone hit the modern day Bangladesh (formerly East Pakistan), the nearly 20-foot storm surge created by winds as high as 225.3 kmph (140 mph) devastated countless offshore islands, wiping out entire villages and destroying crops and livestock.
- **Andhra Pradesh Cyclone, 1977:** Nearly 10,000 people died in the cyclone which crossed the coast near Diviseema in Krishna district in 1977. The worst-affected areas were in the ***Krishna river delta***.

D. Floods

- **Uttarakhand Floods, 2013:** It was one of the worst floods in India's recent history occurred in Uttarakhand in June 2013. Heavy rain due to a cloudburst led to sudden flash floods and landslides in the northern part of Uttarakhand.
- **Assam Floods, 2012:** In July 2012, heavy rains caused floods in Assam. The state got about 528mm rain, which was ***28% more than its average annual rainfall.***
- **Bihar Floods, 1987**
  - The most devastating flood in Bihar's recent history occurred in 1987, when a landslide blocked the Bhote Kosi River, causing it to flood and destroy more than 1.7 million homes.
  - The state government says the flooding killed 1,399 people and 5,302 animals.

E.Urban Floods

- **Mumbai Floods:** On July 26, 2005, Mumbai received about ***944 mm rain in just 24 hours*** which was essentially a ***100-year record***. Over 1,000 people lost their lives in the deluge, while approximately ***14,000 homes were destroyed***.
- **Chennai Floods, 2015:** Chennai floods was one of the world's most expensive natural disasters in that year, causing India over ***50,000 crore rupees*** in losses.

F.Tsunamis

- **Indian Ocean Tsunami, 2004:** A magnitude-9.0 earthquake under the Indian Ocean on Dec. 26, 2004 triggered a tsunami that devastated southern India.
  - The Tsunami waves struck along the southern coast of India, affecting the states of ***Tamil Nadu, Kerala, Andhra Pradesh and Pondicherry.*** India's Andaman and Nicobar Islands were also affected.

G. Cloudburst

- A cloudburst is an extreme amount of precipitation in a short period of time, sometimes accompanied by hail and thunder, which is capable of creating flood conditions.
  - **Kashmir Valley, 2015:** More than eight cloudbursts in three weeks left at least ten people dead in the Kashmir Valley. The occurrences have been reported in Budgam, Kupwara and Ganderbal.
  - **Leh, Ladakh, 2010:** In August 2010, Leh district in the UT of Ladakh experienced a disaster when a cloudburst generated debris flows, killed hundreds of people, destroyed houses, and damaged the hospital,

communication infrastructure, the bus station, and vital roads.

H. Glacial Lake Outburst Flood

- A Glacial Lake Outburst Flood (GLOF) is sudden release of water from a lake fed by glacier melt that has formed at the side, in front, within, beneath, or on the surface of a glacier.
  - **Uttarakhand GLOF, 2021:** A portion of the Nanda Devi glacier broke off releasing the water trapped behind the ice, creating an avalanche and deluge that quickly turned into flash floods in Uttarakhand's Chamoli district.

15 Prime Minister Ten-Point Agenda on Disaster Risk Reduction

The Prime Minister, Narendra Modi, enunciated a **Ten-Point Agenda** in his inaugural speech at the **Asian Ministerial Conference on Disaster Risk Reduction 2016, (AMCDRR),** which has also been incorporated in the NDMP.

Prime Minister Ten-Point Agenda on disaster risk reduction:-

- All development sectors must imbibe the principles of disaster risk management
- Risk coverage must include all, starting from poor households to SMEs to multi-national corporations to nation states.
- Women's leadership and greater involvement should be central to disaster risk management
- Invest in risk mapping globally to improve global understanding of Nature and disaster risks
- Leverage technology to enhance the efficiency of disaster risk management efforts
- Develop a network of universities to work on disaster-related issues
- Utilise the opportunities provided by social media and mobile technologies for disaster risk reduction.
- Build on local capacity and initiative to enhance disaster risk reduction
- Make use of every opportunity to learn from disasters and, to achieve that, there must be studies on the lessons after every disaster.
- Bring about greater cohesion in international response to disasters.

16 The Sendai Framework for Disaster Risk Reduction

The Sendai Framework is the successor to the Hyogo Framework for Action (HFA) 2005-2015. It is a 15-year, voluntary, non-binding agreement which recognises that the State has the primary role to reduce disaster risk.

The Seven Global Targets: -

- **To reduce mortality:** First target aim to substantially reduce global disaster mortality by 2030, with an aim to lower average per 100,000 global mortality rate in the decade 2020-2030 compared to the period 2005-2015.
- **To reduce the number of affected people:** Second target aim to reduce the number of affected people globally by 2030, with target to lower the average global figure per 100,000 in the decade 2020 -2030 compared to the period 2005-2015.
- **To reduce direct disaster economic loss: -** It target to reduce loss in global gross domestic product (GDP) due to disaster by 2030.
- **To substantially reduce disaster damage to critical infrastructure and disruption of basic services: -** This includes reducing damage to health and educational facilities through developing their resilience by 2030.
- **To spread disaster risk efforts:-** It envisage to substantially increase the number of countries with national and local disaster risk reduction strategies by 2020.
- **To increase cooperation and support: -** It aim to enhance international cooperation to developing countries through adequate and sustainable support to complement their national actions for implementation of this Framework by 2030.
- **To increase accessibility: -** It target to substantially increase the availability and access to multi-hazard early warning systems and disaster risk information and assessments to the people by 2030.

17 Coalition for Disaster Resilient Infrastructure (CDRI)

The Union Cabinet approves categorizing the Coalition for Disaster Resilient Infrastructure (CDRI) as an "International Organization".

What is the Coalition for Disaster Resilient Infrastructure?

- The Coalition for Disaster Resilient Infrastructure is a partnership between national governments, United Nations programmes and agencies, development banks, academic institutions and the private sector.
- The objective of the coalition is to address challenges related to building resilience into infrastructure systems and associated developments.
- It promotes the resilience of new and existing infrastructure systems to climate and disaster risks in support of sustainable development.
- CDRI supports the expeditious development of resilient infrastructure in response to the Sustainable Development Goals' necessities of extending universal access to basic services, facilitating prosperity and decent work.
- It will work towards standardisation of designs, processes and regulations relating to infrastructure creation and management.
- It is a platform for knowledge generation and exchange and will also develop country-specific as well as global plans.

Objectives of CDRI

- To promote the resilience of infrastructure systems to climate and disaster risks ensuring sustainable development.
- To rapidly expand the development and retrofit of resilient infrastructure to respond to the Sustainable Development Goals imperatives of expanding universal access to basic services, enabling prosperity and decent work.

18 National Policy on Disaster Management

The National Policy on Disaster Management (NPDM) has been prepared in tune with and in pursuance of the Disaster Management Act, 2005. National Policy on Disaster Management (NPDM) will provide the framework/roadmap for handling disasters in a holistic manner.

Vision: To build a safe and disaster resilient India by developing a holistic, proactive, multi-disaster oriented and technology driven strategy through a culture of prevention, mitigation, preparedness and response.

Approach

- A holistic and integrated approach will be evolved toward disaster management with emphasis on building strategic partnerships at various levels. The themes underpinning the policy are:
- Community based DM, including last mile integration of the policy, plans and execution.
- Capacity development in all spheres.
- Consolidation of past initiatives and best practices.
- Cooperation with agencies at national and international levels.
- Multi-sectoral synergy.

Objectives

- Promoting a culture of prevention, preparedness and resilience at all levels through knowledge, innovation and education.
- Encouraging mitigation measures based on technology, traditional wisdom and environmental sustainability.
- Mainstreaming disaster management into the developmental planning process.
- Establishing institutional and techno-legal frame works to create an enabling regulatory environment and a compliance regime.
- Ensuring efficient mechanism for identification, assessment and monitoring of disaster risks.
- Developing contemporary forecasting and early warning systems backed by responsive and failsafe communication with information technology support.
- The NPDM addresses the concerns of all the sections of the society **including differently abled persons, women, children and other disadvantaged groups**

INTERNAL SECURITY

CHAPTER

1

Challenges to Internal Security

Topic of This Chapter

1	Emerging New Threats
2	The Rise of 'Communalism', a Threat to India
3	Interoperable Criminal Justice System
4	Integration of Central Agency with Crime and Criminal Tracking Network System (CCTNS)
5	Social Media & Risks Associated
6	Big Tech Weaponizing Internet Amid Conflict

1 Emerging New Threats

India faces a wide array of challenges to its internal security that include not only traditional military and nuclear threats, but a vast type of threats such as **terrorism, cyber security, and other demographic challenges**.

Emerging Threats

- **Cyber security**: - The cybercrimes transcend geographical boundaries, which make it tough to track criminals. As per the **CERT-In data**, cyber security incidents related to government has increased significantly.
- **Climate change as a destabilising threat:** One of the most critical issues concerning India's security is climate change and its impact.
- **New form of Terrorism:** Terrorism is taking new shape with increased incidents of lone wolf attacks. They are neither limited by territorial boundaries, nor do they recognise the concept of sovereignty.
- **Internal security challenges: India faces a range of internal security challenges, including insurgencies in some states, communal violence, and extremist movements.**
- **Border disputes: India shares borders with several neighboring countries, including China and Pakistan, with whom it has ongoing territorial disputes.**

Government measures to strengthen India's security

The Indian government has undertaken a range of measures to strengthen India's security. Here are some of the key initiatives:

- **Modernization of the armed forces:** The Indian government has undertaken a major modernization program to upgrade the capabilities of its armed forces.
- **Border infrastructure development:** The government has undertaken a major infrastructure development program along India's border with China and Pakistan.
- **Intelligence and surveillance**: The Indian government has invested in strengthening its intelligence and surveillance capabilities to better track and respond to security threats.
- **Counterterrorism measures:** The government has taken several measures to counter terrorism, including strengthening anti-terrorism laws, enhancing border security, and improving intelligence sharing and cooperation with other countries.
- **Cybersecurity:** The government has taken several steps to enhance India's cybersecurity, including the establishment of a national cybersecurity agency and the development of a cybersecurity strategy.
- **Strategic partnerships:** The Indian government has strengthened strategic partnerships with other countries to enhance its security.

2 The Rise of 'Communalism', a Threat to India

Intolerance may cause India to devolve from a secular to a communal state, threatening the fraternity, integrity and security of India.

Factors responsible for Communalism's emergence in India

- **Communal Parties' Presence:** Religion has become a key means of political socialisation in India, responsible for the creation of communalism, either directly or indirectly.
- **A Legacy of the Past:** India was partitioned based on Jinnah's "Two Nation" doctrine. Communal politics played an ugly game.
- **Poverty**: Poverty a major cause of backwardness, illiteracy, and ignorance, among other things. Religious fundamentalists and fanatics readily trap the unemployed youth of both populations. They use them to incite communal unrest.
- **Social Concern:** Social and cultural diversity playing a role in increase in grudges in society for social and cultural rights of the people.
- **Communalisation of Politics:** Political parties have communalised their political agenda to secure votes and position.
- **Governmental failure:** Both the federal and state governments frequently fail to prevent communalism in the country.

Consequences of Communalism:

- **Genocides**: The poor are the true victims of **mass killings**, as they lose their homes, their loved ones, their lives, their livelihood, and so on. It infringes on human rights in every way. When children lose their parents, they may become orphans for the rest of their lives.
- **Emigration:** Sudden increases in violence against a community result in **mass emigration and stampedes**, which result in the deaths of a large number of people.
- **Dangerous to nation's unity:** It is a danger to **Indian constitutional ideals**, which promote secularism and religious tolerance, in addition to having an impact on society.
- **Separation of people and society:** It just fosters feelings of animosity in all directions, separating society along communal lines.
- **Barrier to development:** Communal activities that occur regularly hurt the country's human resource and economy.

3 Interoperable Criminal Justice System

The Centre approved the implementation of **Phase II** of the **Inter-Operable Criminal Justice System (ICJS)** project by the **Ministry of Home Affairs.**

About Inter-Operable Criminal Justice System (ICJS):

- Inter-Operable Criminal Justice System (ICJS) is a **national platform** for **enabling integration of the main IT system** used for delivery of Criminal Justice in the country by **five pillars namely:-**
  - Police (Crime and Criminal Tracking and Network Systems)
  - e-Forensics for Forensic Labs
  - e-Courts for Courts
  - e-Prosecution for Public Prosecutors
  - E-Prisons for Prisons
- In **Phase-I** of the ICJS project, individual IT systems have been implemented and stabilized; also search of records have been enabled on these systems.
- Under **Phase-II**, the system is being built on the principle of **'one data one entry'** whereby data is entered only once in one pillar and the same is then available in all other pillars without the need to re-enter the data in each pillar.
- **Implementing Agency:** National Crime Records Bureau (**NCRB**) will be responsible for the implementation of the project in association with the National Informatics Centre (**NIC**).
- The project will be implemented in collaboration with the States and Union Territories.
- The ICJS system would be made available through a dedicated and secure **cloud-based infrastructure** with **high speed connectivity**.

4 Integration of Central Agency with Crime and Criminal Tracking Network System (CCTNS)

Union Home Minister has stated that the data of Central agencies such as CBI, NIA etc., should be integrated with **Crime and Criminal Tracking Network System (CCTNS).**

What is Crime and Criminal Tracking Network System?

- CCTNS is a programme through which around 16,000 police stations all over India have been connected so that their data could be shared.
- This programme was implemented by **National Crime Records Bureau.**

The second phase of ICJS

- The **second phase of the Inter-operable Criminal Justice System (ICJS) will be implemented** by the Centre Government by the year 2026.
- ICJS is an initiative of the Ministry of Home Affairs to **enable seamless transfer of data and information among different pillars of the criminal justice system,** like courts, police, jails and forensic science laboratories, from one platform.

What will be the benefits of ICJS?

- **Easy accessibility:** With the aid of the ICJS

platform, the metadata of FIR and charge sheet can be accessed by all the High Courts and subordinate courts.

- **Easing it for courts**: Documents like FIR, case diary and charge sheet are uploaded by police in PDF format for utilization by the courts.
- **Real-time information:** The ICJS platform is an effective tool for the case and court management, as all the relevant information of a case will be available in real-time for use by the courts.
- **Effective compliance:** Compliance of judicial orders and summons can also be achieved expeditiously, ensuring effective time management.
- **Enhanced productivity**: The ICJS is going to be a milestone to enhance the productivity of the criminal justice system both qualitatively and quantitatively.

5 Social Media & Risks Associated

Social media has dramatically transformed the communication scene for all and sundry. Despite the advantages of social media, there are certain risks associated to the internal security of the nation in various forms. Instances of cyber terrorism, fraud, crime, cyber bullying and misinformation etc., are increasing at an alarming rate.

Challenges in adapting social media into policing

- Lack of clarity on how to use the technology
- Absence of adequate internet infrastructure
- Lack of immediate availability of talent
- Shortage of personnel and soft skills required to deal
- with a medium like social media at local levels
- Multiplicity of languages in India require further customization of technology which, in turn, requires Investment, both human and capital as well as redrawing of budget plans.
- **Challenges of social media monitoring**
  - Server Location and Laws of Different Countries
  - Encrypted Message and privacy issue
  - Complicated Networks
  - Accountability issues
  - Anonymity

Ways to address the challenge of social media

- Digital Education
- Strengthening cyber intelligence
- Accountability on social media platforms
- Smart policing
- Mining Social Media for Intelligence

6 Big Tech Weaponizing Internet Amid Conflict

Amid the continued "**weaponization**" of the internet by some Big Tech platforms during the ongoing Russia-Ukraine conflict bringing back the focus on the **sweeping powers of social media platforms**, India is readying a **new cybersecurity and data governance framework**.

How Big Tech firms are weaponizing internet and why it is a troubling precedent?

- Since the Russian invasion of Ukraine, **companies**, **countries**, **Big Tech platforms and intermediaries** have announced a slew of sanctions which have either stopped or cut off services being provided by them to Russia and its citizens.
  - Some of these measures include **stoppage of payment services**, refusal by intermediaries to operate in Russia and not allowing their citizens to post.
- The actions by Big Tech companies and intermediaries **violate** basic principles of **net neutrality** and basic idea of openness of internet as they have now become "**gatekeepers**".
- Two phenomenon are very visible:
  - **Weaponisation of the internet**
  - **Phenomenon of the splinter-net**: The internet is increasingly being splintered, driven by power of some Western countries.

What is splinter-net?

- The splinternet (also referred to as **cyber-balkanization or internet balkanization**) is a characterization of the Internet as splintering and dividing due to various factors, such as **technology, commerce, politics, nationalism, religion, and divergent national interests**.
- In this, internet is controlled by **autonomous political blocs** or any other **controlling power** with diverging national interests tied to nationalism or religion.
- In its original form, the internet transcended borders and allowed people unfettered access to virtually everything, while the **splinternet limits citizens' access to data**, **forces businesses to keep data within borders**, and even **changes how they operate within a state**.

Learning for India in dealing with Cyberspace:

These recent events **strengthen India's case for**

- Data localization
- Resilient internet network architecture
- Native open **APIs** (application programming interface)
- A strong cyber security command centre.
- It is validating our thinking in terms of a **new digital law**, the need for a **data governance framework** which will have the **data protection law**, a **digital law** and other **cyber security statutes**.
- Architecturally, there is need to build the **cyberspace jurisprudence** rather than doing it piecemeal or in catch up mode.

CHAPTER

2

Terrorism

Topic of This Chapter

1	Anti-Terror Laws in India and its Repeal
2	Terrorism the New Violator of Human Rights
3	Organised Crime and its Nexus with Terrorism
4	Solution to Radicalisation in India
5	Challenge of Recidivism to Counter-Radicalisation Programmes
6	Drug Trafficking
7	Exclusive Economic Zone and India's Maritime Governance
8	Insurgency in North East
9	Manipur Tribal Issue

1 Anti-Terror Laws in India and its Repeal

India's anti-terrorism legislation has long been a **source of intense debate**. One of the basic reasons for contention is that these regulations violate citizens' basic freedoms, which are protected by **Part III of the Constitution.**

How Anti-terror laws safeguard India's national security?

- **Counteracting Terrorist Threats:** They provide the legal framework to counter and prevent terrorist activities by equipping law enforcement agencies with necessary powers to investigate, apprehend, and prosecute individuals involved in terrorism-related offenses.
- **Deterrence and Prevention:** The existence of robust anti-terror laws acts as a deterrent to
- **International Cooperation:** India's anti-terror legal framework aligns with international conventions.
- **Protection of Citizens and Infrastructure**
- **Disrupting Terrorist Financing**

How Anti-terror laws in India pose a threat to the very goal they seek to achieve?

Anti-terror laws in India, while enacted with the objective of safeguarding national security, can inadvertently pose a threat to the very goal they seek to achieve.

- **Erosion of Civil Liberties:** Stringent anti-terror laws often grant wide-ranging powers to law enforcement agencies that can lead to the erosion of civil liberties, including the right to privacy, freedom of speech and expression, and the right to a fair trial
- **Risk of Misuse and Abuse**: Anti-terror laws are susceptible to misuse and abuse, which can harm innocent individuals and groups.

Poor press freedom in India: In the **World Press Freedom Index 2022** compiled by rights organization **Reporters Without Borders (RSF),** India ranked 150th among 180 countries — the South Asian nation's lowest ranking ever.

- **Undermining Trust and Cooperation:** Heavy-handed enforcement of anti-terror laws can breed mistrust and resentment among communities.
- **Focus on Symptom rather than Root Causes:** Overreliance on punitive measures under anti-terror laws may divert attention from addressing the root causes of terrorism, such as socio-economic inequalities, political grievances, and radicalization.

2 Terrorism the New Violator of Human Rights

In a recent address at the **90th Interpol General Assembly** in New Delhi, the Home minister has mentioned the collective cooperation of members' to ensure that the **fight against terrorism** is sustained, comprehensive and continuous, for which India is committed to working with the **Interpol.**

What issues arises of Terrorism?

- It violates human rights and weaken democracy
- Countering Terrorism can threaten the **right to life** of an individual.
- Challenges to the absolute prohibition against torture
- Transfer of individuals suspected of terrorist activity
- Liberty and security of the person is threatened
- Due process and the right to a fair trial of the suspects gets staked.
- Surveillance, data protection and the right to privacy is at risk due to terrorist activities.

What are the fundamental challenges?

- Fast evolving of terrorism
- Lack of definition of the term terrorism
- Lack of mechanisms to list terror entities
- The ease with which Islamic State (IS) attracted recruits from around the world.
- The ease with which they travelled across borders to join the so-called caliphate in Syria and Iraq.

- Increasing potential use of 3-D printing, robotics, artificial intelligence (AI), machine learning, unmanned aerial systems, and synthetic biotech, for illegal ends.

Steps Taken by India

- **Comprehensive convention on International Terrorism:-**India highlighted its demand for a Comprehensive Convention on International Terrorism (CCIT) at the 73rd session of the UN General Assembly (UNGA).

It included the following major objectives:-

- Universal Definition of Terrorism:-To have a universal definition of terrorism that all members would adopt into their own criminal laws.
- To ban all terror groups and shut down terror camps.
- To prosecute all terrorists under special laws.
- To make cross-border terrorism an extraditable offence worldwide.
- **Unlawful Activities (Prevention) Act, 1967**: It enables more effective prevention of certain unlawful activities of individuals and associations and for dealing with terrorist activities, and other related matters.
- **National Investigation Agency**: It is India's counter-terrorist task force and is empowered to deal with terror related crimes across states without special permission from the states.
- **Policy of Zero-Tolerance against Terrorism:** India calls for zero-tolerance against terrorism and focuses on developing a common strategy to curb it.
- **Various Counter-Terrorism Operations**
  - **Operation Rakshak**: Counter-insurgency and counter-terrorism operation in Jammu and Kashmir in 1990.
  - **Operation Sarp Vinash:** Undertaken by Indian army to flush out terrorists in the areas of the Pir Panjal range in Jammu and Kashmir in 2003.
  - **Operation All Out:** Joint offensive launched by Indian security forces to flush out militants and terrorists in Kashmir in 2017.

3 Organised Crime and its Nexus with Terrorism

The nexus between transnational '**organized crime and terrorism'** represents a growing threat worldwide.

What is Organised Crime?

