GS-III EXPLANATIONS

[Note: Answers can be extracted from these "Model Explanations" deliberately made comprehensive for conceptual understanding and maximum coverage of topics. Use diagrams, flowcharts, and keywords to represent answers within the stipulated number of words.]

1. Why is Public Private Partnership (PPP) required in infrastructural projects? Examine the role of PPP model in the redevelopment of Railway Stations in India. 10

United Nations defines public-private partnerships as "innovative methods used by the public sector to contract with the private sector who bring their capital and their ability to deliver projects on time and to budget, while the public sector retains the responsibility to provide these services to the public in a way that benefits the public and delivers economic development and improvement in the quality of life."

The advantage of a PPP is that the management skills and financial acumen of private businesses could create better value for money for taxpayers when proper cooperative arrangements between the public and private sectors are used.

Importance of Public Private Partnership (PPP) in infrastructural projects

The creation of durable and high-quality infrastructure is a prerequisite for rapid economic development and requires sustained investment supported well by **technological innovation, a skilled workforce and excellent project management**. For governments alone to bring together all these elements is not always possible. PPPs, while bringing in private capital and experience, also involve the transfer of valuable public assets as well as foregoing future revenues in the form of concessions.

PPPs provide a way of bringing needed additional investment to public infrastructure and also a **mechanism for improving infrastructure planning, implementation, operation and maintenance.**

There are several reasons for the growing collaboration with the private sector in developing and providing infrastructure services, which include:

- Increased efficiency in project delivery, and operation and management;
- Availability of additional resources to meet the growing needs of investment in the sector; and
- Access to advanced technology (both hardware and software).

Properly executed planning and development of a project also allows better screening of options, and helps in deciding appropriate project structure and choice of technology considering cost over the whole life cycle of the project.

PPPs are important for infrastructure development as:

They can enhance the supply of much-needed infrastructure services. The Indian Railways is just an example of realizing the benefits of PPP to accelerate infrastructural development. Fostering innovation and incorporating learning from across the world will be the key to unlocking its plethora of benefits and realizing the dream of the 5 trillion dollar economy by 2024.

- They provide relief from the burden of the costs of design and construction.
- They promise better project design, choice of technology, construction, operation and service delivery.
- **Early Completion Bonus**: To improve efficiency, private companies are motivated through bonus if they complete the project before time.
- **Cut Downs Tax**: The cost-efficient infrastructure projects help the government to save funds and thus, provides for a reduction in the tax rates.

- **Project Completion Efficiency**: When the standard time for completing a project is estimated, its execution and fulfilment become more competent.
- **Project Feasibility**: As the project's risk involvement and practical implementation are well-analyzed, the chances of failure reduce remarkably.
- **Superior Quality Standards**: PPP approach initiates benchmarking for the desired quality of the project and ensures the same during the project's life cycle.
- **Excellent Infrastructure Solutions**: This has been possible since, proficient private companies work in collaboration with the government, where each of them contributes their best.
- **Better Return on Investment**: The ROI of the P3 infrastructure projects might be reasonably high in the long run. The reason being it has been monitored and accomplished by both parties together.
- **Transfer of Risk**: The government hands over the associated risk along with the project to private firms who have relevant experience and knowledge in the area.
- **Reduces Budget Deficits**: In the PPP approach, the private companies determine the cost and perform **capital budgeting** to avoid any shortage of funds in the future.
- **Ensures Efficient Government Investment**: Since P3 initially let private companies invest their funds in infrastructure projects, the government can utilize its capital for socio-economic welfare.

India has a huge infrastructure need *and it is associated with financing. A new World Bank report estimates that India will need to invest $840 billion over the next 15 years—or an average of $55 billion per annum—into urban infrastructure if it is to effectively meet the needs of its fast-growing urban population. So, PPP can assist to meet the need and financing gap. Only 5 percent of the infrastructure needs of Indian cities are currently being financed through private sources. Scaling up public-private partnerships, improving the credibility of the regulatory regime, and introducing second-generation infrastructure projects can promote Infrastructure development in India that is critical for improving India's manufacturing competitiveness and achieving higher growth.*

Role of PPP in Railways

Indian Railways has been the backbone of India's mass public transportation network for decades. It is an integral component of infrastructural development in the country. India boasts among the largest rail systems under single management in the world.

But there are numberless problems in the path of steady growth:

- Old Track and Poor State of Rolling Stock.
- Railway Accidents.
- Lack of modern management.
- The discrepancy between freight charges and passenger fares seem to distort the Railways' performance.
- Inadequate Investment.
- Indian Railways spends heavily on revenue expenditure - there is little left for capital expenditure.
- Missing Targets on electrification, track renewals, bridge works, and doubling of tracks.
- Stranded projects.
- Inordinate delays keep railroads from being preferred despite being cheaper (China ferries over 3x freight for a similar route network).

The recent opening up of public-private partnership (PPP) opportunities by Indian Railways is a clear indicator that a reform-driven agenda is being implemented. It is a controlled foray into PPP, where **market forces will help enhance the quality of services and in-transit experience, without the Government relinquishing control over public safety and security.**

The purpose of PPP in certain routes is to facilitate the **introduction of new technology, provide high-level service and reduce travel time.** With the imminent commissioning of Dedicated Freight Corridors and other infrastructure development, it is likely there would be the availability of additional paths for operation.