- **UN Convention against Transnational Organised Crime** defines an organised criminal group as:-A group of three or more persons that were not randomly formed; existing for a period of time; acting in concert with the aim of committing at least one crime punishable by at least four years' incarceration.

Terrorism and organised crimes

- **For generating money:** As to carry out terrorist activity a lot of money is required so, terrorists engage in organised crime to fund their terrorist activity.
- **Safe opportunities:** Due to the transnational nature of the organised crime, they host the terrorist and create opportunities for their growth in new areas.
- **Symbiotic relationship:** Organised crime groups provide smuggled arms and explosives to terrorist groups in exchange terrorist groups provide protection, drugs etc.

Combating Organized Crimes

Suggested methods to combat nexus between organised crime and terrorism are as follow:

- Strengthening of Criminal Laws
- Improving Coordination and Setting up of Specialized Units
- Enhancing International Cooperation
- Political Commitment
- Public Awareness
- Role of Mass Media

4 Solution to Radicalisation in India

The ban on the PFI has raised the question of the effectiveness of banning radical organizations in arresting the rise of radicalization.

- Such developments raise questions over the fruitfulness of politico-legal actions like banning an outfit to keeping a check on the growth of radicalization.

PFI and its activities:

- PFI and similar organizations can be seen as **not having Islamic subtitles** in their organization's names. This is purposefully done to **legitimize the PFI's official claim as a "neo-social organization**".
- They also try to **forge alliances with non-Muslim organizations** to **avoid any surveillance from state agencies.**
- PFI is one of the well-organized radical outfits, ensuring that it **leaves no trace or evidence of its activities behind.**

"Ban" as a solution to religious radicalism:

- **Resorting to incarnation:** The past observation shows that extremist organizations have a record of morphing from one organization to another. It's difficult to rule out the new incarnation of the same organization in the future.
- **Limitations of Politico-legal actions**: The banning of these radical outfits is undoubtedly crucial to curb violent activities, but such a measure is insufficient **given their structured approach.**
- **Investing at the social level**: Right after the ban, the government must reach out to those communities from which these radical outfits often seek support.
  - This will not only expose them but also make them aware of the nefarious ideologies of these organizations.
  - **The absence of comprehensive measures** at the social level often **nullifies the initial role of politico-legal measures.** As the **banned outfits have inherent tendencies of resurfacing** and portraying of them as messiahs to the downtrodden to further their radical agenda.
- **Supporting Minorities:** Radicalisation is usually a process, not an event. During that process, it is possible to intervene to **prevent minorities/ vulnerable people** from getting radicalized.

Government Initiatives:

- **Legal mechanisms:** The **National Investigation Agency (NIA)** Act was introduced in 2008 after the terrorist attacks in Mumbai (2008).
  - The **Unlawful Activities (Prevention) Act (UAPA)** was introduced in 1967. It aims to provide for the more effective prevention of certain unlawful activities of individuals and associations dealing with terrorist activities.
- **Institutional mechanisms: Counter-Terrorism and Counter Radicalization (CTCR) divisions** of the Ministry of Home Affairs are the key wings of the Government of India dealing with "radicalization, counter-radicalization, terrorism, and counter-terrorism".
- **Cyber world and technology mechanisms: The Indian Penal Code (IPC) Sections** 124A, 153A, 153B, 295A, and 505 prescribe a firm approach against any word, spoken or written, that promotes disharmony, enmity, and hatred.

5 Challenge of Recidivism to Counter-Radicalisation Programmes

In recent times, '**recidivism'** has increased, as some of the released terrorists have carried out terrorist acts.

- Some international policy organisations have expressed concern that certain individuals receiving therapy at **counter-radicalisation centres** may have learnt the art of deceiving the psychologists and in passing the tests conducted there to procure an early release from the prisons.

Understanding radicalisation

- Radicalisation is a process with multiple reinforcing pathways of developing extremist beliefs, emotions, and behaviours.

- It also involves changes in attitudes, beliefs, behaviour, ideals, goals, ideology, and willingness, which become extreme.

Challenges regarding counter-radicalisation

- **Persistent Socio economic inequality**
- **Insufficient reach of the state in the hinterlands**
- **Barriers in the developmental process**
- **Democratic challenges in neighboring states**
- **Easy deceiving: Certain individuals under the therapy have learnt the art of deceiving the psychologists and get early release from prison.**
- **False success rate:** The success rate in the de-radicalisation process is very less and there are several instances of false successes.
- **It is not a fool-proof measure**
- The terrorists portray to the authorities that they have been redeemed by the de-radicalisation programmes and have sworn off from committing terrorist offenses in the future.

6 Drug Trafficking

Recently, the United Nations Office on Drugs and Crime (UNODC), in its **World Drug Report 2021**, has highlighting that the lockdown factor accelerating **drug trafficking** using the Internet.

Assessing threats of drug trafficking to India's national security

- **Societal Impact:** The proliferation of drugs within society can destabilize communities, disrupt family structures, and contribute to an increase in crime rates, including theft, violence, and organized criminal activities.
- **Economic Consequences**: Drug trafficking generates substantial illegal profits, which can be used to fund other criminal activities, including terrorism.
- **Financing of Terrorism:** Drug trafficking has been linked to the financing of terrorist organizations globally.
- **Border Security and Transnational Crime:** Illicit drug trade contributes to border security challenges, including smuggling, illegal migration, and the infiltration of criminal networks.
- **Public Health Crisis**: Drug trafficking contributes to a public health crisis by facilitating the availability and accessibility of illicit drugs.
- **Destabilization of Governance:** The infiltration of drug cartels and organized criminal networks can lead to corruption, undermining law enforcement agencies and compromising the justice system.

7 Exclusive Economic Zone and India's Maritime Governance

According to the Indian Navy, more than **200 Chinese fishing vessels** have been monitored in the Indian Ocean in the year 2022, which further highlights the **illegal, unreported and unregulated (IUU)** activities to continuerising beyond India's **Exclusive Economic Zone (EEZ).**

Threats for India

- **India territory with huge coastline** is vulnerable to the threats emerging from maritime domain.
- **Maritime terrorism** (Mumbai attack of 26/11)
- **China** is rising, emerging as a serious challenger.
- **Other issues:** Piracy, Terrorism, Illegal migration, Transnational Organised crimes, Environmental Concern

Why maritime security is important for India?

- **Water for trade:** India's major import and exports is carried out through the maritime water, thus enhancing the importance of securing coastlines is imperative of economic growth.
- **Maritime threats:** India's huge coastlines, around 7000km, increases the vulnerability to maritime threats as testified by **26/11Mumbai attacks.**
- **Blue economy:** One of the major economic activities of the coastal states of India, comprising around 4% of the Indian economy, with an immense future potential.

- **Strategic Factor:** Increasing Chinese influence and assertiveness in the Indian Ocean Region providing a potential threat to the India's regional interest.
- **Ocean resource security and management of resources.**

Mechanism available for combating maritime security:

- **United Nations Convention on the Law of the Sea (UNCLOS)** provides a framework regarding rights and responsibility of the nations over international waters.
- **SAGAR (Security and Growth for All in the Region) Doctrine**: Indian initiative, aims to deepen the economic and security cooperation with its maritime neighbours, along with enhancing their security capabilities.
- **Indo-Pacific Oceans' Initiative (IPOI)**
- **QUAD initiative** to ensure safe, secure and free Indo-Pacific region.

8 Insurgency in North East

In the current security scenario of India's northeast region, the insurgency in the northeast has become more of a political than security challenge and therefore requires a different approach.

How Army is changing?

- The emergence of the Chinese threat pushed "the Indian army to reorient itself along the Line of Actual Control (LAC) in Arunachal Pradesh."
- Meanwhile, the reorientation will significantly impact the role of state police forces and paramilitary forces deployed in the region, especially the **Assam Rifles.**
  - Functioning under the Ministry of Home Affairs, Assam Rifles are also known as 'Sentinels of the Northeast,' and are tasked with maintaining border security and counter-insurgency in the region.

What are the reasons of insurgency in North East India?

- **Geographical region:**-North East India is connected to the Indian mainland by a narrow stretch of land called Siliguri Corridor (or Chicken's neck) which is only few kilometers wide**.**
- **Difficult terrain:-**.The Northeast terrain is hilly and not easily accessible because of incessant rain during the months of April to July. Moreover the terrain is densely forested and weather conditions are extreme.
- **Socio-cultural:-Cultural differences:-**The tribes of the Northeast are mostly of Mongoloid stock and they view themselves as different from the Aryan and Dravidian races of India.
- **Ethnic or factional conflict:-**All north eastern states except the Arunachal Pradesh have been inflicted with ethnic violence at one time of another in recent history.
- **Presence of draconian laws:-**Laws such as AFSPA have escalated the conflict by bringing it on a military level. There are regular allegations of violation of human rights by the Indian Amy.
- **Porous international border:-**The 4500 kilometer long international border of India in this region is porous.

How insurgency can be handled efficiently?

- **Greater coordination: -** Greater coordination between central forces and state forces for better tactical response.
- **Greater cultural interaction: -** Greater cultural interaction with the rest of the country and socio-economic development that includes a holistic inclusive development.
- **Decentralization:-**Decentralisation with alertness, improving administrative efficiency, pro-people governance and coping up with regional aspirations.
- **Look East Policy**:-Greater awareness about the Look East Policy and its benefits to the North East should be generated among the policymakers and the intelligentsia of the region.
- **Special economic zones**:-Special economic zone along with India-Bangladesh border, especially in Meghalaya and Assam should be set up.

9 Manipur Tribal Issue

An ethnic clash is unfolding in Manipur between the two large communities-the largely Hindu Meiteis, who live in the plains, and the Christian majority Kukis, who dominate the hills.

Background

- **Massive infiltration from Myanmar:** One of the reasons behind the ongoing conflict is the widespread infiltration of Kukis from neighbouring Myanmar, with which Manipur shares a 550 km-long border.

Knowing about the tribes

- Manipur's population has evolved through several waves of immigration from groups originating from both East and West of the region.
- The origin of the state's diverse population to be primarily of the Tibeto-Burman stock.

Who are Meiteis?	Who are Kukis?
◉ Meiteis (also called Manipuris) are the most numerous of all the ethnic groups in the state and largely inhabit the fertile **Imphal valley** that sits at the centre of the state. ◉ Meiteis were originally a set of four different tribes — **Khuman, Luwang, Moirang and Meitei.**	◉ Kukis in the state (called Khongjais in Meiteilon) refers to the **Chin tribes** that inhabit the Southern Hills and the **Kangpokpi region** in the Northern Hills. ◉ They are culturally closer to the Mizos of Mizoram and the Chin tribes of Myanmar. ◉ They are relatively much later migrants to the state compared to the Nagas and the Meiteis. ◉ Nagas in Manipur refers to a collection of tribes that live North of the Imphal valley. ◉ There are 16 major tribes such as Angami, Ao, Chakhesang, Chang, Khemungan, Konyak, Lotha, Phom, Pochury, Rengma, Sangtam, Sema, Yimchunger and Zeliang.

Coverage of the tribes

- The Meiteis make up 53 per cent of the population of the state and the Kukis and the Nagas, who are Scheduled Tribes, constitute 40 per cent.
- The valley, dominated by the Meiteis, constitutes just about a tenth of Manipur's total land area, but it is the most fertile region of the state.
- The Meiteis also dominate the state's sociopolitical and economic landscape.

Why are Tribes against the ST status for Meitei?

- Tribals including **Nagas, Zomis, and Kukis** against the ST status for Meitei. They comprise around 40 per cent of the state's population.
- The Meitei community are already classified under Scheduled Castes (SC) or Other Backward Classes (OBC) and is privy to opportunities that are afforded by that tag.
- The ST communities of Manipur fear the loss of job opportunities and other affirmative actions granted to STs by the Constitution of India to a much-advanced community like the Meitei.
- Apart from being the majority community, Meiteis also have more representation in Manipur Assembly.
- That's because 40 of the 60 Assembly seats in the state are from the Imphal Valley region – the area that is mostly inhabited by the Meiteis.

Push for Scheduled Tribe status

- As of today, 34 sub-tribes of the Naga and Kuki-Zomi tribes are on the government's list of Scheduled Tribes, but the Meiteis are not.
- However, the Meiteis have long been demanding Scheduled Tribe status, arguing that it needs to be protected from the influx of outsiders and "infiltration".

Claims made by Meiteis Community

- The Meiteis blame their troubles on "large-scale illegal immigration" from Myanmar and Bangladesh and have sought ST status.

Security Implications

- Security in the Northeast cannot be looked at in isolation from any particular state. The history of the North East from the Indian independence is full of strife and insurgent movements. There is an insurgency in all seven states of the northeast.
- When the British left India, these areas expected to get autonomous status, if not complete independence. Nothing like that happened, and they were all made inclusive of the Indian Union. This inclusion caused heartburn in many politicians and activists in these states.
- The oldest amongst them are the Naga insurgent groups. The NNC (Naga National Council) was formed in 1946, even before Indian independence.
- The security concerns for all states bordering Myanmar remain a cause for worry, despite India's attempt to improve ties with Myanmar.

CHAPTER

3

Cyber Security

Topic of This Chapter

1	Crypto Currency & Threats to India's National Security
2	Internal Security Threats Due to Social Media
3	India's National Cyber Security Strategy
4	Medical Devices and Cyber-attack Threats

1 Crypto Currency & Threats to India's National Security

The growing use of crypto has led to several innovations and changes in the global economic sphere. However, the anonymity of cryptos may become a serious threat to India's national security.

How is crypto currency a threat to national security?

- **Terrorism (through dark net):** The use of crypto currencies on the dark net for terror acts and drug trafficking by militant organisations is posing a severe threat to the national security and a big challenge to security agencies in India
- **Money Laundering:** Money launderers, cyber criminals and terrorists find cryptocurrencies such as Bitcoin, Monero, Ripples and Zcash highly convenient because they offer anonymity and non-traceability.
- **Illegal game:** The legal environment of this phenomenon is not regulated.
- **Crypto currency frauds: -** Crypto frauds can take many shapes and impact a wide range of demographics. Some common frauds include:

Relevance of Prevention of Money Laundering Act, 2002 in the context of virtual assets:-

- Recently, Finance Ministry has notified that crypto or virtual asset businesses will now be in the ambit of the Prevention of Money Laundering Act, 2002 (PMLA).
- The circular also requires Indian crypto exchanges to report any suspicious activity to the **Financial Intelligence Unit-India (FIU-IND).**
- It also mandates that crypto exchanges and intermediaries dealing with **virtual digital assets (VDAs)** must have proper KYC documentation for all customers they on-board.

Effectiveness of Prevention of Money Laundering Act, 2002 in the context of virtual assets:-

- **As per the international standards:** This provision is as per the global trend of requiring digital-asset platforms to follow anti-money laundering standards applicable to banks, financial institutions and certain intermediaries in the securities and real estate markets.
- **Filling the policy regulations**: As there was a lack of regulatory framework regarding crypto currency, this policy could also be the basis for India to reconsider its tax treatment of virtual digital assets.

2 Internal Security Threats Due to Social Media

Society is now conditioned to primarily function in the digital world, largely via social media. Unfortunately, bad actors of varying sophistication continue to weaponized social media, bringing grave harm to not only individuals and organizations, but also critical infrastructure.

Different Internal Security threats due to Social Media are:-

- **Cyber Terrorism:** The chat service like Skype, which includes voice and video capabilities, has become particularly popular with terrorist cells. Chat rooms and electronic forums enable the insurgent and extremists groups to communicate with members and supporters all over the world, to recruit new followers and to share information at little risk of identification by authorities.
- **Fraud:** Social networking sites also invite fraudsters to take excellent opportunity to become wealthy by applying deceiver schemes.
- **Criminal Activity and Money laundering:** Internet Media is a major resource for developing serious crime. Social networking sites also pose major challenge in financial and organized crime which destabilizes the system.
- **International users:** The other national and international users such as the political parties, NGO's, hackers pose a serious threat using the social media. For example, during the civil turmoil in the Arab Spring Uprising, the various governments were threatened through the social media.
- **Communal Violence and Fanning:** Tensions importantly, social media also seems to be playing a significant role in polarising different communities in India and compounding India's security challenges. The viral videos and false updates of communal clashes, riots and terrorists

attack have created a massive impact in the life of public.

- **Hacking:** Hackers write or use ready-made computer programs to attack the target computer. By using Social Media hackers breach the national security and steal important data of defence or other strategic sectors. This can kneel the whole country without using Arms and Ammunition.

Surveillance Projects in India

e-Surveillance Projects: National Intelligence Grid (NATGRID), Central Monitoring System (CMS), Internet Spy System Network and Traffic Analysis System (NETRA) of India, National Critical Information Infrastructure Protection Centre (NCIPC) of India, National Cyber Coordination Centre (NCCC) of India, Tri Service Cyber Command for Armed Forces of India, Cyber Attacks Crisis Management Plan Of India.

Challenges in Monitoring Social Media

- **Server Location and Laws of Different Countries:** Lack of Geographical Boundaries makes social media regulation an arduous task. Major Complicating Factors to secure the networks and Media Much of the hardware and software that make up the communications ecosystem is sourced externally.
- **Encrypted Message:** Use of phones/what Sapp to send and receive messages, concerns the government because the communications sent via such devices and applications are encrypted and could not be monitored and consequently hinders the country's efforts to fight terrorism and crime.
- **Complicated Networks:** The task of securing the networks is also complicated by the fact that much of the infrastructure is in the hands of private companies who see measures such as security auditing and other regulations and frameworks as adding to their costs.

3 India's National Cyber Security Strategy

Coastal security is one of the major concerns for India with a coastline of 7,516.6 km. The coastline also accounts for 90% of the country's trade.

Maritime and Coastal Security

- Maritime security has been defined in the Indian Maritime Doctrine (IMD) as relating to freedom from threats at or from the sea.
- Although the **IMD does not define coastal security**, the **Indian Maritime Security Strategy (IMSS), an official publication** of the IN defines it as a subset of maritime security, focused on the coastal waters.
- The coastal waters are considered, for the purpose of IMSS, as the water area seawards of the Indian coast up to the limit of India's Contiguous Zone (CZ) which is at 24 nautical miles from the baseline, or the International Maritime Boundary Line (IMBL), in case the latter is nearer.

Present Coastal Security Mechanism

- Currently, the coastal security of India is governed by a three-tiered structure.
- The **Indian Navy** patrols the International Maritime Boundary Line (IMBL), while the **Indian Coast Guard** is mandated to do patrolling and surveillance up to 200 nautical miles (i.e., EEZ).
- Simultaneously, the **State Coastal/Marine Police (SC/MP)** performs boat patrolling in shallow coastal areas.

Vulnerabilities of the Indian coastline

- **Smuggling and trafficking**: Indian coasts have been susceptible to the smuggling of items such as gold, electronic goods, narcotics, and arms.
- **Maritime terrorism**: hijacking, attacking, and sinking ships, taking hostages, sabotaging pipelines, and attacking cities and strategic installations like naval bases and petrochemical storage.
- **Infiltration, illegal migration, and refugee influx**: large-scale refugee influxes over the decades have resulted in widespread political turmoil in the Border States.
- **Discontent in fishermen's communities** interferes with the effective functioning of the coastal security architecture as fishermen are considered the 'eyes and ears of the coastal security architecture and, therefore, an integral part of it.

- **Sensitive installations along the coast:** Due to the process of industrialization along the coastal region, the existence of strategic installations by oil companies, nuclear power plants, missile, and satellite testing centres have taken place, which are high-value targets for the terrorists.

Technologies used for Coastal security and Management

- The surveillance sensor network serves as the eyes and ears of the system. A combination of sensors can track individuals and objects over varying distances, providing higher resolution as the target gets closer to the coastline.
- The sensor network can include a combination of the various types of technologies such as **radar, Automated Identification System (AIS), Electro-Optical/Infra-Red (EO/IR) System, Identification system, Command, and Control system, etc.**

Fundamental deficiencies in security

- **Conflates Policing with Maritime Border Guarding:** This erroneously conflates the responsibility of law and order (State List) with maritime border guarding (Union List).
- **Indian Navy and Indian Coast Guard under Different Departments in MoD**: The Army, Navy, and Air Force were placed under the **Department of Military Affairs (a department created within MoD)**, and the ICG was placed under the MoD.
- **Diffused Responsibilities**: Lack of clarity in jurisdiction between the IN, ICG, and SCP.

Indian Coast Guard Initiatives

- Promulgation of Standard Operating Procedures (SOPs) for effective coordination amongst all stakeholders.
- Coastal security exercises in coordination with the Indian Navy, SCP, and other central and state agencies.
- Special '**Operation Sajag'** training for SCP

Government Initiatives in Coastal Security Infrastructure

Appointment of National Maritime Security Coordinator:-

- The appointment of the country's **first National Maritime Security Coordinator (NMSC)** reflects the serious intent of the Government of India (GoI) to address maritime security challenges.
- It aims to create an interface between the civilian and military maritime domains to enhance India's security architecture and energy security.
- **National Committee for Strengthening Maritime and Coastal Security** headed by Cabinet Secretary coordinates all matters related to Maritime and Coastal Security.
- **Coastal Security Measures Post Kargil war**:- Kargil Review Committee (KRC) constituted to study the circumstances that had led to the war has recommended several coastal security measures like:

Recent Government Interventions

- The Indian government has also drawn plans to reinforce the **NMDA via multilateral cooperation.**
- It is in talks with at least **24 countries** for exchanging information on shipping to ensure that the
- Seas are safe and secure for global commerce.
- India has placed maritime security high on the agenda through active participation in the Indian
- **Ocean Rim Association (IORA), the Indian Ocean Naval Symposium (IONS), the East Asia**
- **Summit (EAS), and the ASEAN Defence Ministers Meeting (ADMM) Plus.**
- Additionally, it is in talks with other countries to institutionalize intelligence exchange among the
- Respective security agencies.

Recommendations

- **Self-dependency**: To develop our own AIS type which can be easily fitted on the smaller craft that operates in our coastal waters to aid detection and identification.
- **Distress Alert Transmitter (DAT)** is provided by Coast Guard to transmit emergency conditions

and position location to the central hub station via the UHF transponder of INSAT for the rescue operation.

- **The use of the Aadhar card** is being propagated as the main identity document for all important purposes including financial transactions. Proving the identity of fishermen at sea has been one of the key concerns.
- **Regulation of fishing**: Fisheries often cite inadequate staff and infrastructure to regulate fishing activities.
- **Deployment of Unmanned platforms**: Aerial vehicles are needed which will provide for quick launch and effective surveillance for prolonged periods.
- **Modernization and Augmentation needed:** Steadily augmenting force levels for effective surveillance and optimum coverage.

4 Medical Devices and Cyber-attack Threats

After ransomware attacks at major hospitals expose the risk to medical records, experts warn that personal medical devices with software components are also hazards that can leak health data.

Need for regulations:-

- The Indian population is growing at a rate of 1.6% per year and has an **elderly population** of over 100 million.

Concerns for India:-

- India currently lacks any **centralised data collection mechanism** which gives an exact cost of data corruption for the healthcare industry.
- As pharmaceutical companies continue to **embrace digital transformation**, their highly sensitive, valuable information becomes even more at risk for cyber-attacks.
- Parma companies face their IT environment being landed with **legacy hardware and software**.

National Medical Devices Policy 2022:-

- **Regulatory streamlining** in order to optimize regulatory processes and multiplicity of agencies for enhanced **ease of doing business,** along with **harmonization with global standards** to ensure standardization (ensuring **safety of devices**).
- **Building Competitiveness** through fiscal and financial support for stimulating the development of the local manufacturing ecosystem with private sector investments.
- **Infrastructure Development** to provide best-in-class physical foundation, including **medical devices parks** with common facilities such as testing centres, to improve cost competitiveness and enhance attraction of domestic manufacturers.
- **Facilitating R&D and Innovation** with a focus on enhanced collaboration in innovation and R&D projects, global partnerships, and joint ventures among key stakeholders to bridge the gap between academic curriculum and industry requirements.

CHAPTER

4

Money-Laundering and Its Prevention

Topic of This Chapter

1	Money Laundering

1 Money Laundering

The government informed the Supreme Court that ₹18,000 crore was confiscated under the Prevention of Money Laundering Act (PMLA) from fugitive businessmen Vijay Mallya, Nirav Modi and Mehul Choksi, and returned to banks.

Process of money laundering

Money laundering is a single process however, its cycle can be broken down into three distinct stages namely, placement stage, layering stage and integration stage.

- **Placement Stage:** It is the stage at which criminally derived funds are introduced in the financial system. At this stage, the launderer inserts the "dirty" money into a legitimate financial institution often in the form of cash bank deposits.
- **Layering Stage**: It is the stage at which complex financial transactions are carried out in order to camouflage the illegal source. At this stage, the launderer engages in a series of conversions or movements of the money in order to distant them from their source.
- **Integration stage**: It is the final stage at which the 'laundered' property is re-introduced into the legitimate economy.

Some of the most widely used methods used to implement the above stages are:

- **Structuring Deposits**: This is also known as **smurfing** , this is a method of placement whereby cash is broken into smaller deposits of money, used to defeat suspicion of money laundering and avoid anti-money laundering reporting requirements.
- **Shell companies**: These are fake companies that exist for no other reason than to launder money. They take in dirty money as "payment" for supposed goods or services but actually provide no goods or services.
- **Third-Party Cheques**: Counter cheques or banker's drafts drawn on different institutions are utilized and cleared via various third-party accounts. Third party cheques and traveller's cheques are often purchased using proceeds of crime.
- **Bulk cash smuggling**: This involves physically smuggling cash to another jurisdiction and depositing it in a financial institution, such as an offshore bank, with greater bank secrecy or less rigorous money laundering enforcement.

Prevention of Money Laundering – Indian Initiatives

Legal framework: In India, before the enactment of **Prevention of Money Laundering Act, 2002 (PMLA)** the major statutes that incorporated measures to address the problem of money laundering were:

Institutional Framework

- The **Directorate of Enforcement** was established in the year 1956 which is responsible for enforcement of the **Foreign Exchange Management Act, 1999 (FEMA)** and certain provisions under the **Prevention of Money Laundering Act**.
- **Financial Intelligence Unit – India** was set by the Government of India in 2004 as the central national agency responsible for receiving, processing, analysing and disseminating information relating to suspect financial transactions.

CHAPTER

5

Various Security Forces and Agencies and their Mandate

Topic of This Chapter

1	Role of CAPF in Internal Security
2	Armed Forces Special Power Act
3	China 'keen' to Recruit Gurkha Soldiers into PLA
4	Poonch Attack
5	Women Get Command Roles in the Indian Army (Specials)

1 Role of CAPF in Internal Security

India has undergone one of the fastest expansions of paramilitary internal security forces in the world. However, with changing times and in order to combat new challenges, there is a need to upgrade these forces.

Role of CAPF in internal security

- **National Security Guard (NSG):** NSG is a federal contingency force tasked with counter-terrorism and special operations. Generally, refereed as black cat commandoes, the NSG is trained to conduct counter-terrorist task including counter hijacking tasks on land, sea, and air; Bomb disposal (Post Blast Investigation (PBI), and Hostage Rescue missions.
- **Border Security Force:** BSF is a border guarding force responsible for guarding India's land borders during peace time and preventing trans-border crimes. It operates under the Ministry of Home Affairs.
- **Sashastra Seema Bal (SSB):** SSB is a border guarding force tasked with guarding India's borders with Nepal and Bhutan under the Ministry of Home Affairs.
- **Indo-Tibetan Border Police (ITBP):** ITBP is a specialized mountain force responsible for guarding India's borders with China operates under the Ministry of Home Affairs.
- **Assam Rifles:** Assam Rifles is a paramilitary force responsible for maintaining law and order in the northeast region of India operates under the Ministry of Home Affairs.
- **Central Reserve Police Force:-**The CRPF's primary role lies in assisting the State/Union Territories in police operations to maintain law and order and counter-insurgency.

Steps to be taken to upgrade these forces to face new forms of challenges:-

- **Infrastructure enhancement**: The infrastructure and curriculum at CAPF training facilities urgently need to be updated. For example-IT, cyber security, and cybercrime, should be covered in training to face new forms of challenges.
- **Good working condition:** The Standing Committee on Home Affairs had expressed concern over the working conditions of personnel of the border guarding forces. The Committee observed that they had to work 16-18 hours a day, with little time for rest or sleep.
- **Cadre allocation and promotional issue:** The paramilitary forces has its own set of officers. However, all paramilitary forces DG are from Indian Police Service. This top officer posting from other service demoralise the confidence of the officers of CAPF.

2 Armed Forces Special Power Act

AFSPA is now applicable fully only in 4 Northeast states. However, due to AFSPA law being draconian which may lead to the violation of human rights, there is a need to repeal it.

How AFSPA succeeded in controlling terrorism:-

- **Handling armed attacks:-**AFSPA helps to control terrorism by destroying any arms dump, hide-outs, and training camp from which armed attacks are made by the armed volunteers or absconders wanted for any offence.
- **Arrest without warrant:-**AFSPA provides power to arrest without a warrant anyone who has committed cognizable offences or is reasonably suspected of having done so and may use force if needed for the arrest thus, helps in combating terrorism.
- **Search any premise:-**AFSPA allows to enter and search any premise to combat terrorism in order to make such arrests, or to recover any person wrongfully restrained or any arms, ammunition or explosive substances and seize it.

AFSPA should be repealed due to charges of Human Rights Violations:-

- **Misuse of Power:-** Due to AFSPA, the immunity granted by the act has led the armed forces to misuse the powers given to them and commit offences like fake encounters and sexual assault.
- **Suspension of Fundamental Rights:-**AFSPA has led to the suspension of fundamental rights and liberties guaranteed to the citizens by the constitution. Thus it weakens democracy.

- **Failed in restoring normalcy:-**Many critics argue that this act has failed in its objective of restoring normalcy in many disturbed areas although being in existence for about 50 years.
- **Removal of absolute immunity:-**Both Justice Verma Committee and Jeevan Reddy Committee have recommended the removal of absolute immunity under AFSPA thus indicating towards the act to be repealed.
- **2nd ARC recommendation:-**The Second Administrative Reforms Commission (ARC) in its `report on "Public Order," recommended to repeal Armed Forces Special Powers Act. It commented that its scrapping would remove sentiments of discrimination and alienation among the people of the North East India.
- **Inserting a new chapter:-**A high-power commission headed by the retired Supreme Court judge, N. Santosh Hedge recommended to amend AFSPA inserting a new chapter to deploy the armed forces of the Union in the North eastern States.

3 China 'keen' to Recruit Gurkha Soldiers into PLA

Communist China, which has long been intrigued by the motivation behind Nepalese youth joining the Indian Army, may seek the Communist government in Nepal to allow the **Gurkhas** to join the **People's Liberation Army (PLA).**

Who are Gurkhas?

- Gurkhas are the Nepali Soldiers that form a significant part of the **Indian Army's legendary Gurkha regiment.**
- They come from four main communities of **Magar, Gurung, Rai and Limbu**.
- **Pre-Independence:** They first encountered the British in 1814, when the British East India Company fought against them during the Anglo-Nepalese War.
- British forces admired the Gurkhas' military abilities and honourable tactics, and first recruited Gurkha troops in 1815 (**Nasiri regiment).**
  - ➤ The Nepali Gurkhas played a crucial role in the consolidation of the British Empire in India. They fought during the **Gurkha-Sikh War, Anglo-Sikh wars, and the Afghan wars.**
- **Post-Independence:** After India gained independence, a **Tripartite Agreement (Britain–India–Nepal)** was signed by which the regiments were split between the Indian armies and the British.
  - ➤ Currently, Gorkha regiments make up Indian Army's 43 Battalions with soldiers from both Nepal and India in seven Gorkha regiments – 1st, 3rd, 4th, 5th, 8th, 9th and the 11th.

Khukri, the national weapon of Nepal

- Their signature weapon of Gurkhas, **Khukri,** forms part of the Gurkha regimental insignia in Britain and India as well.
- The khukri is a **traditional multipurpose knife** of the Nepalese people used for regular cutting, clearing, chopping firewood, digging, slaughtering animals for food etc.

Gorkha pullout

- Gorkhas are some of the best fighters in the world, however, the newly introduced Agnipath Scheme threatens to break this arrangement.
- Nepal urged India to suspend the recruitment of Gorkhas to the Indian Army under this new plan.

Agnipath is a tour of duty scheme introduced by India in June 2022 for recruitment of soldiers below the rank of commissioned officers into the three services of the armed forces. All recruits are to be hired for a four-year period.

4 Poonch Attack

There has been a terrorist attack on an army vehicle in Jammu and Kasmir's Poonch, in which the country has lost 5 of its brave soldiers in this terrorist attack.

Who is responsible for the attack?

- The attack was carried out by the People's Anti-Fascist Front (PAFF), a terror organisation supported by the Jaish.

What is the People's Anti-Fascist Front (PAFF)?

- The People's Anti-Fascist Front (PAFF) is a military group engaged in the current conflict in Jammu and Kashmir between Kashmiri separatists and Indian security forces.
- India asserts that it's a division of the Lashkra-e-taiba.
- PAFF organisation was discussed for the first time when Article 370 was removed in J&K in 2019.

Increasing terrorism in India

- India ranks **13th**on **The Global Terrorism Index (GTI)**. The GTI report is produced by the Institute for Economics & Peace (IEP), a think tank, using data from Terrorism Tracker and other sources.

Framework for Combating Terrorism in India:

- India recently hosted a special meeting of the UNSC's **Counter Terrorism Committee (CTC)**, with theme of 'Countering the use of new and emerging technologies for terrorist purposes'.
- India also hosted the meeting of "**No Money For Terror**", which was initiative of the **French government,** to specifically focus on **cooperation between countries to choke terror funding.**
- In August 2019, the **Unlawful Activities Prevention Act of 1967** was revised to include the ability to label individuals as terrorists.
- **National Investigation Agency** is the lead law enforcement investigative agency to combat terrorism.
- The National Investigation Agency (NIA) Act of 2008 has been **amended** by the Indian Parliament to give NIA the ability to investigate terrorism cases overseas.

Why erasing terror is becoming a challenge?

- **Increased freelancers:** Radicalised individuals, also called 'lone wolves', 'DIY' or 'freelancer' terrorists are now committing random acts of terrorist violence.
- **Dark net**: Terrorist have expandedthe use of The Onion Router (TOR)-enabled darknet for propaganda, and recruitment on encrypted chat forums and platforms beyond the gaze of the security agencies.
- **Evolving tech, evolving terror:** Advancing and emerging technologies like autonomous systems, 3D printing and deep fake potentially offer the terrorists prospects for weaponisation.

5 Women Get Command Roles in the Indian Army (Specials)

For the first time, the Indian army had begun the process for selection of women officers for command postings in the rank of Colonel, which has so far been the domain of male officers.

About

- 80 women officers in the Indian Army **have been cleared for the rank of Colonel (selection grade)**, making **them eligible to command units**in their respective arms and services for the first time.
- The Women Officers were selected by the **Special No. 3 Selection Board**for promotion from the rank of **Lt Colonel to Colonel** to bring them on **a par with their male counterparts**.
- Women officers were selected from the **batch of 1992 to 2006**in **various arms and services**, including Engineers, Signals, Army Air Defence, Intelligence Corps, Army Service Corps, Army Ordnance Corps and Electrical and Mechanical Engineers.
- The **Corps of Engineers has the maximum vacancy**followed by the Army Ordnance Corps and Electrical and Mechanical Engineering.

Women Induction in Army: A battle long fought

- **2020:**Indian Army announced that it **would open up all positions** to women, including those in **combat roles**
- **2021**: The Indian army starts to induct women in **short service commission as fighter pilots**.

Way Ahead:

- Although allowing women on equal footing in the army is a progressive step, the Indian Army should take steps to **create a more supportive environment**for women, such as increasing the number of **women-only barracks** and **providing childcare facilities.**
- While there have been challenges with the induction of women into the Indian Army, there is a need to promote the overall trend as **many women have succeeded** in their roles and made **valuable contributions to the military.**

CHAPTER

6

Security Challenges & Their Management in Border Areas

Topic of This Chapter

1	Smart Fencing
2	Infiltration
3	Drug Abuse Problem in Border Areas

4 Smart Fencing

Challenges of India's border management

- **India –Pakistan:** There are disputed areas like the **Sir Creek** and the **Line Of Control (LoC).** It has frequent ceasefire violation. Moreover, the POK provides a major threat for border management.
- **India China border management:** The unsettled borders and the disputed territories like **Aksai Chin**, LAC poses a serious security threat. Indian army and ITBP has been given the responsibility to guard the border here.
- **India-Bangladesh Border Management:-**Varied topography and rifting course of Brahmaputra provides a deeper challenge to the security forces. Moreover, influx of **Rohingya minority** has posed a threat to the border.
- **Myanmar border:** India shares 1643 km border with Myanmar. Which is mainly defined by the Naga Hills and Chittagong hill tracts.
- **India Nepal Bhutan border:** The matter of security in the region are handled by the **SSB (Sashastra Seema Bal).** However, due to border being porous, there is a challenge from security region as there has been frequent smuggling in these areas.

Smart fencing is a boon for monitoring security situations in border areas:

- **Reduce causality:** With this smart fencing, the number of casualties of soldiers on borders would get minimised and the stress level among them too is expected to reduce to a large extent.
- **Double row fencing:-**The double-row fencing on the **India- Pakistan border (LoC)** is meant to keep out militants, separatists, smugglers and other infiltrators.
- **Project BOLD-QIT:** Smart fencing on Indo Bangladesh border has been a boon.
  - **For example**:-**Project BOLD-QIT (Border Electronically Dominated QRT Interception Technique)** under **Comprehensive Integrated Border Management System (CIBMS)** in Dhubri district of Assam is enabling.

2 Infiltration

India shares a 15,106 km international border with its neighbours, which is lengthy and porous, with some disputed borders. These border characteristics pose substantial and distinct challenges for India.

Infiltration and Its Consequences

- **Illegal Migration:** Illegal migration from Bangladesh and other adjacent nations is an issue in India. It puts a strain on resources, which might lead to violence in India. Illegal migration has also sparked ethnic strife in the north east, since local populations have been reduced to minorities in many states, leading to feelings of insecurity and, as a result, ethnic violence.
- **Terrorism**: India has been a significant victim of Pakistan-sponsored cross-border terrorism, which is usually carried out through cross-border infiltration. The attacks in Uri highlight the security threat posed by infiltration.
- **Insurgency and Left-Wing Extremism:** Infiltration is being used by external forces to help the insurgency in the North East by supplying weaponry and ammunition. Infiltration is sometimes used by left-wing extremist groups to gain external support.
- **Import of counterfeit cash and drug smuggling:** Due to simple cross-border infiltration, India confronts a huge threat of counterfeit currency and drug smuggling.

In order to address the problem of infiltration, India needs adopt an integrated and holistic approach:

- It's a Border Management System with a Wide Range of Functions. The planned **CIBMS** is built as a more robust and integrated system capable of filling weaknesses in the current border security system by seamlessly merging human resources, weapons, and high-tech surveillance equipment. It is made up of three primary parts:
  - Sensors, detectors, cameras, ground-based radar systems, micro-aerostats, lasers, and other high-tech surveillance devices, as well as existing equipment, for round-the-clock observation of the international boundary;
  - For transmitting data collected by these many high-tech monitoring and detection devices,

an efficient and dedicated communication network, including fibre optic cables and satellite communication.

- ➤ The data will be sent to a command and control centre, which will inform top commanders on what is happening on the ground and provide a composite picture of the international border.

- India has begun construction of critical roadways, an upgraded landing air runway, a new infantry battalion, and a strike corps, as well as revamping border checkpoints.
- Building socioeconomic infrastructure is essential for border security since the border population is a strategic asset. As a result, programmes like the **Border Area Development Plan and Border Infrastructure and Management** must be efficiently executed.
- The government can promote the use of space technology in border management through promoting island development, border security, **communication and navigation, GIS & Operations Planning System,** and border infrastructure development.
- Following the successful implementation of the high-tech **BOLD-QIT (Border Electronically Dominated QRT Interception Technique)** on patches of the Indo-Bangla border in Assam, the Indian Border Security Force (BSF) is moving forward with plans to extend it to the sensitive Bangla border in Northern West Bengal.

3 Drug Abuse Problem in Border Areas

Recent study at AIIMS has found that around 5 crore Indians reported to have used cannabis and opioids at the time of the survey.

Reasons for drug abuse

- **Experimentation and identity forming:** The incidence of drug abuse among children and adolescents is higher than the general population. This is notably because youth is a time for experimentation and identity forming.
- **Glorification in media:** Quite often it so happens that doing drugs is romanticized and some fictional positive aspects of the same are shown.
- **Neurotic pleasure:** Abused drugs interact with the neurochemistry of the brain to produce feelings of pleasure.
- **To feel better:** Some people suffer from depression, social anxiety, stress-related disorders, and physical pain.
- **To boost performance:** Ours is a very competitive society, in which the pressure to perform athletically and academically can be intense.
- **Changing traditional societal values:** The processes of industrialization, urbanization and migration have led to loosening of the traditional methods of social control rendering an individual vulnerable to the stresses and strains of modern life.
- **To be accepted by peers:** Many people use drugs "because others are doing it"—or they think others are doing it—and they fear not being accepted in a social circle that includes drug-using peers.
- **Lack of effective policing:** Police sometimes turn blind eyes for the sake of their own profit. Police need to remain alert on surveillance so as to curb this drug syndicate.

Impact of Drug Abuse

- Drug abuse leads to physical, psychological, moral and intellectual decay. This means **wastage of economic potential** of young generation.
- Drug addiction **causes immense human distress**. Incidence of eve- teasing, group clashes, assault and impulsive murders increase with drug abuse.
- Drug use can lead to **social and emotional problems** and can **affect relationships with family** and friends.
- Problems with memory, attention and decision-making, which make daily living more difficult.
- Illegal production and distribution of drugs have **spawned crime and violence worldwide.**
- Increase in **incidences of HIV, hepatitis B and C and tuberculosis due to addiction** adds the reservoir of infection in the community burdening the health care system further.
- **Women in India** face greater problems from drug abuse. The consequences include domestic violence and infection with HIV, as **well as the financial burden**.

Solutions to Drug Problem

- **Society based Solutions:** Prevention programmes involving entities such as families, schools and the immediate communities are important in this regard.
- **Legal Measures:** The Narcotic Drugs and Psychotropic Substances Act, 1985, were enacted with stringent provisions to curb this menace.
- **International effort:** India lies between two major drugs producing areas in the world i.e. Golden Crescent (Iran, Afghanistan and Pakistan) and Golden Triangle (Myanmar, Thailand, Laos and Myanmar).
- Also, India is signatory to the **following treaties and conventions**. U.N. Convention on Narcotic Drugs (1961), U.N. Convention on Psychotropic Substances (1971), etc.
- Manipur is exploring possibility **to legalise cannabis, or marijuana** growing and use it for medicinal and industrial usage.

SCIENCE & TECHNOLOGY

CHAPTER

1

IT, Computer, Robotics

Topic of This Chapter

1	Internet of Things (IoT)
2	Drone Technology
3	Supercomputers
4	Utility of Robots
5	Generative Artificial Intelligence
6	National Quantum Mission
7	Bharat 6G Mission

1 Internet of Things (IoT)

The Internet of Things (IoT) viz. a mesh or network of smart devices has evolved considerably over the last 30 years. Its adoption in different fields is a super hit. In a recent development, IoT based devices were installed to ensure drinking water supply in Bihar.

Internet of things (IoT) influencing the market dynamics in the following ways:

- **Social Media for authenticity:** consumers are connected to businesses and each other more than before. With the evolution of technology the consumers can search about the product, ask sales question, take review from other consumers of the product and buy the best quality services.
- **Online Opinions:** Discussion forums like Quora, WikiAnswers, StackExchange, Facebook Questions, Reddit, Twitter, Instagram and even LinkedIn Answers (oriented around professionals) are helpful in gauging your audience's views.
- **Buying habits:** e-commerce being accessible on hand and secure payment gateways has caused a multiplier effect in the buying habits of consumers.
- **Enhanced competition:** with more services and products accessible on the fingertips of consumers, the scope of perfection has narrowed down.

Role is IoT in modern world:

- **Agriculture:** In agriculture, IoT systems are used for **'precision farming'**. Sensors are deployed to constantly monitor different variables like soil moisture, temperature, irrigation, nutrients, fertilizers, etc.
- **Healthcare:** Wearable devices like smart watches and patient monitoring devices can provide doctors with real-time data about a patient's vital information such as blood pressure, heart rate, etc.
- **Logistics and transport:** Lastly, IoT in logistics and transport has already become deeply integrated. When you order online, you can track the exact location and status of your order through the shopping app.
- **Manufacturing:** Manufacturing is another industry where IoT can be used. It effectively cut down costs and optimizes the manufacturing process.