Rail Land Development Authority is spearheading the **redevelopment of 60 railway stations across India on a PPP Model.** The station redevelopment comprises two components- **i) Mandatory station redevelopment ii) Station Estate (Commercial) development.**
The mandatory station redevelopment will make travel smooth and hassle-free without diluting the historical significance of these stations whereas commercial development will enable developers to tap several revenue streams to ensure the viability of the entire project. These **redeveloped stations will be endowed with state-of-the-art amenities** such as segregation of arrival and departure, excellent road connectivity with multi-modal transport integration, and security and surveillance systems to enhance the travel experience. It **will augment the tourism potential, boost real estate, encourage employment generation and lead to a cascading effect on the local economy.**

Re-Development of Habibganj Station has been undertaken through Public Private Partnership (PPP). In addition, Request for Qualification (RFQ) have been invited for four more stations i.e. Nagpur, Gwalior, Amritsar and Sabarmati Stations on PPP mode.
In 2020, the Ministry of Railways invited Request for Qualifications (RFQ) for private participation to operate passenger train services in over 109 routes through the introduction of 151 modern trains carrying a minimum of 16 coaches.

India is redeveloping the 4 Railway Stations at Gwalior, Nagpur, Amritsar and Sabarmati by PPP mode for which private sector shall be responsible for construction, redevelopment and maintenance. Moreover, India is implementing to run **150 private trains on the Indian Railways network and to 'actively pursue' the Mumbai-Ahmedabad High-Speed project funded by Japan International Cooperation Agency**. It even planned to develop long due Bengaluru suburban rail network. Also, working on other issues like **Solar Power Plants along with railways tracks, Wi-Fi, introducing Tejas Express semi-high-speed network.**

Ministry of Railways (MoR) has taken initiatives in various areas viz. **network expansion, setting up of locomotive factories, induction of railway wagons, Station Re-Development, etc. to attract private investment and participation.**

The redeveloped stations **would witness vertical growth with the creation of overhead spaces on the stations** which will have world-class facilities including waiting lounges and food courts, besides amusement facilities for children. The renovated stations must also incorporate green technologies and work with other means of transportation, such as the bus and metro.

Wrapping it up

The Indian Railways is just **an example of realizing the benefits of PPP to accelerate infrastructural development**. Fostering innovation and incorporating learning from across the world will be the key to unlocking its plethora of benefits and realizing the dream of the 5 trillion-dollar economy.

Q2. Is inclusive growth possible under a market economy? State the significance of financial inclusion in achieving economic growth in India. 10

Market Economy and Inclusive Growth

Inclusive growth is **economic growth that is distributed fairly across society and creates opportunities for all**. The concept of inclusive growth has become central to economic development due to rising economic inequality and its effects on human well-being and prosperity. But the economy is an open market economy which, as Karl Marx famously wrote, functions essentially on ever more concentration of capital in fewer and fewer hands. There is a need within the market economy to reduce real wages to withstand competition and this leads to the ever-more

marginalization of labour. Critiques argue that market economy leads to concentration of capital on one hand and systematically excludes the labour force from participating in the economy. Hence, the **universal paradox is: Can market economy become inclusive?**

A market economy is an economic system where two forces, known as supply and demand, direct the production of goods and services. Market economies are not controlled by a central authority (like a government) and are instead based on voluntary exchange.

Keeping this in cognizance **India rightly adopted the Mixed Economy** where both the private sector and public sector function together. In mixed economic system, the state makes efforts to provide maximum welfare to workers and other citizens. The government makes provision for the employees for housing, education, minimum wages, good working conditions, etc. Food security to all Indians is guaranteed under the National Food Security Act, 2013 where the government provides food grains to people at a very subsidized rate.

Despite being a Welfare State and taking innumerable efforts inequality prevails in India.

Inequality in India

- The top 10% of the Indian population holds 77% of the total national wealth- Oxfam.
- In 2021, the total wealth of 100 of India's wealthiest people reached a record high of Rs 57.3 Lakh Crore ($ 775 billion). In the same year, **the bottom 50% of the population accounted for only 6% of national wealth.**

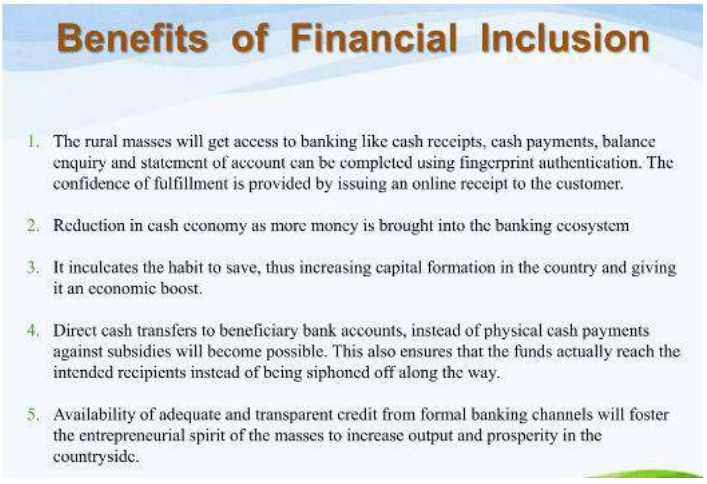
Let's look at the numbers

1%	The top 10% of the Indian population holds 77% of the total national wealth. 73% of the wealth generated in 2017 went to the richest 1%, while 67 million Indians who comprise the poorest half of the population saw only a 1% increase in their wealth.
70	There are 119 billionaires in India. Their number has increased from only 9 in 2000 to 101 in 2017. Between 2018 and 2022, India is estimated to produce 70 new millionaires every day.
10x	Billionaires' fortunes increased by almost 10 times over a decade and their total wealth is higher than the entire Union budget of India for the fiscal year 2018-19, which was at INR 24422 billion.
63 M	Many ordinary Indians are not able to access the health care they need. 63 million of them are pushed into poverty because of healthcare costs every year - almost two people every second.
941 yrs	It would take 941 years for a minimum wage worker in rural India to earn what the top paid executive at a leading Indian garment company earns in a year.