Advantages of IoT	Disadvantages of IoT
◉ **Better decision making:** With added sensors, the devices with advanced technology are able to collect a large amount of data on many different areas and process it with in turn helps in taking better decisions. ◉ **Increases efficiency:** As well as saving time for the device owner, it can also result in cost savings. ◉ **Smarter healthcare:** Smart wears such as smart watches as well as other wearables that monitor our health conditions on a real-time basis are quite common in the present day. ◉ **Disaster management:** IoT aids in predicting the environmental conditions with absolute accuracy and helps us to evacuate the humans inhabiting the disaster-prone area as quickly as possible. ◉ **Helps in businesses:** IoT allows companies to automate processes and save money on labor.	◉ **Security issues:** IoT systems are interconnected and communicate over networks. ◉ **Privacy concern:** The IoT system provides critical personal data in full detail without the user's active participation. ◉ **Increased unemployment:** Unskilled workers or even the skilled ones are at a high risk of losing their jobs, leading to high unemployment rates. ◉ **The complexity of the system:** The designing, developing, maintaining, and enabling the extensive technology to IoT system is quite complicated. ◉ **High chances of the entire system getting corrupted:** If there is a bug in the system, it is possible that every connected device will become corrupted. ◉ **Lack of international standardizations:** As there is no international standard of compatibility for IoT, it is problematic for devices from different manufacturers to communicate with each other. ◉ **High dependency on the internet:** They rely heavily on the internet and cannot function effectively without it.

2 Drone Technology

Drone technology in India is redefining traditional systems in almost every industrial sector. Statements by the Civil Aviation Ministry in India suggest that the Indian drone industry will reach a turnover of Rs. 15,000 Crore by 2026.

Major areas getting impacted by drone technology include:

Role of drone technology in Agriculture:

- **Spraying Applications for Crops:** Drone technology incorporates ultrasonic, light detection, and grounding lasers, allowing farmers to spray crops five times faster than conventional crop spraying methods.
- **Plant Irrigation:** With sensors such as thermal and multispectral varieties, drone technology analyzes and pinpoints dehydrated crops and measures the density, heat signature, and overall health of the field to provide farmers and producers with a comprehensive picture.
- **Crop monitoring:** Precise photography allows modern drone technology to enable agricultural producers to monitor crops in a cost-effective and risk-free manner.
- **Evaluation of Crop Health:** Agricultural drones utilize visible and infrared light sources to identify plants reflecting the types of light that indicate disease and other health issues.
- **Agricultural Planting:** Drone farming technology enables drone-powered planting techniques that can reduce planting costs by up to 85 percent.

Role of drone technology in Manufacturing Sector:

- **Inventory monitoring and picking in warehouses:** As drones can employ built-in sensors to cover large areas, they can be used for inventory monitoring in large areas like steel plants or construction sites.
- **Intra-logistics:** Drones can be used to transport materials or parts from the warehouse to the assembly belt of the production center on the shop floor.
- **Asset management and planning:** By using drones to scan factory infrastructure, 3D digital models can be developed that can trigger preventive maintenance.

Role of drone technology in services sector:

- **Medical services:** Drones can be used to transfer organs from donor to patient, often between 4-36 hours depending on the organ type.
- **Disinfecting and Sanitizing:** Sanitizing convention centers, entertainment, or sports venues with safe disinfectants becomes easy with drones.
- **Hospitality Services:** Drones are revolutionizing the hospitality industry, streamlining and automating many of the services traditionally provided by hotel staff.
- **Administration:** Drones are incredibly useful in managing traffic during rush hours or crowded events. With a drone overhead, authorities can immediately assess the situation, and then radio to the traffic light authorities to better manage the flow.
- **Smart Policing**: The concept of smart policing has outlined the systematic changes to transform the Indian Police to be more efficient, modern, accountable, and reliable and trained, with the aid of advanced technology.
- **Disaster Management:** During the course of disaster drones can help in various operations such as search and rescue, Delivering Emergency Infrastructures and Supplies such as essential medicines and food, assess structural damage, extinguish wildfires to contain the real time situation.
- **Climate:** Drones can be used for predicting weather conditions, storm and hurricane tracking and prediction, long-term data gathering for climate change research.

Role of drone technology in for environmental monitoring and conservation:

- **Securing Protected Forests, Oceans and Endangered Animals:** Drone Cameras being used in many industries for several natural resources

to mass-produce their commercial products to supply rising demands.

- **Reversing Deforestation through Drone Seed Planting:** Hiring humans to guard forests is undeniably too costly, time-consuming, and risky.
- Through **precision planting** and reforestation seed dispersal mechanism users can target critical areas and release the coated seeds making planting efficient and effective.
- Drone monitoring capabilities and real-time data gathering about the wilderness, ocean resources, flora, and fauna are critical in preserving them.

Role of drone technology in generating employment:

- **Supply chain:** Drones have the capability to quickly transport goods from one location to another and offer a cost-effective alternative to traditional distribution methods creating new jobs that require specialized skills in programming and maintenance.
- **Gig Economy: The ability to quickly deliver products and services has been a major benefit of drones in the gig economy.**
- **Maintenance:** Drone technology requires pilots, engineers and technicians.

Government initiatives to promote drone industry:

- **The new Drone Policy 2021:** The policy allows citizens to own drones and use them for non-commercial and personal purposes. Drone pilots no more need a training certificate to fly a nano-drone.
- **Drone Shakti:** In the budget 2022, Finance Minister Ms. Nirmala Sitaraman introduced the Drone Shatki scheme to boost startups and leverage them to facilitate growth in the drone sector.
- **Kisan Drones:** Farmers can use drones to monitor crops and spray the correct amount of pesticides and fertilizers uniformly over their crops.
- **PLI Scheme for drones:** The scheme aims to fulfill the vision of 'Atmanirbhar Bharat' by financially aiding the Indian drone industry. The PLI scheme will allocate an amount of INR 120 crore for drones and drone components spread across a period of three financial years.

3 Supercomputers

India is developing an Arm-based high-performance computing (HPC) processor to power its first exascale supercomputer, which is expected to be ready next year.

Applications of supercomputers:

- **Scientific research:** In this field, scientists use a supercomputer to analyse solar systems, satellites and other nuclear research areas.
- **Data mining:** Large corporations often use specialised computers to extract useful information from data storage warehouses or a cloud system.
- **Weather forecasting:** The forecasting power of supercomputers helps a climatologist predict the likelihood of rain or snowfall in the neighbourhood.
- **Intelligence agencies:** Government intelligence agencies use supercomputers to monitor communication between private citizens and fraudsters.
- **Military and defence:** Supercomputing provides military and defence departments with the ability to perform virtual testing of nuclear explosions and weapon ballistics.
- **Automobile:** Using supercomputers, an automobile company can help people buy vehicles because before purchasing a vehicle, customers can test the simulation environment created by supercomputers.
- **Smog control system:** Many scientists and climatologists use supercomputers in the laboratory for predicting fog and other pollution and smog levels in a particular region.

Performance of India in developing supercomputers:

- India launched the national supercomputing mission to enhance the research capacities and capabilities in the country by connecting them to form a Supercomputing grid, with National Knowledge Network (NKN) as the backbone.
- PARAM Shivay, the first supercomputer assembled indigenously, was installed in IIT (BHU), followed by **PARAM Shakti, PARAM Brahma, PARAM Yukti, PARAM Sanganak.**

- India plans to indigenously develop 60 supercomputers over the next three years, Under **National Supercomputing mission (NSM).**

4 Utility of Robots

Robots operating in environments which are unsafe for humans:

- **Industrial Welding:** Welding is a very important part of all kinds of heavy manufacturing environments.
- **Underwater Exploration:** Even divers with modern equipment and years of experience can succumb to various hazards of the deep, including sea predators and pressure sickness.
- **Deep Space Exploration:** Government agencies and private companies are testing new ideas for space exploration as bigger, more ambitious journeys become possible. In 2011, the Robonaut 2 became the first humanoid robot to make it to the International Space Station.
- **Disaster Response:** Robots have been tested for a wide range of emergency response applications, including dealing with wildfires, floods, and other situations.

Robots undertaking tasks pioneering in Nature:

- **Robots for agriculture:** The United Nations estimates that the world population will reach 10 billion by 2050; this will cause demand for agricultural products to rise by over 30%.
- **Robots for infrastructure monitoring:** Structural health monitoring (SHM) is an essential component in civil engineering for safety and integrity of civil structures such as buildings, bridges, power plants, off-shore structures and tunnels.
- **Robotics in the transport sector:** Flanked by radio transmitters, vision cameras, magnetometers, LiDAR, lasers, equipped with digital maps, navigation systems and fitted sensors to identify obstacles, robots can drive independently to a destination and calculate their exact position and route.
- **Robotics for social care:** Robots and autonomous systems, together with AI, connected data and digital infrastructure can have the potential to revolutionize the way in which social and medical care is delivered, for the elderly and disabled people.

5 Generative Artificial Intelligence

World leaders, during the G7 Summit held in Hiroshima, Japan, in May this year, emphasized the urgent need to assess the impact of **generative artificial intelligence (AI).**

Ethical issues arising out of Generative Artificial Intelligence:

- **Distribution of harmful content:** Generative AI, particularly machine learning approaches such as deep fakes, can be used to generate synthetic media, such as images, videos, and audio.
- **Copyright and legal exposure:** Popular generative AI tools are trained on massive image and text databases from multiple sources, including the internet.
- **Truthfulness & Accuracy:** Generative AI uses machine learning to infer information, which brings the potential inaccuracy problem to acknowledge.
- **Sensitive information disclosure:** Generative AI is democratizing AI capabilities and making them more accessible.
- **Malware / social engineering:** Generative AI can be misused to create convincing and realistic-sounding social engineering attacks, such as phishing emails or phone calls.
- **Education:** In the educational context, generative AI could be misused by generating false or misleading information that is presented as fact.

Issues

- **Lack of explainability and interpretability:** Many generative AI systems group facts together probabilistically, going back to the way AI has learned to associate data elements with one another.

- **Risk of Unemployment:** There is a risk that generative AI could contribute to unemployment in certain situations.

6 National Quantum Mission

National Quantum Mission received cabinet approval at a total cost of about Rs. 6000 crores.

Significance of the Mission

- **Technological advancement:** NQM can take the Technology Development ecosystem in the country to a globally competitive level.
- **Help various disciplines:** The Mission would greatly benefit various sectors, including communication, health, finance, and energy with applications in drug design, space, banking, security, etc.
- **Research and Development:** It will help establish a research ecosystem in and around quantum technology.
- **National Security:** It will aid national security in areas such as optimized intelligence collection, encryption, stealth technology, communications etc.

Applications of quantum computing:

- **Diagnosis:** Quantum technologies could be used to provide faster, more accurate diagnostics with a variety of applications.
- **Treatment:** Targeted treatments, such as radiotherapy, depend upon the ability to rapidly model and simulate complex scenarios to deliver the optimal treatment.
- **Automated, high-frequency trading:** One potential application for quantum technologies is algorithmic trading – the use of complex algorithms to automatically trigger share dealings based on a wide variety of market variables.
- **Fraud detection:** Like diagnostics in healthcare, fraud detection is reliant upon pattern recognition.
- **Big Data Analytics:** Quantum computers will have the ability to aggregate and analyse huge volumes of consumer data, from a wide variety of sources.
- **More Accurate Weather Forecasts:** With so many variables to consider, accurate weather forecasts are difficult to produce.

Challenges:

- **Expensive:** Quantum computers are extremely expensive. The materials used to create them can be costly, and many researchers believe that these costs may never be recovered.
- **Difficult to program:** Quantum computing is extremely difficult to program and control- it requires a high-level understanding of complex quantum principles.
- **Sensitive:** When it comes to interference from the outside world, such as temperature variations, magnetic fields, and vibrations, quantum technology is extremely sensitive.
- **Ethical and Societal Implications:** Quantum technology raises ethical, legal, and societal considerations.

7 Bharat 6G Mission

India released "Bharat 6G Vision" document which eyes 6G services rollout by 2030 and launched the 6G research and development test bed.

Significance of Bharat 6 G mission:

- **Faster Internet Speeds:** 6G is projected to offer internet speeds of up to 1 terabyte per second, which is about 100 times faster than 5G.
- **Lower Latency:** 6G is expected to have ultra-low latency, meaning there will be a very little delay in data transmission.
- **Improved Connectivity:** 6G is expected to provide more reliable and secure connectivity, especially in remote and rural areas where internet access is currently limited.
- **New Applications:** 6G is projected to enable new applications such as seamless virtual and augmented reality, ubiquitous sensing, and machine learning-based communication systems.
- **Economic Development:** 6G is expected to boost economic development by enabling innovation in various industries such as healthcare, transportation, and manufacturing.

Challenges associated with 6G Technology:

- **Technical Complexity:** 6G technology is expected to be much more complex than its predecessor, with a large number of components and subsystems. This complexity could make the development and implementation of 6G more challenging.
- **Infrastructure Deployment:** To deliver on the promise of 6G, significant investments will be required in terms of infrastructure development.
- **Spectrum Allocation:** The availability of spectrum is crucial for the development and deployment of 6G technology.
- **Security:** As with any new technology, 6G is likely to face security challenges. The high speeds and large amounts of data transmitted over 6G networks could make them vulnerable to cyber-attacks. Ensuring the security of 6G networks will be crucial to their success.
- **Standardization:** Developing standards for 6G will be essential to ensure interoperability and compatibility across different networks and devices.

CHAPTER

2

Space Technologies

Topic of This Chapter

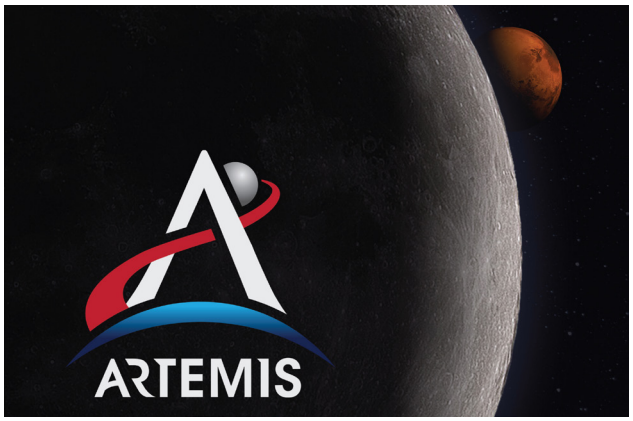
1	NASA's Artemis Mission
2	Gaganyaan
3	India's Remote Sensing Program
4	Role of Private Sector in Space Programmes
5	Indian Space Policy – 2023
6	National Geospatial Policy
7	James Webb Space Telescope
8	LIGO-India Project
9	Space Tourism
10	Controlled Re-entry of the Satellite

1 NASA's Artemis Mission

NASA has embarked on a mission called **Artemis** that involves a multistage plan to send astronauts to the moon and beyond.

Objectives of NASA's Artemis Mission:

- **Enable scientific discovery:** NASA's Artemis aims to find water and other resources that will support long-term space exploration. Along the way, the agency expects to learn more about the moon, Earth and the universe.
- **Economic opportunities:** The space economy is already a $400 billion industry and on the way to $1 trillion. Artemis mission will create new opportunities in the space especially on moon.
- **Inspire upcoming generations:** The mission also aims to inspire the young generations to study science by unveiling the fascinating mysteries of the universe and creating a sense of curiosity in young minds.



NASA's Artemis Mission will help prepare for human landing on Mars:

- The primary focus of Artemis missions from a space radiation perspective is developing the capability to accurately monitor the deep space radiation environment and its effect on the human body.
- The research gathered through Artemis mission aims to examine the risks astronauts will encounter on long missions far from Earth.
- When medical issues arise on Mars, crews will need to deal with them quickly and competently. On trips to Mars, communication delays will require astronauts to address health events themselves using automated technology.
- The gravity on Mars is about one-third that of Earth's while that of moon is one-sixth. Astronauts landing on the Moon will have to adapt to the gravity of the lunar surface.

2 Gaganyaan

Indian Space Research Organisation (ISRO), along with the Indian Navy, has conducted an important trial for the Gaganyaan, Indian Human Spaceflight Programme (IHSP).

Challenges in carrying out Man Made Missions:

- **Hostile environment:** Gaganyaan has to create an atmosphere like Earth inside a small volume and ensure that is adequate supply of oxygen, removal of carbon dioxide and comfortable temperature and humidity levels are maintained throughout the mission.
- **Gravity field:** Transitioning from one gravity field to another has impact on the physical bodies. It affects hand- eye and head-eye coordination.
- **Isolation:** Due to isolation, one may encounter depression, fatigue, sleep disorder and psychiatric disorders.
- **Radiation:** In space stations, astronauts receive over ten times the radiation than what people are subjected to on Earth.
- **Budgetary constraints:** These missions require exorbitantly huge investment as they are highly technology intensive.

What are the Other Upcoming Missions?

- **Shukrayaan Venus Mission (for 2023):** The Shukrayaan orbiter will be the ISRO's first mission to Venus, and it will spend four years studying the planet.
- **L-1 Aditya Solar (2022-2023):** It is the first scientific mission of India to study the Sun. After AstroSat, which was launched in 2015, this would be ISRO's second space-based astronomy mission.

- **Chandrayaan-3 Mission(for 2022-23):** The Chandrayaan-3 mission, which is a follow-up to the Chandrayaan-2 mission, entails "a variety of processes, including configuration finalization, subsystems realization, integration, spacecraft level comprehensive testing, and a number of special tests to evaluate system performance on Earth."

3 India's Remote Sensing Program

Indian Space Research Organisation (ISRO), which has the world's largest constellation of remote-sensing satellites and has sent two missions to the Moon and one to the Mars, is ready to help Oman in its space research programme.

Success of India in achieving the foresaid objective:

- **Enhancing agriculture productivity:** In increasing productivity to feed the growing population, present day agriculture has twin major challenges of reducing the environmental degradation caused by the input- intensive agriculture and making growth inclusive.
- **Water security:** The remote sensing data in conjunction with sufficient ground truth information provides information on the geology, geomorphology, structural pattern and recharge conditions which ultimately define the groundwater regime.
- Through remote sensing, the suitable areas for recharging the aquifers can also be brought out as the better rechargeable areas, which have porous lithologies, maximum fractures, highly weathered region, flood plains, regions of null slope, etc.
- **Towards improving livelihood:** One of the major applications of satellite remote sensing is in delineating the potential fishing zones (PFZ). The technique developed for the PFZ forecast (up to 2–3 days in advance), which combines chlorophyll information.
- **Building natural resources assets:** Timely and reliable information on spatial distribution, intra and inter annual changes in cropping systems, forest cover, surface water bodies and snow cover is a pre-requisite for land use planning, etc.
- **Disaster resilience**: The **Disaster Management Support (DMS) Programme** of ISRO commits to providing timely support and services from aero-space systems, both imaging and communications, for strengthening the resolves of disaster management in the country.
- **Reaching the unreached:** VRCs are envisaged as the single window delivery mechanism for a variety of space-enabled services and deliverables such as telemedicine; tele-education; information on natural resources for planning and development at local level; interactive advisories on agriculture, fisheries, and land and water resources management; livestock management, etc.

4 Role of Private Sector in Space Programmes

The new space policy opens up the Indian space sector, providing a place for the private sector to play an active role in augmenting the development and competitiveness of the Indian space program.

Reasons why India's space programmes lacks private sector participation:

- **Limited to components and subsystems:** Indian players have generally been unable to compete in satellite-based services and ground-based systems segments, as they have mainly been suppliers of components and subsystems.
- **Resource crunch:** Indian companies do not have the resources or the technology to undertake independent space projects or provide space-based services.
- **Traditional model of functioning:** ISRO works on the traditional vendor-supplier model, most intellectual property is owned by the organisation; this has hindered the technological advancements of Indian companies.
- **Skilled labour:** as we have entered the space arena in later stages we lack technological advances to skill our workforce for the space sector.
- **Investment:** due to the nature of industry being capital intensive and un-assured returns, the sector lacks proper investment which is imperative to drive growth.

- **Absence of coherent policy:** The absence of a comprehensive policy framework for private sector participation in space in India has created uncertainties regarding investment and technology transfer.

India contributed 2.1% to the global space industry economy in 2020, amounting to US$ 9.6 billion, with a contribution of 0.4% to the country's gross domestic product (GDP).

Significance of private sector in growth of Indian space Industry:

The significance of the space industry in enabling services and applications across several industries, such as media and entertainment, weather forecasting, disaster management, agriculture, geological and oceanographic studies, navigation, broadband services, and remote sensing, demonstrates the importance of the sector.

- **Reduction in cost:** Participation of private sector and start-ups in the space sector have an advantage in terms of low-cost operations.
- **Technology and innovation:** Participation of the private sector will give rise to new innovations and technology.
- **Investment and capacity development:** Private sector facilitates investments in technology development and acquisition, capacity-building and space exploration, including planetary exploration.
- **Harvesting talent pool:** India has a huge talent pool and is searching for opportunities. So, participation of private entities in the space sector helps to harvest a sizable talent pool available outside ISRO.
- **Transparency and accountability:** Expanding the number of stakeholders with participation of private entities will ensure more transparency and better accountability and regulatory practices.
- **Competitiveness:** With low cost, innovation and better talent pool in India's space will make it more competitive with respect to globally reputed, private space industry.
- **Fill communication infrastructure deficit:** The vast amount of potential and resources available with the private sector will help the space industry to grow and fill in the communication infrastructure deficit by looking beyond the traditional modes of internet delivery and look for space-based solutions.

Initiatives to promote space sector among young minds:

- **YUva VIgyani KAryakram (YUVIKA-2022):** YUVIKA is a two weeks residential programme organized at five ISRO centres which includes teaching and practical exposure to students in the 9th standard. 153 nos. of students from 36 states/ UTs participated in the programme.
- **UNNATI (Unispace Nano Satellite Assembly & Training by ISRO):** UNNATI is a capacity building programme, it is a training on combination of theoretical course work and hands-on training on assembly, integration and testing of nano satellites for the foreign participants.
- **Space Tutor Space Tutor:** is a collaborative programme between ISRO and NGOs/Start-ups/Institutions involved in promoting space education & STEM activities.
- **Atal Tinkering Labs (ATL):** ISRO has adopted 100 Atal Tinkering labs established by Atal Innovation Mission, Niti Aayog across the country to promote space education in the schools.

Role of Government-owned Commercial Organisations in fostering private sector participation:

- **IN-SPACe:** In-SPACe will be responsible for regulating and permitting private sector activities in the sector. It will appoint its own directorates for security, legal, promotion (of activities) and monitoring purposes.
- **NSIL:** It is the commercial arm of ISRO and primarily responsible for enabling Indian industries to take up high-tech, space-related activities.
- **Antrix Corporation Limited:** Was incorporated as a marketing arm of ISRO; it handles ISRO's commercial deals for satellites and launch vehicles with foreign customers.
- **Space communication Policy – 2020:** The policy aspires to address the nation's expanding needs

for space-based communications and the creation of pertinent technologies for self-sustenance in the fields of commercial, secure, and societal communications.

- **The Indian Space Association (ISpA):** To make India self-sufficient, technologically advanced, and a major player in the global space arena, it will engage in policy advocacy, engage, and operate with all stakeholders, etc.

5 Indian Space Policy – 2023

The Indian Space Research Organisation (ISRO) formally published Indian Space Policy, 2023.

Key Highlights of the Policy

The Indian Space Policy 2023 is a comprehensive set of guidelines that outlines the roles and responsibilities of different entities in the Indian space sector.

- **Research & Development:** The policy aims to keep India at the cutting edge of space research and development.
- **Efficient collaboration between public and private sector:** The policy outlines a strong emphasis on sharing technologies, products, processes, and best practices with New Generation Entities (NGEs) and Government companies.
- **Privatising:** The policy permits non-government entities to undertake end-to-end activities in the space sector through the establishment and operation of space objects, ground-based assets and related services such as communication, remote sensing and navigation.
- **Democratizing Data for All:** Data with a Ground Sample Distance (GSD) of 5 meters and higher will be made freely accessible on a timely basis.
- **Focus on human spaceflight capabilities:** ISRO will work on developing the necessary technologies, infrastructure, and ecosystem for sustained human presence in space.
- **Celestial Prospecting and In-situ Resource Utilization:** ISRO is set to undertake studies and missions focused on in-situ resource utilization, celestial prospecting, and other aspects of extra-terrestrial habitability.

Roles and responsibilities of organisations

- **NewSpace India Limited:** The **Public Sector Undertaking**, NewSpace India Limited (NSIL), has been assigned responsibilities for commercializing space technologies and platforms, as well as servicing space-based needs of users, whether Government entities or NGEs.
- **Indian National Space Promotion and Authorization Center (IN-SPACe):** IN-SPACe will serve as the interface between ISRO and non-governmental entities.
- **Department of Space:** The Department of Space (DOS) will oversee the implementation of the **Indian Space Policy-2023**, ensuring that stakeholders are suitably empowered to carry out their respective functions.

What are the expected benefits of the new policy?

- **Enhancing the Indian space economy:** The Policy is expected to have a significant impact on the Indian space economy. It aims to increase India's share in the global space economy from less than 2% to 10%.
- **Making India a global space leader:** Through a combination of research and development, collaboration, and innovation, the nation is poised to reach for the stars and solidify its position as a global space leader.

6 National Geospatial Policy

The Ministry of Science and Technology has notified a citizen centric National Geospatial Policy (NGP) 2022, to strengthen the Geospatial sector to support national development.

Geospatial Data Infrastructure

- GDPDC will adopt and develop Data Themes related to 14 global geospatial data themes recognized by United Nations Statistics Division. It will also develop Sectoral Geospatial Data Themes for various sectors like Environment, Forest, etc.
- **National Geospatial Data Registry (NGDR):** It will act as a common set of registers of data sets and services accessible by all stakeholders.
- **Unified Geospatial Interface (UGI):** It will operationalize to provide consumer-oriented products, applications, services, and solutions using the Geospatial data.
- **Survey of India (SoI):** It shall be the agency responsible for developing and operating the NGDR and the UGI in collaboration with BISAG-N, other institutions, and the private sector, under the guidance and supervision of GDPDC.
- **Mapping infrastructure:** This Policy shall replace the National Map Policy, 2005.
- **Geospatial Education and Skill Development:** National Institute for Geo-informatics Science and Technology (NIGST), Indian Institute of Remote Sensing (IIRS), and/or any suitable institute(s), public or private, will be developed into Centre(s) of Excellence for Geospatial Science & Technology.
- **Geospatial Enterprise:** An enabling ecosystem will be provided for industry, academia, and research with ease of doing business and proactively engaging them in various spheres of the Geospatial domain.
- An advisory body named as **Geospatial Industrial Development Board (GIDB)** will be constituted under GDPDC for advancing the growth of the Indian Geospatial entities.

Significance of National Geospatial Policy:

The focus of the National Geospatial Policy is to make geospatial technology and data agents of transformation for achieving sustainable development goals, bringing efficiency in all sectors of the economy and instilling accountability and transparency at all levels of governance.

- **Atmanirbhar Bharat:** The Policy recognizes the importance of locally available and locally relevant Maps and Geospatial Data in improved planning and management of resources and better serve the specific needs of the Indian population.
- **IGIF:** The National Geospatial Policy seeks to draw on international best practices, such as work by the **United Nations Global Geospatial Information Management (UN-GGIM) Committee of Experts** and the **Integrated Geospatial Information Framework (IGIF),** to strengthen national-level spatial information management arrangements across our country.
- The Policy seeks to create a conducive business atmosphere and facilitate ease of doing business for a prosperous geospatial sector economy by enhancing the effectiveness of the policies and their implementation.
- The Policy will support innovation, creation, and incubation of ideas and start-up initiatives in the Geospatial Sector that will enable leapfrogging of outdated technologies and processes, bridging the geospatial digital divide and capitalizing on the opportunities due to continually evolving Technology.
- The National Geospatial Policy will encourage open-source software, open data, and platforms.

7 James Webb Space Telescope

James Webb Space Telescope has provided a glimpse of the early universe in a new image to the astronomers.

Key differences between Hubble and James Webb Telescope:

	Dimension	Hubble telescope	James Webb Telescope
1.	**Size**	The instruments on Hubble mainly focus on the ultraviolet and visible parts of the spectrum. It could observe only a small range in the infrared from 0.8 to 2.5 microns.	Webb Space Telescope has four scientific instruments to observe primarily in the infrared range and provide coverage from 0.6 to 28 microns
2.	**Size**	Hubble's mirror was much smaller, about 2.4 meters in diameter hence it covered a lesser field of view.	Webb's primary mirror has a diameter of 6.5 meters which will have a larger field of view.
3.	**Orbit**	Hubble orbits around the Earth at an altitude of about 570 km.	Webb will orbit the sun at about 1.5 million kilometres away from Earth.
4.	Area of Study	Webb's near- and mid-infrared instruments will help study the first formed galaxies, exoplanets, and birth of stars.	Webb's near- and mid-infrared instruments will help study the first formed galaxies, exoplanets, and birth of stars.

Webb has been designed to answer outstanding questions about the Universe and to make breakthrough discoveries in all fields of astronomy. It will have a unique and profound role in transforming our understanding of astrophysics and origins of galaxies, stars, and planetary systems.

8 LIGO-India Project

The government has given the final go-ahead to **India's Laser Interferometer Gravitational-Wave Observatory, or LIGO, project**, clearing the way for the construction of the country's biggest scientific facility that will join the ongoing global project to probe the universe by detecting and studying gravitational waves.

What is LIGO-India?

- LIGO-India will be an **advanced gravitational-wave observatory** to be located in India as part of a worldwide network.
- **Background:** LIGO-India had received the government's in-principle approval in February 2016. Since then, the project reached several milestones towards selecting and acquiring a site and building the observatory.
- **Collaboration**: It is envisaged as a collaborative project between a consortium of Indian research institutions and the **LIGO Laboratory in the USA**, along with its international partners.
- The United States will provide key components for the lab worth USD 80 million, which amounts to Rs 560 crore.
- **Built by:** The LIGO-India project will be built by the D**epartment of Atomic Energy and the Department of Science and Technology**, with a memorandum of understanding (MoU) with the **National Science Foundation**, the US, along with several national and international research and academic institutions.
- **Location:** Hingoli district of Maharashtra, about 450 km east of Mumbai
- LIGO-India will be an **extremely sensitive**

interferometer capable of sensing **gravitational waves** generated during the **merger of massive astrophysical objects** such as **black holes, and neutron stars**.

- The observatory comprises **two 4-km-long vacuum chambers**, built perpendicular to each other. **Highly reflective mirrors** are placed at the end of the vacuum chambers.
- **Fifth node:** LIGO India would be the **fifth node** of this international network of gravitational wave observatories. Currently, there are following operational gravitational wave observatories around the world–
  - two in the United States (Hanford and Livingston)
  - one in Italy (Virgo)
  - one in Japan (Kagra)

9 Space Tourism

Indian Space Research Organisation (ISRO) is planning space tourism by 2030.

Overview:

- The objective of India's maiden human spaceflight programme Gaganyaan is demonstration of human spaceflight capability to Low Earth Orbit, which is a precursor to future Space Tourism Programme.
- ISRO has carried out a few feasibility studies for a sub-orbital space tourism mission.

Pros

- **Job creation:** Commercial space tourism has the potential to boost the economy by creating jobs and encouraging investment.
- **Advances in research**: Spending more time in space could help solve some of the most baffling mysteries about the universe.
- **Opportunity to experience space:** At Space Perspective, we want to enable more people than ever before to go to space to gaze into the unknown and imagine what could be, and to look down at Earth and gain a new perspective on home.
- **Economic Impact:** the market size of space tourism was USD $598 million in 2021 and it is expected that the market for space tourism would reach multi-million dollar levels in the next 10 years.

Cons

- **It's expensive:** Many people point out that the hefty price tag is one major downside to today's space travel. At hundreds of thousands of dollars per ticket, only the wealthiest travelers can afford a seat on a future spaceflight.
- **It may be bad for the environment:** Scientists also worry that space travel could damage the planet and contribute to climate change. One study found that the carbon released by 1,000 private suborbital flights per year would increase the temperature over the poles by 1 degree Celsius and reduce polar sea ice levels by 5% each year.
- **Space debris:** Space tourism and satellite deployment have contributed to a significant amount of space debris orbiting Earth, which poses risks to future space missions and the safety of spacecraft.
- **Lack of responsibility and regulation:** The space tourism industry is relatively new, and there are insufficient regulations to ensure the safety of passengers and the environment.

Future of space tourism:

- Need to formulate laws and legislations that shall regulate issues of space tourism including the regulation of private players.
- Need for habitable structure apart from international space station
- Future of space tourism has the ability to positively impact many socioeconomic factors on Earth including creating jobs, educating citizens about space and fostering further innovation in the space economy.
- Need for environmental regulation to reduce the climatic damage from this fast-growing industry

10 Controlled Re-entry of the Satellite

ISRO successfully carried out controlled re-entry experiment of decommissioned Megha-Tropiques-1 (MT-1) satellite.

- MT-1 was launched by ISRO and French space agency for carrying out tropical weather and climate studies.
- Controlled re-entries involve deorbiting (large satellites/rocket bodies) to very low altitudes to ensure impact occurs within a targeted safe zone.
- **UN/IADC (Inter-Agency Space Debris Coordination Committee) space debris** mitigation guidelines recommend deorbiting a LEO (Low Earth Orbit) object at its End Of Life:
- Through controlled re-entry to a safe impact zone. By bringing it to an orbit where orbital lifetime is less than 25 years.
- Space debris encompasses both natural (meteoroid) and artificial (man-made) particles.
  - Much of the debris is in LEO, though some debris can be found in geostationary orbit.
  - LEO is normally at an altitude of less than 1000 km but could be as low as 160 km above Earth.

Initiatives taken by ISRO for space debris mitigation:

- **ISRO System for Safe and Sustainable Space Operations Management (IS4OM)** for tracking and monitoring space objects.
- **Project NETRA:** To provide first-hand information on the status of debris.

CHAPTER

3

Health

Topic of This Chapter

1	One Health Approach
2	Medical Biotechnology
3	PRET (Preparedness and Resilience for Emerging Threats)

1 One Health Approach

Four multilateral agencies have launched a **One Health Joint Plan of Action** (2022-2026).

About One Health Joint Plan of Action (2022-2026):

Launched as collaborative approach between:

- United Nations (UN) Food and Agriculture Organization (FAO),
- UN Environment Programme (UNEP),
- World Health Organziation (WHO)
- World Organisation for Animal Health.
  - The plan is valid from 2022-2026 and is aimed at mitigating the health challenges at global, regional, and country levels.
  - It will create a framework and integrate systems and capacity to collectively better prevent, predict, detect and respond to health threats to all living beings as well as the environment.

What are common One Health issues?

One Health issues include emerging, re-emerging, and endemic zoonotic diseases, neglected tropical diseases, vector-borne diseases, antimicrobial resistance, food safety and food security, environmental contamination, climate change and other health threats shared by people, animals, and the environment. For example:

- Antibimicrobial-resistant germs can quickly spread through communities, the food supply, healthcare facilities, and the environment (soil, water), making it harder to treat certain infections in animals and people.
- Vector-borne diseases are on the rise with warmer temperatures and expanded mosquito and tick habitats.
- Diseases in food animals can threaten supplies, livelihoods, and economies.
- The human-animal bond can help improve mental well-being.
- Contamination of water used for drinking, recreation, and more can make people and animals sick.

Even the fields of chronic disease, mental health, injury, occupational health, and non-communicable diseases can benefit from a One Health approach involving collaboration across disciplines and sectors.

Global initiatives in line with one health approach:

- **The Pilanesberg Resolution, 2001:** It was targeted at multilateral and bilateral donors and governmental authorities to consider potential wildlife health impacts in development projects.
- **One World-One Health:** Introduced by The Wildlife Conservation Society (WCS) in 2007 along with 12 recommendations (Manhattan Principles) that focused on establishing a more holistic approach to preventing epidemic disease and maintaining ecosystem integrity.
- **National Framework for One Health, 2021** by FAO guides towards overcoming the systemic barriers to implement the One Health approach.

Steps taken to implement one health approach in India:

- **Institutional collaboration:** Institutes like Indian Council of Medical Research (ICMR) and Indian Council of Agricultural Research (ICAR) have collaborated for joint research priorities, to control disease outbreaks.
- One Health Support Unit (OHSU) initiated by the Department of Animal Husbandry and Dairying (DAHD), to develop a national One Health Framework.
- Under it, the pilot project are being implemented in states like Uttarakhand and Karnataka.
- **National Mission on Biodiversity and Human Well-being (NMBHWB):** It explicitly links biodiversity to human health by integrating biodiversity, ecosystem services, climate change, agriculture, health, bio-economy and capacity-building in the realm of biodiversity science.
- **One Health' project:** Launched by department of Biotechnology, It envisages carrying out surveillance of important bacterial, viral and parasitic infections of zoonotic as well as trans boundary pathogens in India, including the North-eastern part of the country.

Possible outcomes of one health approach:

- Prevent outbreaks of zoonotic disease in animals and people.
- Improve food safety and security.
- Reduce antibimicrobial-resistant infections and improve human and animal health.
- Protect global health security.
- Protect biodiversity and conservation.

By promoting collaboration across all sectors, a One Health approach can achieve the best health outcomes for people, animals, and plants in a shared environment.

2 Medical Biotechnology

The biotechnology industry has seen remarkable growth and progress over the past few years.

About Medical Biotechnology:

- Medical biotechnology is a branch of medicine that uses living cells and cell materials to research and then produce pharmaceutical and diagnosing products.
- These products help treat and prevent diseases.
- The Indian Biotechnology has witnessed a manifold increase in valuation in the past ten years, with COVID-19 giving the industry a much-needed push.
- India is poised as one of the leading destinations for bio innovation and bio manufacturing, and hence is identified as a sunrise sector.

Medical Biotechnology providing avenues for technological growth while saving lives:

- **Recombinant DNA Technology**: It is combining DNA molecules from two different species and then inserting that new DNA into a host organism. That host organism will produce new genetic combinations for medicine, agriculture, and industry.
- **Medical utility:** The ability of therapeutics and vaccines to treat and prevent diseases has been well documented.
- **Stem Cell Research:** Biotechnology plays a big part in supporting stem cell research, which supports the exploration of growing stem cells in a lab setting or in vitro.
- **Agriculture:** Biotechnology can be used to create genetically modified crops for combating hunger and malnutrition.
- **Environment:** Biotechnology has the potential to help mitigate pollution by using microbes and their byproducts, instead of chemical methods, to treat solid, liquid, and gaseous wastes.
- **Dairy/Animal Biotechnology:** Apart from enhancing the quality and quantity of milk, meat, and other animal products like wool produced through the use of recombinant DNA technology, therapeutic proteins/drugs can also be made to be produced in animal products.

Reasons why India is considered a land of opportunities in the field of biotechnology:

- **Growing market:** India is among the Top 12 destinations for biotechnology worldwide and 3rd largest destination for biotechnology in Asia Pacific.
- **Biggest supplier:** India is one of the biggest suppliers of low-cost drugs and vaccines in the world. India also leads in biosimilars, with the greatest number of biosimilars approved in the domestic market.
- **Largest producer:** With nearly 55% of Indian terrain under agriculture and allied activities, India is one of largest producer of BT-Cotton and has the 5th Largest Area of Organic Agriculture Land Globally.
- **Waste disposal:** The application of biotechnology to industrial processes is transforming manufacturing and waste disposal across the country.
- **Research ecosystem:** India offers a strong capability in contract manufacturing, research and clinical trials, and is home to the most US FDA approved plants globally outside of the US.
- **Entrepreneurship:** India has more than 5300 biotech startups, which are estimated to reach 10000 by 2025.
- **Relaxed Investment norms:** The government of India has allowed 100% FDI under the automatic

route in the biotech startups which will foster a sense of innovation in the country.

Initiatives taken by government to address the issue of Tuberclosis:

- **National Strategic Plan for Tuberculosis Elimination** 2017-2025
- **National Tuberculosis Elimination Program (NTEP)-** Centrally Sponsored Scheme
- **TB Harega Desh Jeetega Campaign**
- **Bacillus Calmette–Guérin (BCG) vaccine** included in the Indradhanush program.
- **National TB Elimination Programme** to meet the goal of ending the TB epidemic by 2025 the country, five years ahead of the Sustainable Development Goals (SDG) for 2030
- **Two vaccines VPM (Vaccine Projekt Management) 1002 and MIP (Mycobacterium Indicus Pranii)** have been developed and are under Phase-3 clinical trial.
- **Ni-kshay Poshan Yojana:** It provides Rs 500 support through direct benefit transfer to the patients.
- **'Dare2eraD TB' campaign-** data-driven research to eradicate TB in the year 2022 while citing the goal to achieve TB Mukt Bharat by 2025.

Trans fat

Five billion people unprotected from trans fats leading to heart disease.

Actions taken to combat Trans-fats in India:

- **PFA Act, 1954:** Prevention of Food Adulteration (PFA) rules were introduced under PFA Act, 1954. According to these rules, it was mandatory for food products containing hydrogenated vegetable oils or bakery shortening to declare on their label "hydrogenated vegetable fats or bakery shortening used contains trans-fats".
- **Amendment to Food Safety Standards Regulations, 2011:**Under this regulationthe limit of trans fats in margarine, bakery shortening, inter esterified vegetable oils and Vanaspati was set to "not more than 10% by weight" which was further reduced to "not more than 5% by weight" in the year 2015.
- **India@75:** As a commemoration of the 75th year of Indian Independence, FSSAI had launched a campaign called **India@75: Freedom from Trans-fats**. The campaign is set to align with the global target of eliminating Trans fats completely from India by 2022.
- **Heart Attack Rewind**: The first mass media campaign of its kind – supported FSSAI's global target of eliminating trans-fat in India by the year 2022, a year ahead of the global target by the **World Health Organization (WHO)** for complete elimination of trans fat.

3 PRET (Preparedness and Resilience for Emerging Threats)

World Health Organisation (WHO) has launched Preparedness and Resilience For Emerging Threats (PRET) Initiative.

Systems and capacity:

PRET recognizes that there are **3 tiers of systems and capacities** relevant for pandemic preparedness those that are:

- cross-cutting for all or multi-hazards,
- Relevant for groups of pathogens (respiratory, arboviruses etc.),
- are specific to a pathogen

Technical actions:

- The technical actions in PRET are mapped to the IHR core capacities, grouped according to five subsystems for health emergency preparedness, response and resilience (HEPR).
- HEPR under WHO is a learning channel brings together resources for WHO, national counterparts and partners to outline the process of developing national investment plans to apply for additional resources, including Pandemic Fund resources.

CHAPTER

4

Defense Technologies

Topic of This Chapter

1	Space Technology and Indian Armed Forces
2	Defence Indigenization

1 Space Technology and Indian Armed Forces

Absence of a space force huge gap in India's security cover, must be filled on priority as adversaries like Pakistan and China can impact India's space capabilities through jamming, lazing, hacking, or spoofing.

Space technology augmenting the capabilities of Indian armed forces:

- **Border management**: India has deployed military satellite **RISAT** which can help trace any unusual activity in the border terrains and transmit the information to ground sources to address the situation.
- **Navigation**: From target location to guiding weapons systems. There are two main systems: the US military's global positioning system or GPS, The **Indian Regional Navigation Satellite System (NavIC),** is an autonomous regional satellite navigation system that provides accurate real-time positioning and timing services. It covers India and a region extending 1,500 km around it.
- **Telecommunications (telecoms): GSAT 7 and GSAT 7A** enable the exchange of information, for example between the 'front-line' and strategic commanders, so decisions can be based on up-to-date intelligence.
- **Multi band communication:** India has Geosynchronous Satellite (GSAT) 7 in a Geosynchronous Transfer Orbit since 2013 to meet the Indian Navy's multi-band communication requirements over the whole of the Indian Ocean region.
- **Early warning**: Infrared satellite sensors can spot missile launches by detecting their hot plumes. However, the technology to track missiles along their trajectory, from space, is in its early stages.
- **Surveillance:** India has an **Electromagnetic Intelligence Gathering Satellite** or *EMISAT* which is equipped with an Electronic Intelligence (ELINT) package called **Kautilya** that allows the collection of information on ground-based radar as also electronic surveillance across India.
- **Meteorology**: India is a country with vast and rugged terrains, especially on its borders. Advanced information about the climate and weather conditions can help the military be better prepared to guard the borders, especially during the time of war.
- **Situational awareness**: **EMISAT satellite** enhances the situational awareness of the Indian Armed Forces by providing information about the **hostile radars**.