- Oxfam described inequality as economic violence, adding that lack of access to health care, gender-based violence, hunger and climate change kill 21,000 people each day.

Financial Inclusion for Economic Growth

- Financial Inclusion, broadly defined, refers to universal access to a wide range of financial services at a reasonable cost.
- The financial services not only include regular bank services but insurance, pension, saving, and accessibility to other financial products, which has a positive role in economic growth.



- Findings show that financial inclusion of supply side has only a positive impact on economic growth. This finding is also supported by Chatterjee (2020), who noted that financial inclusion helps inclusive growth by mobilizing savings and investment in the production sector.
- Financial inclusion improves the economic activity in society which in turn leads to fostering economic growth. This result is supported by Allen et al. (2014), who suggested that financial inclusion can affect economic growth positively by reducing income inequality and poverty.

Financial Inclusion Schemes in India

- The Government of India has been introducing several exclusive schemes for the purpose of financial inclusion. These schemes intend to provide social security to the less fortunate sections of the society.
  - Pradhan Mantri Jan Dhan Yojana (PMJDY)
  - Atal Pension Yojana (APY)
  - Pradhan Mantri Vaya Vandana Yojana (PMVVY)
  - Stand Up India Scheme
  - Pradhan Mantri Mudra Yojana (PMMY)
  - Pradhan Mantri Suraksha Bima Yojana (PMSBY)
  - Sukanya Samriddhi Yojana
  - Jeevan Suraksha Bandhan Yojana
  - Credit Enhancement Guarantee Scheme (CEGS) for Scheduled Castes (SCs)
  - Venture Capital Fund for Scheduled Castes under the Social Sector Initiatives
  - Varishtha Pension Bima Yojana (VPBY)

Challenges Facing Financial Inclusion

The biggest challenge facing financial inclusion is the lack of robust technology infrastructure. Further, lack of awareness and trust in digital payments enhances the problem. While many people from rural areas now have access to mobile devices, they still struggle for affordable and reliable internet connectivity options. The government is taking significant steps to address this challenge, for example, it aims to connect, 50,000 gram panchayats with rural broadband under BharatNet.

Additionally, issues like the large size of the unbanked population spread across vast geographies, low skills, unfamiliarity with technology, limited access to credit, high loan default rates and lack of financial literacy enhance the problem. The challenges are not limited to the demand side or rural population alone. Even the financial institutions are reluctant to serve small value and unprofitable customers and therefore, perceive inclusion as an obligation rather than an opportunity.

The growing number of cyber security issues further dissuades the rural population from being a part of the digital economy. Though the government has taken many initiatives to overcome the challenges, there are many loopholes in the system and a lot more needs to be done. For example, beneficiaries of Direct Benefit Transfers (DBT) hardly have any knowledge about the process like what to do when their payments get rejected. Corruption, inadequate rural banking infrastructure and lack of accountability are also some of the many challenges discussed so far.

What can be done?

Substantial **investments in physical and social infrastructure** as well as in need-based products, **financial literacy along with innovative delivery mechanism** is necessary to ensure inclusive growth of the economy. Further, financial institutions need to focus more on tailor-made services and deliver an effective mechanism. Measures need to be initiated to **make credit disbursement more flexible** and attract the masses that are used to informal sources of credit.

Eliminating multiple layers of governance, leveraging modern technology, better participatory role by benefactors and easing procedures can help in building a better delivery infrastructure that provides efficiency and security. An affordable and accessible solution, based on mobile technology can be a good platform to deliver financial services. **Investing in audit studies,** reducing the risk of agent misconduct and conducting risk management assessments are some of the popular and effective strategies that the government can adopt. There is a strong need to **restructure the financial system** and these measures if effectively implemented can accelerate the process of inclusive growth.

Financial inclusion is a long-term goal and a progressive initiative, which will evolve. Also, there is **no one-size-fits-all solution to ensure inclusive growth**. The short-term opportunities should be leveraged to accelerate the process as opportunities, as well as challenges, provide insights regarding innovative ways of economic value addition. It is required that all stakeholders, including the regulators, policymakers, industry bodies and service providers focus on a sustainable services delivery model while developing policies or initiatives for inclusive growth.

Some Suggestions

Fix credibility

To address the issue of credibility of BCs, banks could take advantage of a wide network of post offices and fair price shops and provide banking counters for the unbanked population. Even multi-language ATMs with audio-video services could be considered. On their part, the banks could pay a 'rent fee' to India Post and fair price shops, for use of their facilities/premises. To address the high attrition rate, ascribed to low commission/earnings, banks could consider nominating housewives, and owners of fair price shops, retired people and people with limited disabilities to become BCs to supplement their regular income. To attract and retain people in the business of BCs, provision for higher commission by routing more financial services through BCs can be considered as well as providing them with respectable designation and identification cards, with incentivised structured benefits in terms of bonus or promotion or absorption in mainstream banking.

Offer diverse products to suit different sections

India being a diverse country with unique regional and occupational characteristics, and following different cropping pattern and income streams, it is necessary to have diverse products for its unbanked population. Thus, there is a need to have granular schemes, preferably different schemes for rural areas and urban areas. Further, distinct schemes can be made on the basis of nature of employment of people. For example, daily wage laborers can be allowed to make tiny deposits on daily basis.

Innovations backed by financial literacy

To address the issue of seamless connectivity, upgrading the hand-held device so that it contains basic information in an offline mode and exploring satellite connectivity technology could be helpful. Technological innovations like integrated machine that has functionality of cash withdrawal and deposit and biometric identification of users, voice commands and narration for all facilities in multi-language format could help increase banking penetration.