2 Defence Indigenization

India has been making progress with its self-reliance project or the **Atmanirbhar Bharat (AB)** initiative that was launched in May 2020. This flagship undertaking has shown signs of incremental progress in the defence sector.

Overview:

- As India inches to achieve its rightful strategic autonomy, it needs to do much more in planting the seeds for a commercially viable and technologically robust indigenous defence industrial base along with promotion of developing defence equipment in India.
- **Defence indigenisation** has remained the inner calling of a nation, which has the third largest Army, is the eighth largest military spender and has emerged as the largest importer of weapon systems and platforms in the world.
- Even when defence products are manufactured domestically, there is a large import component. This factor reflects that Make in India itself is not sufficient for an evolving sector like defence, thus there is a need to promote indigenization for holistic development of the sector.

A country like India with its immense potential and strategic location requires being self-reliant, hence it is important to pursue the idea of indigenisation for:

- **Self-defence:** The presence of hostile neighbours like China and Pakistan makes it improbable for India to boost its self-defence and preparedness.
- **Strategic advantage:** Self-reliance will make India's geopolitical stance strategically stronger as a net security provider.
- **Technological advancement**: Advancement in the defence technology sector will automatically boost other industries hence catapulting the economy further ahead.

- **Economic drain:** India spends around 3% of GDP on defence and 60% of that is spent on imports. This leads to an immense economic drain.
- **Employment:** Defence manufacturing will need the support of numerous other industries which generate employment opportunities.

Progress in defence indigenization:

- **INS Vikrant:** India's first indigenous aircraft carrier 1 (IAC 1).
- **Tejas aircraft:** DRDO is trying to develop an indigenous Kaveri engine for the aircraft.
- **Project 75:** Indian navy's submarine program dealt with France, Germany, Russia, Sweden, Spain, and Japan to build six advanced stealth submarines. INS Kalvari, INS Khanderi, INS vela are constructed by Mazagaon Dock Ltd in Mumbai.
- "**Dhanush**", first indigenous Long-range artillery gun.
- **Arihant:** India's first indigenous nuclear submarine by BARC and DRDO
- **Agni V:** The ICBM (intercontinental ballistic missile)
- The **Pinaka** multi-barrel rocket launcher was developed by RDE, Pune.
- Supersonic cruise missile **Brahmos** was developed by a joint venture with Russia.
- **Arjun tank:** the third-generation main battle tank developed DRDO and produced by Indian Ordnance Factories.

Issues related to defence indigenization:

- Lack of an institutional capacity and capability to take different policies aimed at indigenisation of defence to its logical conclusion.
- **Dispute Settlement body:** There is an urgent need for a permanent arbitration committee which can settle disputes expeditiously.

In the USA, the **procurement agency DARPA** has a permanent arbitration committee which resolves such issues amicably and their decision is final.

- Infrastructural deficit increases India's logistics costs thus reducing the country's cost competitiveness and efficiency.
- Land acquisition issues restrict entry of new players in the defence manufacturing and production.
- Policy dilemma offset requirements under the DPP are not helping it achieve its goal. (Offsets are a portion of a contracted price with a foreign supplier that must be re-invested in the Indian defence sector, or against which the government can purchase technology.

CHAPTER

5

Biotechnology, Nanotechnology, Intellectual Property Rights

Topic of This Chapter

1	Genome Editing vs. Genome Technology
2	Nanotechnology
3	Indian Biological Data Centre
4	Cloning
5	Intellectual Property Rights

1 Genome Editing vs. Genome Technology

The government of India has been taking initiatives regarding developing **CRISPR Cas9 technology** since 2017 that will not just enable editing parts of the genome of DNA sequence, but will also make it affordable.

Difference between genome editing technology and GM Technology:

- **Genetically modified organisms (GMO)** involves modification of the genetic material of the host by introduction of a foreign genetic material.
- In the case of agriculture, soil bacteria is the best mining source for such genes which are then inserted into the host genome using genetic engineering.
  - **For example,** in case of cotton, introduction of genes **cry1Ac and cry2Ab** mined from the soil **bacterium Bacillus Thuringiensis (BT)** allow the native cotton plant to generate endotoxins to fight pink bollworm naturally.
- The basic difference between genome editing and genetic engineering is that while the former does not involve the introduction of foreign genetic material, the latter does.
- In the case of agriculture, both the techniques aim to generate variants which are better yielding and more resistant to biotic and abiotic stress.
- Before the advent of genetic engineering, such variety improvement was done through selective breeding which involved carefully crossing plants with specific traits to produce the desired trait in the offspring.

Risks posed by gene editing:

- Studies show that gene-edited organisms are prone to unintended and unexpected effects at the molecular level. These could pose a threat to human health and the environment if commercialized without comprehensive mandatory safety assessment and oversight.
- Gene drives, designed to drive a particular trait through the entire population of a species, could have far-reaching and unpredictable negative consequences for organisms and the environment.
- The prevalence of herbicide-tolerant gene-edited plant proposals implies that gene editing applications will further entrench a chemical-intensive approach to agriculture.
- Gene flow can reduce the differences between populations and decrease diversity within a population, thus broadly impacting biodiversity.
- Gene introgression into wild relatives may also pose more direct risks, depending on the introduced trait.
- Invasiveness of gene-edited animals in special cases involving traits increasing their fitness (ability to survive, reproduce, feed and persist in ecosystems) could theoretically pose risks to ecosystems should they escape or be deployed in unmanaged situations.

2 Nanotechnology

India to usher in revolution in global fertiliser space with nano technology.

Environmental application of Nanotechnology:

- **Generating less pollution during the manufacture of materials**: One example of this is how researchers have demonstrated that the use of **silver Nano clusters** as catalysts can significantly reduce the polluting byproducts generated in the process used to manufacture propylene oxide which is used to produce common materials such as plastics, paint, detergents and brake fluid.
- **Production of solar cells at a competitive cost:** Researcher have demonstrated that an array of silicon nanowires embedded in a polymer results in low cost but high efficiency solar cells.
- **Increasing the electricity generated by windmills:** Epoxy containing **carbon nanotubes** is being used to make windmill blades.
- **Cleaning groundwater:** Researchers have shown that iron nanoparticles can be effective in cleaning up organic solvents that are polluting groundwater.
- **Cleaning up oil spills:** Using **photocatalytic copper tungsten oxide** nanoparticles to break down oil into biodegradable compounds.

- **Reducing the cost of fuel cells:** Changing the spacing of platinum atoms used in a fuel cell increases the catalytic ability of the platinum.
- **Storing hydrogen for fuel cell powered cars:** Using graphene layers to increase the binding energy of hydrogen to the graphene surface in a fuel tank results in a higher amount of hydrogen storage and a lighter weight fuel tank.

Healthcare applications of nanotechnology:

- **Treatment of cancer:** Commercial applications have adapted gold nanoparticles as probes for the detection of targeted sequences of nucleic acids, and gold nanoparticles are also being clinically investigated as potential treatments for cancer and other diseases.
- **Timely diagnosis:** Better imaging and diagnostic tools enabled by nanotechnology are paving the way for earlier diagnosis, more individualized treatment options, and better therapeutic success rates.
- **Low cost and high speed:** The design and engineering of advanced solid-state nanopore materials could allow for the development of novel gene sequencing technologies that enable single-molecule detection at low cost and high speed
- **Regenerative medicines:** Research in the use of nanotechnology for regenerative medicine spans several application areas, including bone and neural tissue engineering.
- **Vaccine Efficiency:** Nanomedicine researchers are looking at ways that nanotechnology can improve vaccines, including vaccine delivery without the use of needles.

Energy Applications of Nanotechnology:

- **Enhanced efficiency:** Nanotechnology is improving the efficiency of fuel production from raw petroleum materials through better catalysis.
- **Oil and gas industry:** Nanotechnology is also being applied to oil and gas extraction through, for example, the use of nanotechnology-enabled gas lift valves in offshore operations or the use of nanoparticles to detect microscopic down-well oil pipeline fractures.
- **Pollution control:** Researchers are investigating carbon nanotube "scrubbers" and membranes to separate carbon dioxide from power plant exhaust.
- **Reduces power loss:** Researchers are developing wires containing carbon nanotubes that will have much lower resistance than the high-tension wires currently used in the electric grid, thus reducing transmission power loss.
- **Renewable energy:** Nanotechnology can be incorporated into solar panels to convert sunlight to electricity more efficiently, promising inexpensive solar power in the future.
- **Longer electric charge:** Nanotechnology is already being used to develop many new kinds of batteries that are quicker-charging, more efficient, lighter weight, have a higher power density, and hold electrical charge longer.

Initiatives taken by the government for the promotion of Nano technology research and innovation:

Research and work on nanotechnology in India started in 2001 with the formation of the Nano Science and Technology Initiative with initial funding of Rs. 60 crores.

- **Nano Mission:**
- It is an umbrella programme aims for the overall development of research in the field of nanotechnology and to make use of its applied potential for economic development.
- **UNNATI Program (UNispace Nanosatellite Assembly & Training by ISRO):**
  - UNNATI is a capacity building programme on nanosatellite development.
  - It is an ISRO initiative to commemorate the 50th anniversary of the first United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE+50).
- **Nanotechnology regulatory** board was set up to regulate industrial nano products.
- Nano technology institutes like Indian Institute of Nano sciences at Bangalore,Mumbai,Kolkata were set up to promote the environment of innovation.
- Department of Science and Tech-Nanomission (nano-biotechnology activities) through DBT, ICMR, and CoE in Nanoelectronics by

MeitY support nanoscience, nanotechnology, nanobiotechnology, and nanoelectronics activities.

- **Thematic Units of Excellence (TUEs)** for various areas of nanoscience and nanotechnology play a major role in product-based research to support nanotechnology.

3 Indian Biological Data Centre

Indian Biological Data Center (IBDC) was inaugurated at Faridabad, Haryana.

Significance of Indian biological data center:

- **Improved understanding of genetic diseases:** Genome data management allows for the identification of genetic mutations and variants associated with various diseases, which can lead to improved diagnosis, treatment, and prevention strategies.
- **Enhanced drug discovery:** It can help identify new drug targets and facilitate drug discovery and development by providing a better understanding of the underlying genetic mechanisms of disease.
- **Personalized medicine:** Data repository can enable personalized medicine by providing a more comprehensive understanding of an individual's genetic makeup, which can help tailor treatment plans to their specific needs.
- **Improved agricultural productivity:** IBDC can help identify genetic markers associated with desirable traits in crops and livestock, which can improve breeding programs and increase agricultural productivity.
- **Evolutionary research:** It can facilitate research into the evolutionary relationships between species, providing insights into the history of life on Earth.
- **Studying zoonotic diseases:** The database currently stores the genomic sequences of crops such as rice, onion, tomatoes. With genomes of humans, animals, and microbes present in the same database, it will also help researchers in studying zoonotic diseases.
- **Research for vaccines:** The database will store the 25,000 sequences of mycobacterium tuberculosis. This will help in understanding the spread of multi-drug and extremely drug resistant TB, and aid the search for targets for new therapies and vaccines

Disadvantages of Indian biological data center:

- **Privacy concerns:** A centralized repository raises privacy concerns, as genetic information is highly personal and sensitive.
- **Ethical concerns:** It raises ethical concerns related to issues such as genetic discrimination and the potential for misuse of genetic information.
- **Data quality:** relies on accurate and reliable data and data quality issues such as errors or inconsistencies can affect the accuracy and usefulness of the data.
- **Computational challenges:** management of genome data requires powerful computing resources and specialized software tools to process and analyze large datasets, which can be expensive and time-consuming.
- **Standardization challenges:** Accumulation of Genome data involves a diverse array of data types and formats, which can make standardization and integration of data challenging.

4 Cloning

China has successfully cloned a wild Arctic wolf for the first time in the world. The Arctic wolf (white wolf or polar wolf) is native to the High Arctic tundra of Canada's Queen Elizabeth Islands.

About cloning:

Cloning is a technique scientists use to make exact genetic copies of living things. Genes, cells, tissues, and even whole animals can all be cloned.

- The copied material, which has the same genetic makeup as the original, is referred to as a clone.
- Despite having the same genetic material clones do not always look identical. This is because the environment also plays a role in deciding the physical feature of an organism.
- To clone a gene, researchers take DNA from a living creature and insert it into a carrier like bacteria or

yeast. Every time that carrier reproduces, a new copy of the gene is made.

Applications of cloning

- Animals can be cloned to have gene mutations that help scientists study diseases.
- Livestock can be cloned to produce more dairy products.
- Recreating extinct species to conduct studies and impacts.
- Cloned embryo could produce stem cells that can be used to fix damaged organs like spinal cord, insulin-making cells to treat diabetes, etc.

5 Intellectual Property Rights

Women in India face unique challenges in protecting their intellectual property rights.

Role of IPR in encouraging innovation and rewarding entrepreneurs:

- Intellectual property serves as the foundation of innovation in our economy. Government-granted rights incentivize discovery and creativity by providing creators with an opportunity to profit from the value of their innovative work.
- The creative work is made public so that others may build on and benefit from the work of the original creator thus fostering an environment and push for innovation.
- Laws protecting intellectual property also reduce the transaction costs between inventors and industry by providing information about the quality of the invention without jeopardizing the ownership of the idea.
- For the entrepreneur, intellectual property in the form of patents, trademarks, and copyrights can be especially valuable. Patents, for example, have been shown to increase firm productivity and, more immediately, a firm's market value.
- The revenues generated from commercially successful patent-protected technologies make it possible to finance further technological research and development (R&D), thereby improving the chances of even better innovations in the future.
- Patents recognize and reward inventors for their commercially-successful inventions. With a patent, an entrepreneur or small business knows there is a good chance that they will get a return on the time, effort and money they invested in developing a technology.

Success of India in fostering creativity and stimulating a strong IPR system:

India has made a significant progress in developing an IPR regime, which is proving to be successful in protecting the rights of the innovators and creators. India formulated the National Intellectual Property Rights (IPR) policy in 2016.

Development in the field of IPR over years:

- **Introduction of the National IPR Policy:** India announced its first National IPR policy in 2016, which aimed to strengthen the country's intellectual property regime and promote innovation and economic growth.
- **Digitalising IP Registration and Prosecution:** The Indian government has taken several steps to make the IP registration process more efficient. On the recommendations given by the Parliamentary Standing Committee in their 161st Report, the Controller General of Patents, Designs and Trademark (CGPDTM) took active steps to streamline the IPR filing system in India, which has led to a spur in the inflow of the FDI.
- **SIPP (Start-Ups Intellectual Property Protection) Scheme:** The Indian Government has launched the Start-Ups Intellectual Property Protection (SIPP) Scheme to provide legal and financial support to start-ups for filing and prosecution of their patents, trademarks and designs.
- **Introduction of IPR toolkits for proper enforcement:** DPIIT had launched an IPR enforcement toolkit in association with the Federation of Indian Chambers of Commerce and Industry to help the police in handling IP crimes, particularly counterfeiting and piracy.
- **Ministry of Education's Innovation Cell:** The Ministry of Education's Innovation Cell have also taken steps to foster innovation and promote IP literacy and awareness in classrooms across the country.

CHAPTER

6

Miscellaneous

Topic of This Chapter

1	Hydrogen fuel cell vehicle (HFCV) vs Battery Electric Vehicle (BEV)
2	Flex Fuel Vehicles
3	Rare Earth Elements
4	Lithium Deposits

1 Hydrogen fuel cell vehicle (HFCV) vs Battery Electric Vehicle (BEV)

The Automotive Research Association of India (ARAI) has organised a one-day seminar on Hydrogen as a Carbon Neutral Fuel for internal combustion engines (ICE) at its Kothrud campus in Pune.

Advantages of hydrogen fuel cell electric vehicle over battery electric vehicle:

- **Availability:** Earth has approximately 88 million tonnes of lithium, but only one-quarter is economically viable to mine as reserves.
- **Flexible energy source:** Hydrogen fuel cells provide an inherently clean source of energy, with no adverse environmental impact during operation as the byproducts are simply heat and water.
- **High energy efficiency:** Hydrogen fuel cell technology provides a high-density source of energy with good energy efficiency. Hydrogen has the highest energy content of any common fuel by weight.
- **Highly Efficient:** Hydrogen fuel cells are more efficient than many other energy sources, including many green energy solutions.
- **Reduces Carbon Footprint:** With almost no emissions, hydrogen fuel cells do not release greenhouse gases, which means they do not have a carbon footprint while in use.
- **Fast charging:** The charge time for hydrogen fuel cell power units is extremely rapid, similar to that for conventional internal combustion engine (ICE) vehicles and markedly quicker in comparison to battery powered electric vehicles.
- **Long Usage Times:** Hydrogen fuel cells offer greater efficiencies with regard to usage times. A hydrogen vehicle has the same range as those that use fossil fuels (around 300 miles).

Disadvantages of hydrogen fuel cell electric vehicle over battery electric vehicle:

- **Transportation and storage:** The biggest problem associated with the use of hydrogen as a fuel is its transportation and storage.
- **Flammable in nature:** Hydrogen is flammable and therefore dangerous if not properly stored or handled. Hydrogen has to be highly compressed for road use.
- **Gaps in infrastructure:** Battery-electric vehicles have the significant advantage of building on an already extensive electric grid infrastructure, which means that virtually every electric outlet in the world can function as a charging station.
- **Cost efficiency:** The cost for a unit of power from hydrogen fuel cells is currently greater than other energy sources, including solar panels.

Whereas solar energy can be used to generate electricity which in turn can be used to power the electric vehicles.

- **Cost of Raw Materials:** Precious metals such as platinum and iridium are typically required as catalysts in fuel cells and some types of water electrolyser, which means that the initial cost of fuel cells (and electrolysers) can be high. This high cost has deterred some from investing in hydrogen fuel cell technology.

Lithium which is used in manufacturing of batteries in EV is widely available and becoming accessible due to technological advancements.

Challenges for India to develop a FCEV ecosystem:

- It is quite challenging to integrate renewables in the electric grid beyond a point without technological intervention. Higher penetration might result in the **duck curve phenomenon**, first observed in California, USA.
- The cost of green hydrogen production is much higher than what is produced from fossil fuels.
- Hydrogen can be produced by a variety of process and has use in various sectors, making its sourcing and supply chain complicated when compared to oil and gas.
- Traditionally, hydrogen has seen minimal policy support from the governments.

2 Flex Fuel Vehicles

Ministry of Road Transport & Highways has launched first of its kind pilot project on Flexi-Fuel Strong Hybrid Electric Vehicles (FFV-SHEV) in India which would run on 100% petrol as well as 20 to 100% blended ethanol and electric power.

Flex Fuel, also known as **E85**, is a fuel mixture made of gasoline and between 51-83 percent ethanol. E85 can only be used in Flex Fuel vehicles that have been specifically designed to use this type of fuel.

Significance of FFV:

- **Less polluting:** According to the US department of energy, they have lower overall greenhouse gas emissions, between 40-108%, depending on the feedstock used to produce them.
- **Manage glut in sugar production**: India suffers from a glut in sugar production of 6 million tonnes and in sugar season 2020-21, about 2.4 million tonne was diverted to produce 302 liters of ethanol for blending.
- **Burning facility:** Possibly the greatest advantage is that the flex fuel vehicle has been designed to burn whatever proportion of mixture is in its combustion chamber.
- **Reduce import bill:** as they reduce the dependence on crude oil.
- **Benefits farm community:** wide uptake of ethanol or methanol as a fuel may create additional revenue stream for farmers and aid in increasing farm income.
- **Uses Waste Materials For Production:** Under the government's 'waste-to-wealth' program, using waste products like straw, sugarcane, bamboo and waste grains makes the raw material abundant and cheap for producing bioethanol sustainable for the long-term.
- **Helps Reduce Dependence On Crude Oil & Provides Cushion Against Oil, Currency Fluctuations:** The 20% ethanol blend in petrol will help us cut our crude oil imports.

Challenges associated with Flex fuel vehicles:

- **Issues with ethanol:** Constant supply must be ensured. However, since this largely comes from sugarcane in India, which is a water-guzzling crop, any drought could have an impact on blending rates.
- **Less vis-à-vis environmental benefits:** The benefit for the environment is less as compared to battery EVs or hydrogen fuel cell vehicles of the future.
- **Less Mileage:** While ethanol raises a vehicle's octane level, it contains less energy. It will take 1.5 times more to provide the same energy levels.
- The report by Ministry of Petroleum and Natural Gas mentioned that E20 blending will result in drop in fuel efficiency by nearly 6-7% in 4 wheelers calibrated to E10.
- **Resource Scarcity:** NITI Aayog in a report mentioned that over 90% of ethanol in India came from sugarcane alone, and other food crop like maize.
- **Ethanol Is More Hygroscopic Than Petrol:** Ethanol attracts moisture far more easily than petrol.

3 Rare Earth Elements

Hyderabad-based National Geophysical Research Institute has found large deposits of 15 Rare Earth Elements (REE) in Andhra Pradesh's Anantapur district.

What are rare earth metals?

- Rare Earths are a group of 15 elements in the periodic table known as the Lanthanide series. Chemically, rare earths are strong reducing agents.
- Their compounds are generally ionic and they display high melting and boiling points.
- Rare earths are relatively soft when in their metallic state while those with a higher atomic number tend to be harder.
- Rare earths react with other metallic and non-metallic elements to form compounds each of which has specific chemical behaviours.
- This makes them indispensable and non-replaceable in many electronic, optical, magnetic, and catalytic applications.
- Rare earth compounds are commonly fluorescent under ultraviolet light, which can assist in their identification. Rare earths also react with water or diluted acid to produce hydrogen gas.

Applications of rare earth metals:

- **New technology:** Rare-earth elements (REEs) are used as components in high technology devices, including smart phones, digital cameras, computer hard disks, fluorescent and light-emitting-diode (LED) lights, flat screen televisions, computer monitors, and electronic displays. Large quantities of some REEs are used in clean energy and defense technologies.
- **In lights :** Specific REEs are used individually or in combination to make phosphors—substances that emit luminescence—for many types of ray tubes and flat panel displays, in screens that range in size from smart phone displays to stadium scoreboards.
- **Glass:** Some REEs are used in fluorescent and LED lighting. Yttrium, europium, and terbium phosphors are the red-green-blue phosphors used in many light bulbs, panels, and televisions.
- **Screens:** Lanthanum makes up as much as 50 percent of digital camera lenses, including cell phone cameras.
- **As catalysts:** Lanthanum-based catalysts are used to refine petroleum. Cerium-based catalysts are used in automotive catalytic converters.
- **In magnets:** Magnets that employ REEs are rapidly growing in application. Neodymium-iron-boron magnets are the strongest magnets known, useful when space and weight are limiting factors.
- **In batteries:** "Nickel-metal hydride batteries are built with lanthanum-based alloys as anodes.
- **In steel alloys:** Cerium, lanthanum, neodymium, and praseodymium, commonly in the form of a mixed oxide known as mischmetal, are used in steel making to remove impurities and in the production of special alloys.

- Scientists from **Institute of Minerals and Materials Technology**, Bhubaneswar, have estimated the quantity of REEs that can be recovered from **Red Mud**.
- Red Mud is a toxic byproduct of aluminium extraction from bauxite ore using Bayer process.
- Red Mud contains REEs, there are two strategies to recover REEs from red mud: extract only REEs or extract all metals (such as iron, titanium, and sodium) including REEs.

4 Lithium Deposits

Months after India's first lithium reserves of 5.9 million tonnes were discovered in Jammu and Kashmir, the Geological Survey of India (GSI) has found another reserve of the crucial mineral in Degana in Rajasthan's Nagaur district.

Previously, in India, lithium reserves have been reported from Karnataka's Mandya district.

Significance of Lithium finding

- **Reduce import dependency:** Currently, India does not have its own lithium resources and is dependent on imports.
- In FY2022, India imported lithium and lithium ion worth almost ₹14,000 crore, which is likely to increase going forward.
- India presently imports lithium from Hong Kong, China, USA, Australia and Argentina.
- **Boost to manufacturing and exports:** Manufacturing of rechargeable Lithium based batteries for multiple purposes and self-reliance.

A World Bank study suggests that the demand for critical metals such as lithium (Li) and cobalt is expected to rise by nearly 500% by 2050.

- **Transformation of Mobility:** It will strengthen India's National Mission on Transformative Mobility and Battery Storage for transitioning towards Electric Vehicles and green mobility.
- **Fulfilment of Net Zero Emission Goal by 2070:** Lithium being a key component of lithium-ion batteries used in EVs, harnessing solar power, wind energy etc.
- **Strengthening of critical mineral supply chain for emerging technologies:** Lithium reserves and processing is highly concentrated and India's find will significantly strengthen its supply chain.
  - ➤ Although, China does not hold a lot of lithium reserve, it controls over half the global lithium processing and almost 75% of cell components and battery cell production in the world.

Risks associated with lithium mining:

- **High risk in ecologically sensitive Himalayas**: Recent Joshimath subsidence shows fragility of the region and long term issues with activities like mining.
- **Environmental pollution:** Open-pit-mining, refining, and waste disposal from Lithium extraction processes substantially degrades the environment, including depletion and contamination of waterways and groundwater, biodiversity, and considerable air pollution.
- **Stress on Water Resources:** Extracting lithium from its ore is highly water-intensive, taking about 2.2 million litres of water for one tonne of lithium.
- **CO_2 Emissions:** The lithium production process involves heating the ore at a high temperature that can only be cost effective by burning fossil fuels.

Reflective Questions

Economy

Q 1. Elaborate on how tax rates can be utilized for encouraging/discouraging investment or demand in the economy. Illustrate with the help of any tax being levied in our country.

Q 2. Explain the role of fiscal policy in India along with its objectives. Highlight the relationship between fiscal policy and monetary policy.

Q 3. State the factors responsible for high rate of inflation in the Indian Economy in recent time. Suggest certain measures to keep the inflation within the tolerance band of RBI.

Q 4. Explain the reasons that led to the rise in NPAs in recent years. What steps have been taken to address the problem of growing NPAs?

Q 5. Fiscal Consolidation is considered to be an effective tool in reduction of government deficit and debt stock. Explain why complying with FRBM Act, 2003 is necessary in achieving the purpose of Fiscal consolidation.

Q 6. What do you mean by Subsidy Reforms'? Comment on the major reforms taken by the government of India in the last decade.

Q 7. Do you think monetary policy of the RBI which is based on Inflation targeting has proved to be inefficient and needs reform? Comment.

Q 8. The key objective of the sugarcane pricing policy should be a fair price to cane growers, adequate returns to the industry, and supply of sugar to consumers at reasonable prices. Critically examine India's sugarcane pricing policy in this regard.

Q 9. To meet the challenges of climate change use of ICT in agriculture is more necessary than optional. Discuss. Also, highlight the need for a customized approach to implementing digital agriculture for small farms in India.

Q 10. Discuss the features of the Indian economy that make it so heavily dependent on the service sector. Do you think that the rapid development of the services sector led to jobless growth in India?

Q 11. Ensuring food security will aid in reducing hunger but will not eliminate malnutrition. Discuss. Suggest measures for proper monitoring and timely evaluation of nutritional programs in India.

Q 12. Despite its initial successes, the World Trade Organization currently faces an existential crisis. Analyse. Could the reforms of WTO pave the way for an improved Indian economy? Justify your answer.

Q 13. The MSME sector constitutes the spine of the nation and has been one of the major pillars of India's economic development strategy since its Independence. In this light discuss the role of MSME in propelling economic growth, sustaining livelihood and in promoting equitable regional development in India.

Q 14. Manufacturing sector in India is still not living up to its expectations. What are the hindrances faced by this sector? Assess the success of Make in India programme in strengthening India's manufacturing sector.

Q 15. With the onset of the Fourth Industrial revolution how can India endowed with such a large workforce harness benefits and utilize it as an opportunity for the economic growth of the country?

Q 16. "Economic growth alone does not necessarily translate into more and better jobs". Elaborate on why India is experiencing jobless growth despite high economic growth. Examine how India can avoid jobless growth in the post pandemic recovery phase.

Q 17. **"Social infrastructure contributes indirectly to the country's economic development." Discuss the trends in social sector expenditure in India and examine its significance in light of India's aim to improve its ranking in Human development Index (HDI).**

Q 18. **What are the main causes for rural-urban divide? What are the implications of such disparity? Discuss the policies taken by the government to bridge this gap and suggest some solutions to address it.**

Q 19. **Despite consistent experience of high economic growth inclusive growth remains a distant dream for India. Examine the issues that make inclusive growth elusive. Mention the steps taken by the government towards ensuring inclusive growth in the nation.**

Q 20. **Often the terms growth and development are used interchangeably and accepted as synonymous however they are different in various aspects. Discuss with respect to the Indian economy.**

Q 21. **Despite various initiatives taken by the Government towards addressing gender inequality, India ranks poorly in Gender Inequality Index (GII). Examine why such initiatives have had a limited impact and suggest steps required to improve the position of women in India.**

Q 22. **"1991 was a landmark moment in India's post-independence history that changed the nature of the economy in fundamental ways." Critically analyse how the 1991-92 economic reforms have transformed the Indian economy during the last 30 years. Have economic reforms improved the quality of life in India? Substantiate.**

Q 23. **Do you think that recently notified labour codes can have a transformative impact on labour empowerment in India? Critically analyze.**

Q 24. **With partial Capital Account Convertibility, India will not be able to serve the purpose of fully integrating its economy with the global economy. Do you agree? Examine whether the time has come for India to usher in full liberalisation of the Capital Account.**

Q 25. **Critically analyse the role of the service sector in poverty reduction and inclusive growth in India. Also explain, why the service sector in India is more urbanized than the manufacturing sector?**

Q 26. **Discuss the significance of domestic and foreign investment in the economic growth of India. Also, identify the factors that hinder the favorable investment climate in the country and suggest measures.**

Q 27. **While India has lifted million people out of poverty, it still accounts for a large number of the world's 'multidimensional' poor. Discuss the causative factors and mention the steps required for improved performance in this regard.**

Q 28. **Diversification of agricultural livelihoods in agricultural sub-sectors in India has strengthened resilience and led to considerable increase in labour force participation in the sector. Elaborate.**

Q 29. **Public private partnership (PPP) offers the public sector potential cost, quality and scale advantages in achieving infrastructure service targets. However, it is not a panacea for all the public sector's funding and infrastructure problems. Analyse.**

Q 30. **Though seen as the game changing reform for the Indian economy, there are still gaps between expectation and actual implementation of the GST. Analyse.**

Q 31. **Fishery sector occupies an important place in the socio-economic development in India. In this regard, assess the potential and challenges of this sector. How the Pradhan Mantri Matsya Sampada Yojana (PMMSY) could prove to be transformative in this regard?**

Q 32. **Discuss the vital role played by the Indian ports and shipping industry in sustaining growth in the country. Also, analyse the role of the Sagarmala Project in enabling the ports to become drivers of port-led economic development.**

Q 33. **What do you understand by the term 'green fiscal policies'? Analyse the role of Green fiscal policies in addressing the challenges of climate change and transition to an inclusive green economy. Also, suggest measures to strengthen the green fiscal federalism in India.**

Q 34. What are the key issues and challenges relating to small holding agriculture in India? How technological and institutional innovations can enable marginal and small farmers to raise agricultural productivity and increase incomes?

Q 35. Climate change is imperiling the livelihoods of farmers by exacerbating droughts, heat waves, floods and other extreme-weather events. In this regard analyse how smart farming would prove to be the savior of Indian farming. Also, explain what makes millets worth an 'International Year'.

Q 36. Discuss the concept of a global minimum tax rate in the context of international taxation and its potential implications for global economic stability.

Q 37. Discuss the impact of the COVID-19 pandemic on the GST compensation fund, highlighting the resulting federal tensions in India's fiscal architecture.

Q 38. Discuss the impact of the European Union's Carbon Tax on India's exports.

Q 39. Examine the concept and significance of sovereign green bonds as a financial instrument for promoting sustainable development.

Q 40. Evaluate the role of central and state governments in supporting municipal finance and addressing the funding gaps. Discuss the potential consequences of stagnated municipal expenditure, including infrastructure decay, inadequate public services, and social inequalities.

Q 41. The costs of providing freebies need to be carefully managed to avoid straining public resources and potentially leading to fiscal imbalances. Comment

Q 42. What do you mean by banking system liquidity deficit? Discuss the reasons behind occurrence of this phenomenon along with its implications.

Q 43. Digital payments lead to transparency, efficiency, and financial inclusion. Examine

Q 44. Discuss the concept and potential implications of establishing "bad banks" in the banking system. Analyze the role and functions of bad banks in dealing with non-performing assets (NPAs) and toxic loans.

Q 45. India's UPI has the potential to be a major facilitator of financial inclusion in India. Discuss.

Q 46. What are the primary goals of monetary policy? What are the major tools of monetary policy?

Q 47. Evaluating the consequences of accounting fraud on investor trust and market stability, discuss the regulatory framework and enforcement mechanisms required to prevent and detect such fraudulent activities.

Q 48. Examine the concept of Direct Benefit Transfer (DBT) and its role in improving the efficiency and effectiveness of social welfare programs

Q 49. Explain the concept of Initial Public Offering (IPO) and its significance in the capital market and corporate finance.

Q 50. Evaluating the effectiveness of Minimum Support Price (MSP) in ensuring income security for farmers, highlight the challenges faced in determining and implementing MSPs.

Q 51. Evaluate the role and functioning of Primary Agricultural Credit Societies (PACS) in India's rural credit system.

Q 52. Discuss the opportunities and challenges faced by the agriculture sector in the wake of LPG reforms and the subsequent integration with the global economy.

Q 53. Evaluate the impact of technology-driven solutions, market linkages, and financial support provided by agriculture startups on improving agricultural practices, increasing yields, and enhancing the income of farmers.

Q 54. Discuss the significance of increasing investment in agricultural research and development (R&D) in India. Also, suggest policy measures to promote increased investment in agricultural R&D and the potential impact on the overall agricultural sector in the country.

Q 55. Evaluate the objectives, implementation, and impact of the Pradhan Mantri Kisan Samman Nidhi (PM-KISAN) scheme in India. Also, critically examine the potential long-term implications of PM-KISAN on the agriculture sector and the overall economy.

Q 56. Examine the significance of micro-irrigation techniques in addressing the challenges of depleting water resources in India. Assess the role of government policies, financial incentives, and technological advancements in promoting the widespread adoption of micro-irrigation.

Q 57. Critically examine the need for reforming farm subsidy policies to ensure their effectiveness, sustainability, and alignment with broader agricultural objectives. Suggest alternative approaches to support farmers that promote long-term resilience and inclusivity in the agricultural sector.

Q 58. Analyze the significance of the fisheries sector in India's economy and its potential for sustainable development.

Q 59. Examine the causes and consequences of agricultural distress in India. Discuss the role of agrarian movements, cooperative farming models, and diversification strategies in mitigating agricultural distress.

Q 60. Discuss the transformative role of technology in the agricultural sector. Evaluate the impact of technological advancements in enhancing productivity, resource efficiency, and sustainability in farming practices.

Q 61. What are the challenges faced in maintaining accurate and updated land records in India? Examine the significance of efficient land records management in promoting land governance and inclusive development.

Q 62. Evaluate the potential and challenges of the food processing industry in India as a catalyst for agricultural transformation and economic growth.

Q 63. Analyze the benefits and challenges associated with the establishment of Special Economic Zones (SEZs). Suggest strategies to maximize the potential of SEZs in the Indian economy, ensuring sustainability, and balanced regional development.

Q 64. In light of the slowdown in global trade, do you think that the Foreign trade policy 2023 can boost exports of India's goods and services. Substantiate your answer with relevant facts.

Q 65. Discuss the concept of de-dollarization and its implications for global financial stability. Substantiate your answer with relevant examples and case studies.

Q 66. Examine the causes and consequences of currency depreciation in an economy. Discuss the measures that can be taken to mitigate its adverse effects.

Q 67. Discuss the significance of foreign exchange reserves (Forex reserves) for an economy.

Q 68. Discuss the benefits of increased global economic interconnectedness, such as expanded market opportunities, enhanced efficiency, and technological advancements, in the context of Indian economy.

Q 69. Analyze the impact of oil price fluctuations on key macroeconomic indicators, such as GDP growth, fiscal deficit, current account balance, and inflation.

Q 70. Define rural tourism and highlight its significance in generating economic opportunities, preserving cultural heritage, and promoting rural development.

Q 71. Discuss the significant transformations in the Indian telecom industry and their impact on the economy. Analyze the challenges and opportunities associated with these transformations.

Q 72. Examine the recent measures taken by the government to promote Public Private Partnership (PPPs) in India.

Q 73. Evaluate the role of budgetary policies in addressing regional disparities, including infrastructure development, skill enhancement, and resource allocation for marginalized regions. Give examples.

Q 74. Analyze the challenges faced in implementing and enforcing labor laws in India, including issues of informal employment, labor exploitation, and the informal sector's inclusion.

Q 75. Discuss the regulatory gaps and legal ambiguities surrounding gig work and its impact on workers' protection and welfare.

Q 76. Caregiving economy promotes social welfare and gender equality. Discuss

Q 77. Examine the significance of women's participation and contribution to the economy. Also, suggest measures to address the barriers that hold back women's economic activity.

Q 78. Discuss the potential of education, skill development, and entrepreneurship to bridge widening economic inequality and promote inclusive growth.

Q 79. Discuss the significance and growth of India's pharmaceuticals industry in the global context. What are the implications of India's pharmaceutical exports on the country's economy and its contribution to healthcare accessibility worldwide?

Q 80. Examine the importance of the semiconductor industry and the role of design-linked incentives in promoting its growth and competitiveness.

Q 81. Discuss the increasing role of Micro, Small, and Medium Enterprises (MSMEs) in fostering economic growth and employment generation.

Q 82. What do you understand by energy poverty? Discuss its socio-economic implications.

Q 83. Provide an overview of the Indian startup ecosystem, highlighting its growth, innovation, and contributions to the economy.

Environment & Ecology

Q 84. What is climate neutrality? Why is 'net-zero' so important in the fight against climate change? Throw some light on India's stand on climate neutrality.

Q 85. "At a time when chemical-intensive farming is resulting in soil and environmental degradation, Zero Budget Natural Farming (ZBNF) is definitely a good alternative". Analyse the role of ZBNF in reducing soil and environmental degradation as well as achieving the goal of increasing farmers' income.

Q 86. 'Access to clean and affordable energy is pivotal for India's sustainable development.' In this regard, discuss various initiatives taken by our government to promote renewable energy and challenges that still remain.

Q 87. Peri-urban areas have a spillover effect of environmental problems in surrounding rural areas. Explain.

Q 88. Global warming has been observed lately in permafrost areas, which may result in terrible impacts on the ecology of the region and intensify the warming effect further. Discuss.

Q 89. Wastelands form the core of degraded lands in India. Discuss how these wastelands are created and briefly highlight the International efforts to combat the problem of wastelands.

Q 90. Discuss the need for climate-resilient infrastructure in India. How can India climate-proof its infrastructure?

Q 91. Coral reefs worldwide are facing severe threats that jeopardize their survival. Discuss. Highlight the measures taken on India and global level to preserve coral reefs and related ecosystems around the world.

Q 92. Discuss the natural and anthropological causes of acid rain. Highlight the measures taken by the government in this regard.

Q 93. Discuss the factors responsible for soil pollution and explain its deleterious consequences on ecosystems.

Q 94. Discuss the causes and the environmental effects of Ozone Depletion. Explain the importance of Montreal Protocol in protecting the ozone layer.

Q 95. With the urban sprawl and burgeoning population pressure in cities, urban fire accidents are becoming a norm. In this context, critically analyze the effectiveness of the present institutional framework for fire prevention in India. Suggest measures to overcome these constraints.

Q 96. The issue of gender-sensitivity is crucial for low carbon climate resilient planning at local, national and international levels. In this context examine the impact of climate change on the women in developing countries like India.

Q 97. Discuss the significance of the circular plastic economy and highlight the challenges in plastic recycling in India. Also, mention some measures taken by the government to promote the circular plastic economy.

Q 98. What is meant by "loss and damage" in the context of climate change? How will the recently concluded COP27 Loss and Damage Fund (LDF) help vulnerable countries to deal with the adverse effects of climate change?

Q 99. Stating the significance of traditional water harvesting systems in India, enumerate the need to re-introduce them.

Q 100. Identifying the major threats to biodiversity, discuss the significance of Kunming Declaration on biodiversity.

Q 101. The challenge with financing the SDGs is that most of the onus falls on national governments. In this context, discuss the issues in SDGs financing in India. Suggest measures to be taken in this regard.

Q 102. Discuss the significance of the Environmental Impact Assessment (EIA) and describe the different stages involved in the EIA process in India.

Q 103. Solid waste management, which is already a mammoth task in India, is becoming more complicated by the invasion of e-waste. Highlighting the various issues related to e-waste management in India, bring out the measures taken by the government in this regard.

Q 104. Oil spills nowadays are creating major environmental attention due to the sudden increase in the transportation through the sea. Analyze the impact of oil spill on marine life, citing specific examples. Also, explain the role of the Environmental Sensitivity Index (ESI) in oil spill contingency planning and response.

Q 105. Owing to its long coastline and continuous increase in population in the coastal areas, the marine diversity in India is facing serious anthropogenic threats. Discuss. Suggest measures to be taken for facing these challenges.

Q 106. Stating the reasons for degradation of wetland in India, enumerate the significance of Ramsar Sites and steps taken by India in conservation of wetlands.

Q 107. Access to clean and affordable energy is pivotal for India's sustainable development.' In this regard, evaluate various initiatives taken by our government to promote renewable energy and challenges that still remain.

Q 108. Discuss the concept of species relocation as a conservation strategy, its implications, and the challenges associated with it. Illustrate your answer with suitable examples from different regions of the world.

Q 109. Human Wildlife conflicts results from a variety of ecological and anthropogenic drivers that exert pressures on landscapes. Discuss

Q 110. Fewer than 50,000 Asian elephants live in the wild, with more than half of them in India. However, most of them are in private hands and put to work for entertainment, tourism and religious purposes". In the light of this statement, suggest effective measures to address this issue and ensure better protection for these majestic animals.

Q 111. Analyse the key challenges and successes in tiger conservation efforts in India. Discuss the significance of tigers in maintaining ecosystem balance and their cultural importance.

Q 112. Discuss the causes, impacts, and mitigation strategies of forest fires in India. Analyze the socio-economic and ecological consequences of forest fires on local communities and biodiversity. Suggest measures to enhance fire management and prevent future occurrences, ensuring the sustainable management of forest ecosystems."

Q 113. Discuss the threats faced by the biodiversity in India. Discuss effectiveness of the global framework to tackle this threats.

Q 114. To what extant Wildlife (Protection) Act is successful in protecting India's Wildlife. Discuss

Q 115. The term 'net zero' is becoming a global rallying cry, frequently cited as a necessary step to successfully beat back climate change, and the devastation it is causing. Comment

Q 116. Solar Energy can act as a panacea to the growing energy needs of India. Discuss. What are challenges for India's solar energy growth?

Q 117. What exactly do you mean by agroforestry? Explain its importance in context of climate change for India?

Q 118. Granting legal rights and protections to non-human entities such as animals, trees and rivers is essential if countries are to tackle climate breakdown and biodiversity loss. Do you agree?

Q 119. The Ganga and Yamuna examples highlight the need for urgent laws — and a robust legal framework to back them — to protect nature from human damage and exploitation. Comment

Q 120. Examine the factors behind burgeoning problem of e-waste in India. Suggest some measures to tackle this crisis.

Q 121. What is Miyawaki method of afforestation? Discuss the significance and issues associated with Miyawaki method.

Q 122. Why should clean, healthy environment be recognized as a universal human right? Discuss the statement in the light of the recent UN resolution.

Q 123. Discuss the significance of the The Energy Conservation (Amendment) Bill, 2022. Also, discuss the issues associated with the bill.

Q 124. Biofuels contribute to the diversification of India's energy mix and reduce dependence on fossil fuels. Comment

Q 125. Urban air contamination is a serious problem in many of the India's big cities. Examine the causes and consequences of increasing pollution in big cities and suggest effective measures and policy interventions to combat pollution and promoting sustainable urban development.