The most important aspect of financial inclusion is financial literacy. There is lack of awareness, especially amongst people, both rural and urban about various schemes of FIs. To increase awareness and interest in products offered under various schemes of FIs, increase in advertisement in local language, on radio and television, and in print media, with local icons and artistes as brand ambassadors of the campaign, could help in building public confidence. In this context, role of mobile phones and reach of mobile banking is immensely promising.

Awareness of mobile banking is significantly low and there is reluctance, especially amongst rural people, probably because of low technological and financial literacy. In addition, there were practically no efforts, an observation based on our survey and consultations with unbanked people and commercial bankers, from either the bank staff or BCs in promoting mobile banking services, probably because of a conflict of interest, as increased adoption of the same could reduce commission of the BC. The mobile phones could be used for targeted advertisement campaigns, devised for mass media and locally effective media. Government agencies could actively participate in these campaigns, communicating mobile banking to be user friendly and safe.

Also, common consumer knowledge in rural areas about dialing to a toll-free number should be leveraged to provide introduction to financial literacy as well as instructing people on steps to use mobile banking. The banks should educate their staff and BCs about latest developments in mobile banking, and mandate them to promote these facilities during financial literacy campaigns in rural areas. The banks could also revise their commission schemes, incentivizing BCs in increasing mobile banking registrations in their respective territories. The government could consider commissioning an audit system for banks, telecom operators and handset manufacturers to certify security levels of

mobile banking services, across various channels, so that banks and telecom operators can then favorably advertise these ratings to improve their customer base.

At present, post offices and commercial banks offer opportunity for saving bank accounts. This leads to confusion as well as weaning away demand for banking facilities from commercial banks. Once banking extension counters are provided at post offices, then fresh opening of accounts in existing postal banking schemes can be discontinued, with a forward-looking approach for banks to spearhead the financial inclusion process, through deposit mobilization. Post offices held an amount of Rs 6,03,170 crore under postal banking schemes in 2013 which if released to banks through BCs will probably provide volumes to commercial banking and make FI commercially attractive for reluctant bankers.

Local bodies' role

Finally, to achieve a 100 per cent success, there is need to seek help from local governments, both in villages and cities. The panchayati raj institutions, municipalities and city councils can help not only in identifying but encourage the unbanked to start operating in formal banking channels. The new government, with massive mandate and new hope can achieve this and set a blazing success story, Made in India, for rest of the world.

Conclusion

By targeting bottom of the pyramid, **financial inclusion will not only help promote financial stability but also broaden the country's socioeconomic growth.** This will also enable the participating institutions such as banks, NBFCs and insurance companies to improve their customer base and expand into the rural sector. By leveraging technology and support through proper grievance redressal systems, financial inclusion can reduce income inequality and serve the underprivileged and the underserved.

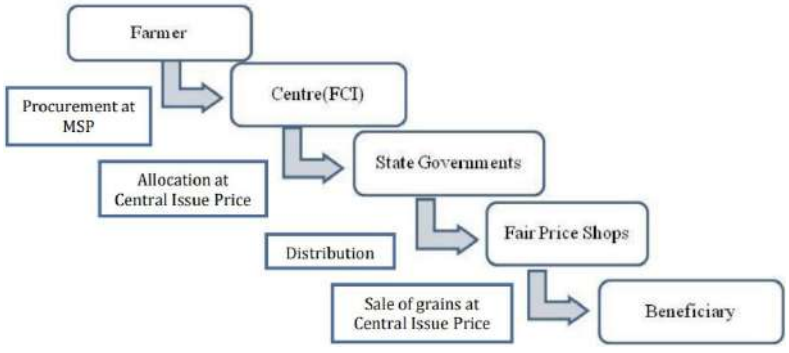
Owing to 24% improvement in financial inclusion (from FY17 to FY21) and sharp focus of the policy makers, the system is likely to become more efficient going forward. Based on this, **financial inclusion can be a lethal weapon in combatting poverty as well as spurring economic growth across the country.** Therefore, the improvement in financial inclusion is an important step towards a better India, an inclusive India.

Q3. What are the major challenges of Public Distribution System (PDS) in India? How can it be made effective and transparent? 10

PDS

Definition: Public distribution system is a government-sponsored chain of shops entrusted with the work of distributing basic food and non-food commodities to the needy sections of the society at very cheap prices.

Wheat, rice, kerosene, sugar, etc. are a few major commodities distributed by the public distribution system.



Description: The Public Distribution System (PDS) is an Indian food security system that was established by the Government of India under the Ministry of Consumer Affairs, Food and Public Distribution to distribute food and non-food items to India's poor at subsidised rates. A statutory body created by the Food Corporation of India Act of 1964, the FCI was established for the "purchase, storage, movement, transport, distribution and sale of foodgrains and other foodstuffs"

Table 1: Timeline of PDS: 1930s to present

Evolution of PDS	Timeline	Details
PDS	1940s	Launched as general entitlement scheme
TPDS	1997	PDS was revamped to target poor households
Antyodaya Anna Yojana	2000	Scheme launched to target the 'poorest of the poor'
PDS Control Order	2001	Government notified this Order to administer TPDS
PUCL *vs.* Union of India	2001	Ongoing case in Supreme Court contending that "right to food" is a fundamental right
National Food Security Act	2013	Act to provide legal right to food to the poor

The system is often blamed for its inefficiency and rural-urban bias. It has not been able to fulfil the objective for which it was formed. Moreover, it has frequently been criticized for instances of corruption and black marketing.