Q 126. How are black soot and ash deposited on distant glaciers? What are the effects of soot & ash deposits on glaciers?

Q 127. Bringing out the natural and anthropogenic factors responsible for the Methane emissions, highlight the national and global initiatives to tackle the methane emissions.

Q 128. Human migration and mobility are age-old phenomena, but their triggers are fast changing due to deteriorating environment and ecosystems. Discuss.

Q 129. The cost of land degradation can be substantial in the case of India where agriculture is a large contributor to the country's Gross Domestic Product. Examine.

Q 130. The adverse impact of nutrient depletion in soils resulting from nutrient removal and fertilizer practices poses a significant threat to global food security, as it compromises soil quality and hampers the stability of crop yields. Discuss.

Q 131. What is Hazards of Radioactive Pollution? Evaluate the measures and regulations in place to mitigate radioactive pollution and suggest strategies for better management of radioactive waste to ensure long-term environmental sustainability.

Q 132. Discuss the factors behind continuance of stubble burning in northern part of India. Also, suggest some measures to solve the issue of stubble burning.

Q 133. What is carbon capture, utilization, and storage? Discuss the significance of Carbon Capture, Utilisation, and Storage as an emission reduction strategy to achieve deep decarbonization from the hard-to-abate sectors.

Q 134. Discuss the role of the wind energy in achieving the energy security in India. Why India's wind potential still remains largely untapped?

Q 135. As the world grapples with climate change and its consequences, it is important to recognise the need for climate change resilience with fiscal stability. Discuss

Q 136. Despite several policy and regulatory interventions, coal ash management in India remains a challenge. Critically examine.

Q 137. With its steep topography and abundant water resources the Himalayas offer sustainable, low-carbon hydropower for energy-hungry South Asia. However, the mountain range falls in one of the world's most seismically active regions. Analyze the environmental implications and challenges associated with developing hydropower projects in this seismically active region.

Q 138. Given India's current energy savings-based market mechanism, do you think the proposal to create the Indian Carbon Market (ICM) to decarbonise the Indian economy by pricing the Green House Gas (GHG) emission is an effective solution? Give reason in support of your answer.

Q 139. In the light of the latest findings in a report by the Intergovernmental Panel on Climate Change (IPCC), highlight the need of "increased urgency" to reduce emissions.

Q 140. Over the years, the influence of the city has spread to the peri-urban zones putting immense pressure on the agricultural land. Examine.

Q 141. River linking projects for the country are a great opportunity to address the water issues arising out of climate change.

Q 142. Do you think river interlinking is the most suitable way forward for water management in India? Critically examine.

Q 143. Data centers account for about 1% of global electricity use annually, and emit enormous amounts of heat that generally goes unused. In the light of this statement, discuss the significance of recycling of waste heat as a sustainable tool for civilization.

Q 144. Discuss the potential benefits and challenges of implementing organic and natural farming methods to ensure ecological balance and long-term agricultural sustainability.

Q 145. Given the current scenario, it is imperative to prioritize sustainable agriculture while ensuring a harmonious balance between economic gains and environmental sustainability. Discuss

Q 146. Critically evaluate the Environmental Impact Assessment (EIA) as Precautionary Principle of Environmental jurisprudence in India.

Q 147. The combination of climate change and poorly executed human activities in the Himalayas has amplified the susceptibility of the hilly regions to disasters, leading to a significant rise in the destruction of both property and human lives.

Q 148. How does climate change affect the strength and frequency of extreme weather events?

Q 149. As global efforts to mitigate greenhouse gas emissions continue, there arises a pressing imperative to enhance the resilience of coral reefs and facilitate their adaptation to the escalating temperatures resulting from climate change. Discuss.

Q 150. What is heat stress? Discuss how heat stress poses a significant threat to coral growth and reef accretion.

Q 151. The maritime industry is highly dependent on fossil fuels contributing to almost 3% of global greenhouse gas emissions annually. In the light of this statement, discuss the challenges and strategies for decarbonizing the maritime sector, and highlight the role of international cooperation in achieving sustainable shipping.

Q 152. There has been a significant increase in climate action, both multilaterally and in individual countries. Alongside fiscal policies, recent years have seen a growing experimentation with regulatory instruments. Discuss.

Q 153. What is climate smart agriculture? Discuss the necessity of climate smart agriculture in the 21st century.

Q 154. Give reasons for the increase in frequency and intensity of heat wave in India in recent time. How does heat wave affect human and animal lives?

Q 155. Critically analyze the impact of the Artificial Intelligence on the Environment and Biodiversity of India and world.

Q 156. What is Carbon Border Adjustment Mechanism? Discuss its impact on India.

Q 157. "Climate change can disrupt agricultural systems, leading to reduced crop yields and lower nutritional quality of food." Comment.

Q 158. Critically analyse the impacts of the climate change on the Himalayan ecosystem.

Q 159. Discuss the essentiality of the Environment driven taxes in India.

Disaster Management

Q 160. What do you understand by Disaster Risk Management and Disaster Management Cycle? Discuss the Broader Strategies Adopted in Disaster Management with suitable examples.

Q 161. How has the seismic zonation map of India changed in response to recurring earthquake hazards? Discuss the mechanism and challenges for earthquake management in India.

Q 162. Highlight the Significance of Coastal Vulnerability Index. Also, discuss the utility of Coastal Multi-Hazard Vulnerability Mapping

Q 163. Identify the regions which are particularly vulnerable to landslide disasters in

India. Also, elucidate the challenges and measures of the National Landslide Risk Management strategy.

Q 164. Capacity is central to reducing disaster risk. Highlighting the types of capacities in disaster management, indentify ways to enhance it.

Q 165. Enumerating the reasons for disasters in Himalayan region, bring out the post disaster management challenges in this regard.

Q 166. Disaster Management' is not confined to 'disaster response' alone. In this context, elaborate on how the government of India has brought about a change in the approach to disaster management from a relief-centric to a holistic and integrated approach

Q 167. Discuss the major reasons behind increasing incidents of wildfires and their impacts across the globe. Also, explain why global action plans in line with the 'Fire Ready Formula' (designed by UNEP) are critical in addressing the issue.

Q 168. Analyze the problems and prospects of traditional knowledge in disaster management.

Q 169. Nature based solutions hold more significance in reducing the disaster risks. In this context explain how Ecosystem-based Disaster Risk Reduction (Eco-DRR) can help in mitigating the impact of tropical cyclones.

Q 170. As compared to other levels of government, local governments have more important roles to play in disaster management. Discuss.

Q 171. .India is highly vulnerable to flood as it is the most frequently occurring natural hazard. Critically examine the efficacy of institutional arrangements dealing with flood management in the country.

Q 172. Discuss about the vulnerability of India to Tsunami related hazards. Highlight the measures taken for prevention and mitigation of Tsunami in the Indian Ocean region.

Q 173. Describe the role and significance of the GIS Technology in Disaster Management. Discuss the key issues in the use of this technology and the measures being taken to make such technology more impactful in the Indian context.

Q 174. With warming climate short duration rainfall extremes and cloudburst are becoming more intense and frequent. Discuss the pre and post-disaster management phases to prevent or lessen the menace of the cloudbursts.

Q 175. Disaster management occupies an important place in India's policy framework. Critically evaluate the performance of National Disaster Management Authority (NDMA) in ensuring timely and effective response to disasters.

Q 176. Science and Technology plays vital role in disaster management. Discuss

Q 177. The Pandemic Fund will bring additional, dedicated resources for pandemic prevention, preparedness, and response to disaster management. Discuss.

Q 178. Floods are the most commonly occurring natural disaster in India. In light of this statement, discuss social and economic cost of disaster induced displacement.

Q 179. Unplanned and rapid development of urban cities has caused frequent urban flooding. Do you agree? Discuss the measures to prevent urban flooding in India?

Q 180. Lightning strikes account for 35% of all natural hazard deaths in India, however, its impact vary from states to states. Do you think a lightning risk management strategy needs to be customised for each state, taking into account seasonality, intensity and frequency of lightning?

Q 181. Prioritizing disaster risk financing within the G20, under India's presidency, presents an opportunity to convert intentions into investment opportunities. Discuss

Q 182. Earth is constantly facing adverse weather conditions, with floods, heat waves, and droughts more frequent than ever. Discuss. How India could achieve Atmanirbhar to manage such disaster.

Q 183. "While one can prevent natural disasters from happening, an understanding of disaster risk can help mitigate its effects". In the light of this statement, discuss how India can take lessons from the recent

Turkey earthquake for future planning to reduce its impact.

Q 184. "As countries are becoming more aware of the reality of climate change, there is a growing recognition that disaster resilience must be a priority." In the light of this statement, discuss how India is preparing to develop a disaster resilient infrastructure.

Q 185. What do you mean by disaster resilient infrastructure? Discuss the role played by coalition for disaster resilient infrastructure (CDRI) in India?

Q 186. Critically examine the provisions of National Policy on Disaster management. Other than these initiatives, what could be the way forward to manage disaster?

Q 187. The uncontrolled expansion of infrastructure in the Himalayan region, without proper planning, is exacerbating the fragility of the ecosystem and intensifying its susceptibility to the amplified effects of climate change, which acts as a force multiplier. Analyse

Q 188. Floods have been a way of life for people living in Assam. Discuss. Suggest measures by which flood crisis could turn into opportunities.

Q 189. Cyclone Disaster Management in India works to implement measures to prepare and mitigate the effects of an upcoming cyclone.

Q 190. What is Tsunami Ready Recognition Programme?

Q 191. Forest Fire pose a threat not only to the forest wealth but also to the entire regime to fauna and flora disturbing the bio-diversity and the ecology and environment of a region. Discuss. Suggest the measures to enhance fire safety system in India.

Q 192. Discuss the causes, consequences, and mitigation strategies for man-made disasters, with reference to any two significant events in recent history.

Science & Technology

Q 193. How has India's pursuit of space exploration, ranging from the triumphant Mars mission to the ambitious objective of deploying a lunar rover, been instrumental in positioning the country as a prominent player in the field of space research?

Q 194. "Genetic scissors have taken the life sciences into a new epoch." In this light discuss the CRISPR gene editing technology and the concerns raised by it.

Q 195. Explaining India's first Manned Mission into Space, discuss how it will contribute to technological, economic and educational development of India.

Q 196. Why has the overall participation of women in scientific research been low in India, in spite of some notable individual achievements? What steps have been taken by the government in this regard?

Q 197. The Nano technology can become a major tool in controlling pollution but at the same time, can become a challenge too. Comment.

Q 198. Given the importance of floral diversity, explain the significance of the conservation of Plant Genetic Resources (PGR). Also, list down the initiatives taken up by India to conserve PGR.

Q 199. What are self-driving cars? Discuss some of the obstacles that autonomous vehicles must overcome before they can be widely used in India.

Q 200. NFTs are often called "Digital Birth Certificates". Explain the functioning of Non-fungible Tokens (NFT). Also, list some of the advantages and risks involved in widespread use of NFTs.

Q 201. Biotechnology is recognized as the sunrise sector- a key driver for contributing to India's USD 5 Trillion economy target by 2025. Examine.

Q 202. What are the advantages of thorium over other nuclear fuels? Explain the hurdles in the way of large-scale deployment of thorium-fuelled reactors in India.

Q 203. What are the advantages of hyper-loop technology as compared to high speed railways like Bullet trains? Does India need investments in such technologies?

Q 204. Neutrinos play a key role in many fundamental aspects of our lives. Elaborate on the significance and potential applications of Neutrinos. Also, highlight India's initiative in neutrino research.

Q 205. Due to its precise data collection and accuracy, LIDAR is one of the most sought after technologies in the world today". Discuss the significance of LIDAR technology for industrial, commercial, and scientific applications.

Q 206. The use of digital technology can play a transformational role in modernizing and organizing agricultural activities in India. Discuss.

Q 207. Geospatial technology will be crucial to drive the growth ambitions of the country". In this light, discuss the roadblocks in harnessing the full potential of India's geospatial sector and also comment on the recent policy efforts to de-regulate the sector.

Q 208. Robotics technology has potential to enhance our lives as it saves human efforts and energy. Elaborate. Also, explain the various robotics projects and challenges faced by India in optimum utilization of this technology.

Q 209. The applications of Unmanned Aerial Vehicle (UAVs) are not limited to the military world; the usage has been expanding rapidly in many fields. Elaborate. Also, highlight some of the measures taken by the government of India to regulate the usage of drones.

Q 210. Discuss the advantages and application of remote sensing satellites. Also, highlight some of the remote sensing satellites launched by India and the various projects facilitated through them

Q 211. Innovation is the need of time to achieve the target of Atmanirbhar Bharat. Discuss. What are the steps taken by the Government to build a conducive environment for Innovation in India?

Q 212. Critically analyze whether GM Agriculture could be India's answer to agrarian crisis and malnutrition.

Q 213. Discuss the various applications and ethical issues associated with Artificial intelligence (AI). Also, briefly explain some challenges of AI adoption in India.

Q 214. Highlighting the need and advantages of Intellectual property Rights (IPR), discuss various issues related to India's Intellectual property ecosystem.

Q 215. The Internet of Things (IoT) has emerged as a significant technological advancement with the potential to revolutionize various aspects of human life. Discuss the concept of IoT, its key features, and its applications in different sectors.

Q 216. Bringing out the various applications of drone technology, discuss how AI is revolutionizing this technology?

Q 217. What is India's National Supercomputing Mission? Analyse the performance of India in developing supercomputers while discussing their applications.

Q 218. What do you understand by generative artificial intelligence? Do you think disruptive technologies like generative artificial intelligence poses a threat to the labor force? Provide a suitable argument.

Q 219. Discuss why India needs to harvest Quantum Technology for strategic as well as economic development. Analyse the role of National quantum mission in achieving the foresaid objectives.

Q 220. Critically analyze the potential impact of 6G technology on India's digital infrastructure and economy, taking into consideration the Bharat 6G Vision document and the roles of various stakeholders such as the government, industry, and academia.

Q 221. Discuss the objectives of NASA's Artemis Mission. How will this Mission help prepare for human landing on Mars?

Q 222. Why is Gaganyaan mission significant for India? Discuss the features as well as challenges associated with the mission.

Q 223. Discuss the significance of India's remote sensing program in development and protection of the country.

Q 224. State the significance of private sector investment in growth of Indian space industry. Also mention the reasons why India's space program lacks private sector investment.

Q 225. Discuss how ISRO is gearing up For India's space programe. However, there are many opportunities and challenges in the new space age that needs to be addressed.

Q 226. State how geospatial technology has applications in almost every domain of the economy? Also discuss how the National geospatial policy, 2022 will ensure an Atmanirbhar economy?

Q 227. Why is James Webb Telescope considered to be a milestone in space exploration? Discuss how the mission will benefit the human race while stating the goals and objective of the mission?

Q 228. Briefly explain the Laser Interferometer Gravitational-Wave Observatory (LIGO). How will the establishment of LIGO-India contribute to advancing India's scientific capabilities?

Q 229. ISRO is gearing up for India's space programe. However, there are many opportunities and challenges in the new space age that needs to be addressed. Discuss.

Q 230. Mention the relevance of "one health approach" in today's world. Highlight the steps and initiatives taken in India to implement one health approach.

Q 231. Discuss how medical biotechnology is providing avenues for technological growth while saving lives. Highlight the reasons as to why India is considered to be a land for opportunities in the field of biotechnology.

Q 232. What are Trans fats? Discuss the reasons why Trans fats are considered harmful. Mention the initiatives taken by the government to combat trans fats in India.

Q 233. Discuss the role of Preparedness and Resilience for Emerging Threats (PRET) in improving pandemic preparedness. Mention how COVID-19 has served to be an eye opening event in this regard.

Q 234. Advancement in Space technology will help the defence sector in harnessing its unrealized potential. Discuss.

Q 235. Discuss the need for defence indigenization while highlighting the progress in the said arena. Also mention the initiatives taken by government to promote defence indigenization.

Q 236. Highlight the difference between genome editing and GM technology. Discuss the risks posed by gene editing to agriculture.

Q 237. Discuss the applications of nanotechnology while highlighting the risk the technology poses to the environment. Mention the key initiatives taken by the government for promotion of nanotechnology research and innovation.

Q 238. Indian biological data bank will reduce the dependency of Indian researchers and agencies on the western world. In the light of the above statement, discuss the significance of Indigenous data bank center.

Q 239. Analyse the role of IPR in encouraging innovation and rewarding entrepreneurs. Discuss the development of IPR regime over years in India.

Q 240. What is flex fuel? State the significance of flex fuel vehicle in green model of development. What are the challenges associated with the implementation of flex fuel vehicle infrastructure in India?

Q 241. What is flex fuel? State the significance of flex fuel vehicle in green model of development. What are the challenges associated with the implementation of flex fuel vehicle infrastructure in India?

Q 242. Why rare earth metals are strategically important? Do you think concentration of rare earth metals can prove to be disastrous during times of war and disturbances?

Q 243. The discovery of lithium deposits in India may have substantial effects on India's security as well as economic development. Analyze.

Internal security

Q 244. How has the recent outbreak of violence in Manipur, a region that had previously managed to recover from a deadly insurgency, heightened concerns and tension in the North East India?

Q 245. The Unlawful Activities Prevention Act (UAPA) is often described as a 'draconian' law that undermines the Fundamental Rights of citizens. In this regard, critically examine the need for such laws in India. Suggest measures to check its misuse.

Q 246. The paradigm shift in the nature of the security challenges facing the country lends urgency to the need for reforms in the country's intelligence apparatus. Evaluate.

Q 247. **"The prospect of non-State actors, including terrorist groups and their supporters, gaining access to and using weapons and materials of mass destruction (WMD) is a serious threat to international peace and security". In this context, critically evaluate the efforts made internationally to deter, detect, defeat, and respond to terrorist attempts to acquire or use WMDs.**

Q 248. **With evidence mounting of Pakistan providing tacit support to Taliban, evaluate the security threats that India faces with the new order in Afghanistan. Suggest measureson how India should deal with the situation.**

Q 249. **The traditional approach to border management, i.e. focussing only on manual border security, has become inadequate. Analyse the role of technology in managing India's border with an emphasis on Comprehensive Integrated Border Management System (CIBMS). Enlist the steps taken by the government on this front.**

Q 250. **While there are numerous benefits that accrue to communication through social media, it is not bereft of its inherent risks. In the light of the above discuss the security threats posed by social media and the challenges in monitoring such platforms.**

Q 251. **How does money laundering impact the economy of a nation? Discuss the key reforms ushered in the anti-money laundering legislations in India.**

Q 252. **In recent years, the rise in non-traditional threats has necessitated increased focus on coastal and offshore security. Critically analyze the measures taken by the government with respect to marine security.**

Q 253. **Explain the nature and intent of Pegasus spyware. What impact does such incidents have on Cyber Surveillance?**

Q 254. **The nexus between terrorism and organized crime presents a major challenge for India. Analyse the linkages of organized crime to terror funding. Also, briefly explain the Government of India's approach to counter the challenges posed by terror funding.**

Q 255. **"Cyber security risks are global. Hence, a global coordinated and collaborative approach is needed to deal with this menace". Discuss how Paris call and other international mechanisms will protect and strengthen the world of Cyberspace and Cyber security from malicious activities online.**

Q 256. **India has been suffering through internal security menace since the past few decades but the threat still exists in multiple aspects. Thus a comprehensive internal security doctrine could be a panacea to the problem. Critically analyze this aspect.**

Q 257. **AFSPA has often been criticized as a "draconian Act" for the unbridled power it gives to the armed forces. Discuss the background, major concerns and recommendations of several committees associated with it.**

Q 258. **Examine the various challenges emanating across the India-Bangladesh border. Explain the need for the project BOLD-QIT (Border Electronically Dominated QRT Interception Technique) along India-Bangladesh border.**

Q 259. **Discuss the factors responsible for the spread of extremism due to enhanced technology and connectivity. Briefly explain the Government of India's approach to counter such challenges.**

Q 260. **Examine India's vulnerabilities due to cyber attacks to its Critical Information Infrastructure (CII). Do you think the set up of "National Critical Information Infrastructure Protection Centre" will protect the nation's Critical Information Infrastructure?**

Q 261. **Poor security along the India-Myanmar border poses a challenge to India's security. In this context, elucidate the challenges and strategies for effective border management.**

Q 262. **In ensuring the security of India, the paramilitary forces have played a vital role in almost all the critical matters of internal security and border security. Elaborate. Also, explain some of the issues faced by these forces and suggest measures.**

Q 263. **There is also growing concerns in cyber threats to critical infrastructure. Evaluate the preparedness of India in dealing with these threats.**

Q 264. **Discuss the need for interoperable criminal justice system in India. What are the challenges in deploying this technology in policing?**

Q 265. What is Crime and Criminal Tracking Network System (CCTNS)? How will CCTNS help in creating effective policing in India?

Q 266. There has been a frequent change in anti-terror laws in India. Explain the reasons behind such changes and highlight the measures to be undertaken for effective implementation of the present anti-terror laws.

Q 267. The scourge of terrorism is a grave challenge to national security. What solutions do you suggest to curb this growing menace?

Q 268. Analyse the role of the internet and social media in radicalisation. Also, suggest measures required to be taken to eradicate the menace of radicalisation in India.

Q 269. Why do Indian Coasts remain vulnerable to seaborne threats? Examine the mechanism available for combating maritime security in India.

Q 270. Analyze the causes and consequences of tribal conflict in Northeast India, and suggest measures to promote peace and harmony in the region.

Q 271. Discuss the relevance of Prevention of Money Laundering Act, 2002 in the context of virtual assets. Suggest measure to be taken to combat the challenges arising from crypto currency.

Q 272. Social Media, with all its benefits and the potential, is a boon to our world, however misuse or irresponsible usage can have negative effects on Internal security. Discuss highlighting the challenges in monitoring social media.

Q 273. In ensuring the security of India, the central armed police forces have played a vital role in almost all the critical matters of internal security. Elaborate. Suggest steps to be taken to upgrade these forces to face new forms of challenges.

Q 274. Discuss the challenges of India's border management? How smart fencing helps in monitoring security situation in border areas?

Q 275. Why is India vulnerable to narcotic drug trafficking? Suggest the ways through which menace of drug trafficking could be combated.