Issues in implementation of PDS

Identification of beneficiaries

Studies have shown that targeting mechanisms such as TPDS are prone to large inclusion and exclusion errors. This implies that entitled beneficiaries are not getting food grains while those that are ineligible are getting undue benefits. An expert group estimated that about 61% of the eligible population was excluded from the BPL list while 25% of non-poor households were included in the BPL list.

Production vs Procurement

Under the National Food Security Act, the centre procures millions of tonnes of food grains consistently every year to deliver rights under the law. Procurement of this quantity of food grains might be easier in years when production is high. However, in years of drought and domestic shortfall, India will have to resort to large-scale imports of rice and wheat. This will exert significant upward pressure on prices. This further raises questions regarding the Government's ability to procure grains without affecting open market prices and adversely impacting the food subsidy bill.

Allocation and offtake of food grain

The centre allocates food grains to states on the basis of the identified BPL population, the availability of food grains stocks, and the quantity of food grains lifted by states for distribution under TPDS. The allocation to a state changes every year on the basis of the state's average consumption over the last three years.

However, according to the CACP, consumption under TPDS was only 60% of the total offtake. This implies that nearly 40% of offtake is being leaked into the open market.

Rising food subsidy

The food subsidy has increased over the years, having more than quadrupled from Rs 21,200 crore in 2002-03 to Rs 2.2-lakh crore in 2019-2020. In 2021-22, **Rs 2.03 lakh crore has been allocated for food subsidy to FCI**.

The factors that contribute to the rising food subsidy are:

1. record procurements in recent years, as discussed above,
2. increasing costs of buying (at MSP) and handling food grains, and
- a stagnant CIP

Imbalances in the availability of storage capacity across states

There is an imbalance in the availability of storage capacity across regions. On the one hand, there is a shortage of space in consuming states, such as Rajasthan and Maharashtra, and on the other hand, 64 percent of the total storage capacity is concentrated in states undertaking large procurement such as Punjab, Haryana, Andhra Pradesh, Uttar Pradesh and Chhattisgarh.

Maximum buffer norms not specified:

The minimum buffer norms prescribed by the government do not clearly delineate individual elements of food security (e.g., emergency, price stabilization, food security reserve, and TPDS) within the minimum buffer stock. The existing norms also do not specify the maximum stock that should be maintained in the central pool for each of the above components.

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Low utilisation of existing capacity in various states/UTs:

CAG audit observed that despite storage constraints in FCI, utilization of existing storage capacity in various states/UTs is abysmal.

Supreme Court order on rotting of food grains in storage

In August 2010, in the ongoing case of PUCL vs. Union of India, the Supreme Court found that food grains were rotting due to inadequate storage. It directed the central government to adopt long and short-term measures to store and preserve procured food grain, and prevent rotting, including:

- constructing adequate FCI storage facilities in each state and division,
- increasing allocation to BPL families,
- opening FPSs for all days in the month, and
- Distributing food grains to beneficiaries at low or no costs.

Leakage of food grains

TPDS suffers from large leakages of food grains during transportation to and from ration shops into the open market. In an evaluation of TPDS, the Planning Commission found 36% leakage of PDS rice and wheat at the all-India level.

Issue prices and politics

Central Issue Price (CIP), has remained at Rs. 2 per kg for wheat and Rs. 3 per kg for rice for years, though the NFSA, even in 2013, envisaged a price revision after three years.

What makes the subject more complex is the variation in the retail issue prices of rice and wheat, from nil in States such as Karnataka and West Bengal for Priority Households (PHH) and Antyodaya Anna Yojana (AAY) ration card holders, Rs. 1 in Odisha for both categories of beneficiaries to Rs. 3 and Rs. 2 in Bihar for the two categories.

The Centre stated that “the economic cost of food management in view of rising commitment” towards food security, does not want the NFSA norms to be disturbed.

But, a mere increase in the CIPs of rice and wheat without a corresponding rise in the issue prices by the State governments would only increase the burden of States, which are even otherwise reeling under the problem of a resource crunch.

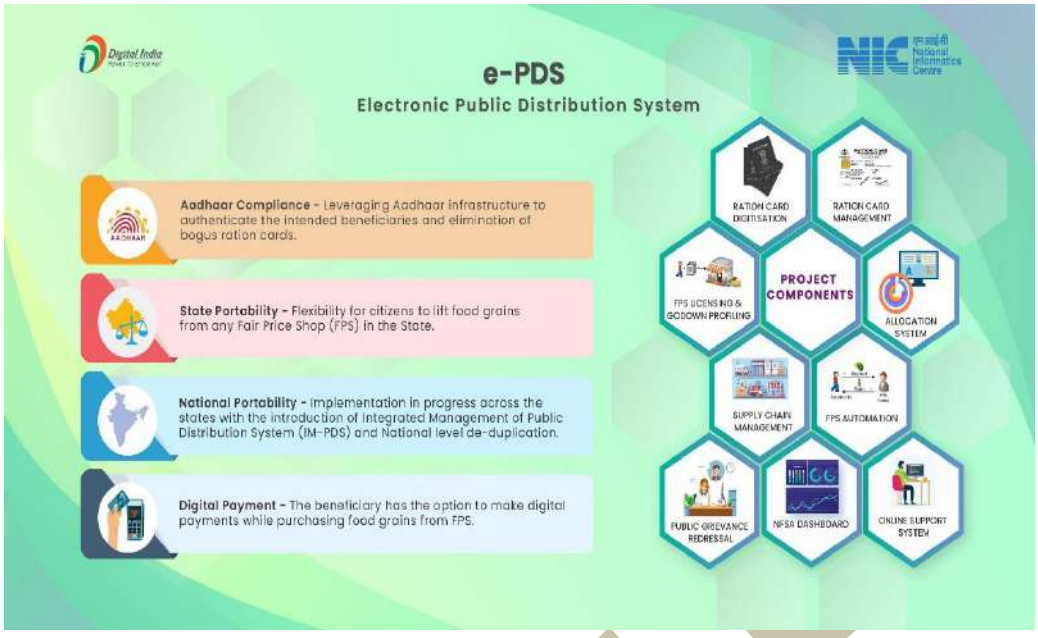
Urban Bias

PDS is also criticised for having an urban bias, despite having a higher quota for rural areas (75% coverage for rural and 50% for urban areas).

Reforms undertaken by certain states

Technology-based

Type of reform	Benefits of reform
Digitisation of ration cards	▪ Allows for online entry and verification of beneficiary data ▪ Online storing of monthly entitlement of beneficiaries, number of dependants, offtake of food grains by beneficiaries from FPS, etc.
Computerised allocation to FPS	▪ Computerises FPS allocation, declaration of stock balance, web-based truck challans, etc. ▪ Allows for quick and efficient tracking of transactions
Issue of smart cards in place of ration cards	▪ Secure electronic devices used to store beneficiary data ▪ Stores data such as name, address, biometrics, BPL/APL category and monthly entitlement of beneficiaries and family members ▪ Prevents counterfeiting
Use of GPS technology	▪ Use of Global Positioning System (GPS) technology to track movement of trucks carrying food grains from state depots to FPS
SMS based monitoring	▪ Allows monitoring by citizens so they can register their mobile numbers and send/receive SMS alerts during dispatch and arrival of TPDS commodities
Use of web-based citizens' portal	▪ Publicises grievance redressal machinery, such as toll free number for call centres to register complaints or suggestions



Linkage with Aadhaar and Digitalization

According to a UIDAI paper by the Planning Commission, integration with Adhaar as has been done would help eliminate duplicate and fake beneficiaries and make identification for entitlements more effective.

Way Ahead

Universal TPDS

There are some alternatives to TPDS, which address some problems during implementation. Tamil Nadu implements a Universal rather than a Targeted PDS.
Experts have noted that PDS could be replaced with cash transfers or food coupons.

Case study: Universal PDS in Tamil Nadu

Non-classification of beneficiaries - Subsidised PDS commodities are distributed to all residents without classifying them into different categories. According to **the Justice Wadhwa Committee Report**, non-classification helps the state avoid errors of exclusion of eligible and vulnerable families. However, TN identifies AAY beneficiaries. **Commodities provided under universal PDS -** Rice is distributed at the price of Re 1/ kg to everyone, lower than the central issue price. Families are not given 35 kg as mandated by the central government; rice cardholders get anywhere between 12-20 kg rice depending on the number of individuals in their family.
Groups involved in the distribution of food grains - No private trader is engaged in the PDS activity. Ration shops are mainly run by the cooperative societies and the Tamil Nadu Civil Supplies Corporation, the FCI counterpart in the state.

Cash Transfers

The National Food Security Act, 2013 includes cash transfers and food coupons as possible alternative mechanisms to the PDS. Beneficiaries would be given either cash or coupons by the state government, which they can exchange for food grains. Such programmes provide cash directly to a target group – usually poor households.

Potential advantages of these programs include:

1. Reduced administrative costs,
2. Expanded choices for beneficiaries, and
3. Competitive pricing among grocery stores.

Downsides:

- Cash transfers may expose recipients to price fluctuation if they are not frequently adjusted for inflation.
- Such programs also do not address the issue of the inclusion of ineligible beneficiaries and the exclusion of eligible ones.
- Additionally, since cash transfers include the transfer of money directly to the beneficiary, poor access to banks and post offices in some areas may reduce their effectiveness.

Food coupons

Food coupons are another alternative to PDS. Beneficiaries are given coupons in lieu of money, which can be used to buy food grains from any grocery store. Under this system, grains will not be given at a subsidized rate to the PDS stores. Instead, beneficiaries will use the food coupons to purchase food grains from retailers (which could be PDS stores). Retailers take these coupons to the local bank and are reimbursed with money. According to the Economic Survey 2009-10 reports, such a system will reduce administrative costs. Food coupons also decrease the scope for corruption since the store owner gets the same price from all buyers and has no incentive to turn the poor buyers away. Moreover, BPL customers have more choice; they can avoid stores that try to sell them poor-quality grain.

Issues

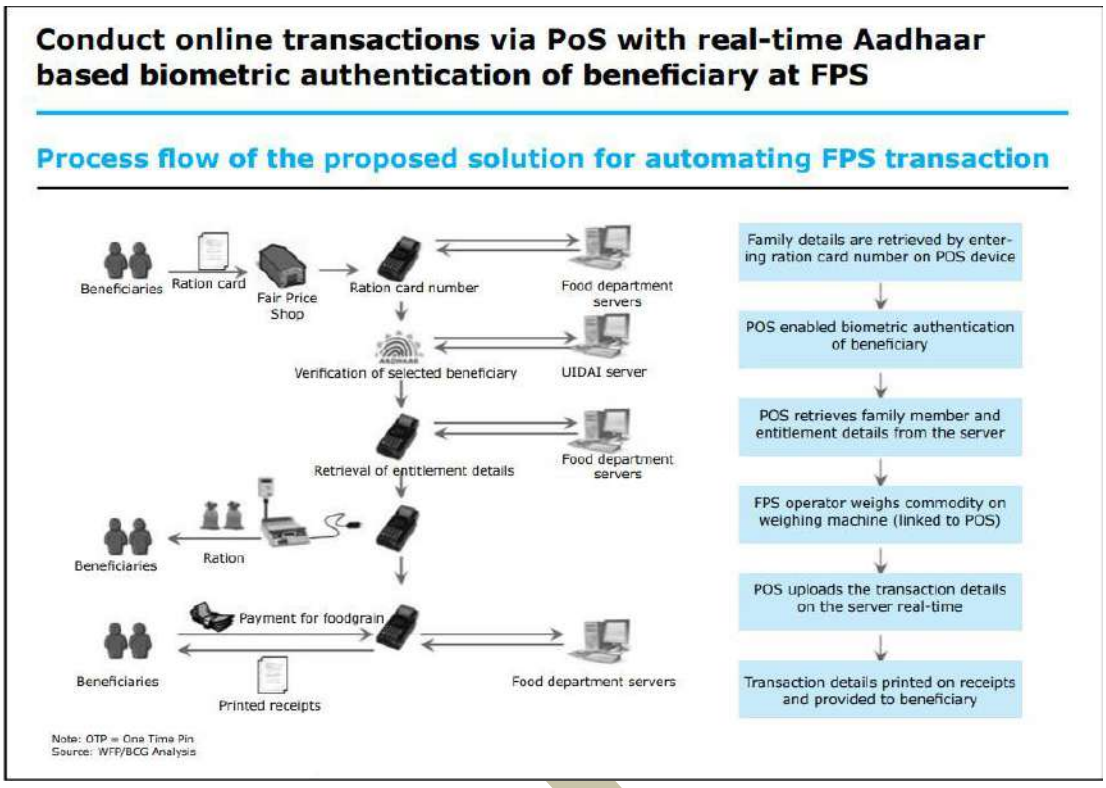
Some problems could exist while designing such a system. Food coupons can be counterfeited. Regular delivery of food coupons to the intended beneficiaries could also pose logistical challenges; there is a need to ensure the timely reimbursement of subsidy to the participating retailers.

PDS vs Cash Transfer

Table 15: Advantages and disadvantages of PDS and other delivery mechanisms[31]

Mechanism	Advantages	Disadvantages
PDS	Insulates beneficiaries from inflation and price volatility Ensures entitlement is used for food grains only Well-developed network of FPS ensures access to food grains even in remote areas	Low offtake of food grains from each household High leakage and diversion of subsidised food grain Adulteration of food grain Lack of viability of FPS due to low margins
Cash transfers	Cash in the hands of poor increases their choices Cash may relieve financial constraints faced by the poor, make it possible to form thrift societies and access credit Administrative costs of cash transfer programmes may be significantly lesser than that of other schemes Potential for making electronic transfer	Cash can be used to buy non-food items May expose recipients to price volatility and inflation There is poor access to banks and post offices in some areas
Food coupons	Household is given the freedom to choose where it buys food Increases incentive for competitive prices and assured quality of food grains among PDS stores Ration shops get full price for food grains from the poor; no incentive to turn the poor away	Food coupons are not indexed for inflation; may expose recipients to inflation Difficult to administer; there have known to be delays in issuing food coupons and reimbursing shops

Strengthen Aadhaar Linkage



Give Up Option

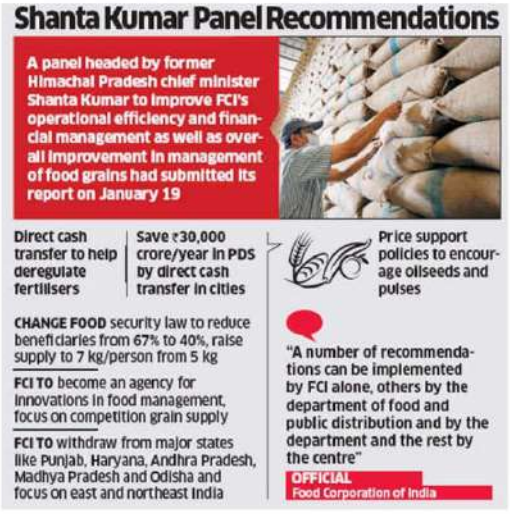
It should revisit NFSA norms and coverage. An official committee in January 2015 called for decreasing the quantum of coverage under the law, from the present 67% to around 40%. For all ration cardholders drawing food grains, a "give-up" option, as done in the case of cooking gas cylinders, can be made available.

Even though States have been allowed to frame criteria for the identification of PHH cardholders, the Centre can nudge them into pruning the number of such beneficiaries.

Slab System

As for the prices, the existing arrangement of flat rates should be replaced with a slab system. Barring the needy, other beneficiaries can be made to pay a little more for a higher quantum of food grains.

The rates at which these beneficiaries have to be charged can be arrived at by the Centre and the States through consultations.



Effective Monitoring

The Department of Food in each state should open a special cell on grievance redressal and appoint a grievance redressal officer as the nodal person. Gram panchayat members should be made aware of their role in the PDS in states like Karnataka. Such awareness may be increased through the involvement of civil society and local NGOs.

The number of inspections and sample analysis should be increased and strict action should be taken against the offenders

Address Leakage issue

Collecting biometric information on all members of a cardholder's family (head of the family and other members of the household) or of all cardholders where the entitlement is on an individual basis, linking it with their Aadhar number and storing it in an electronic weighing machine may solve the problem. The introduction of an SMS alert at the beneficiary level is an important measure to increase awareness.

Doorstep Delivery

Poor people, most of whom are daily wagers, have to give up their day's work for taking ration (from fair price shops). Doorstep delivery of ration could be explored.

Improve Storage

FCI should make vigorous efforts in this regard to minimise the storage losses of foodgrains to prevent the food subsidy from rising further.

Parliamentary Committee has recommended that work for phasing out of covered and plinth (CAP) storage capacity be taken up expeditiously to minimise storage losses.

Prompt Grievance Redressal Mechanism

The Delhi High Court observed that the grievance helpline numbers for distribution of foodgrains could not be reached and it "is a disaster that needs to be addressed immediately by the Delhi Disaster Management Authority".

Conclusion

Under Public Distribution System (PDS) reforms, digitization of ration cards/beneficiaries and distribution of highly subsidised foodgrains, namely- Rice, Wheat and Coarse-grains, to targeted beneficiaries under NFSA through electronic Point of Sale (ePoS) devices, after biometric/Aadhaar authentication of beneficiaries are key objectives to improve the efficiency and transparency in the distribution process.

At present, nearly 90% of the total 23.4 Crore ration cards under NFSA across the country have been seeded with Aadhaar number of at least one member of the household.

The above-mentioned measures, if properly implemented, can have a salutary effect on retail prices in the open market.

A revamped, need-based PDS is required not just for cutting down the subsidy bill but also for reducing the scope for leakages. Political will should not be found wanting.

Q4. Elaborate the scope and significance of the food processing industry in India. 10

India's food processing sector is a **sunrise sector** that has gained prominence in recent years. The food processing industry includes raw products of agriculture, dairy, fishing, poultry which are transformed through a process that ultimately adds commercial value. This value addition can take several forms such as packaging, preservation, sun drying, the addition of artificial additives. In India, there are several success stories of profit-making food processing businesses such as Maggi's noodles, Kissan Jams, Lijjat Papads, Parle G biscuits, Mother's Recipe Pickles, McCain's frozen snacks, etc.

Thus, major processed food products exported from India include processed fruits and juices, pulses, guar gum, groundnuts, milled products, cereals preparations, oil meals and alcoholic beverages. India created history in agriculture and processed food exports by exporting products worth US$ 25.6 billion in FY22.

There has been a great revolution in the food ordering business in India with online food delivery players like Zomato, Swiggy, etc. Investors are more attracted to the Food processing industry, foreseeing its high potential and wider customer base.
The FDI equity inflow in the Food Processing Sector for the period of April 2021- March 2022 was $ 709.72 Mn.

Initiatives being taken

100% FDI

The Government of India aims to boost growth in the food processing sector by leveraging reforms such as 100% Foreign direct investment (FDI) in the marketing of food products and various incentives at the central and state government level along with a strong focus on supply chain infrastructure.

MEGA PARKS

Recently the government of India has established 18 mega food parks and 134 cold chain projects to develop the food processing supply chain.

ODOP

The government has launched the One District One Product program, to upgrade SMEs on selected products through credit linked subsidy of 35% of the eligible project cost limited to a maximum value of Rs.10 lakhs.

PM KISAN SAMPADA YOJANA

Aim

- Creation of modern infrastructure for food processing mega food parks/ clusters and individual units
- To create effective backward and forward linkages - linking farmers, processors and markets
- To create robust supply chain infrastructure for perishables

Sub Schemes

- Mega Food Parks
- Integrated Cold Chain and Value Addition Infrastructure
- Creation/ Expansion of Food Processing/ Preservation Capacities (Unit Scheme)
- Infrastructure for Agro-processing Clusters
- Creation of Backward and Forward Linkages
- Food Safety and Quality Assurance Infrastructure
- Human Resources and Institutions

Operation Greens

- In the budget 2018-19, the government announced the Operations Greens scheme to promote integrated value chain development for crops. They are tomato, potato, onion.
- Post-harvest processing facilities will be eligible for a grant in aid of up to 50% of the project cost. It also subjects to the maximum limit of 50 crores.

PM Formalization of Micro Food processing Enterprises

- This scheme aims at helping small micro-units engaged in the food processing industry.
- Many businesses at the grass-root level such as chilli drying, spice packaging, pickle, and papad making engage directly with farmers.
- Recognising the role of such micro-units, a 35% subsidy can be availed. It is by such units on their project cost, up to a maximum of ₹10 lacs

Opportunities for Food Processing in India

- India has the distinct advantage of being one of the **largest markets of consumer products** in the world.
- India is the **second-largest grower of fruits and vegetables** (only next to China) as well as the largest grower of agriculture produced in the world.

- **Huge production scope** – Despite being a leader in produce, India has a minimal yet growing processed food base, thereby indicating that a huge opportunity exists in this sector.
- **Large segments of the population** – Unlike many other developed countries, India is a young nation, with a large population of adolescents, young adults, and middle-aged groups. This presents a business opportunity for designing several food products catering to different consumer groups.
- **Rising awareness for healthy and organic products** – The pandemic has renewed our interest in healthy living, controlled diet, reducing sugar, and fat intake. Thus, natural products made from organic fruits and vegetables are such as nutritional supplements, snacks, etc are here to stay.

India's food processing sector is one of the largest in the world and its output is expected to reach US$ 535 billion by 2025-26. This sector is expected to generate 9 million jobs by 2024. India's food sector attracted US$ 4.18 billion in foreign direct investments between April 2014 and March 2020. By 2030, Indian annual household consumption is expected to triple, making India the fifth-largest consumer in the world- IBEF.

Key Growth Drivers & Trends

- There is growth in the organised food retail sector and increase in urbanisation.
- MSME's are playing a vital role in India's food processing chain through various advancements in skills and technology.
- The online food ordering business in India is witnessing an exponential growth.
- There is high demand for packaged, healthy and immunity booster snacks such as roasted nuts, popcorns, and roasted pulses.
- There is a shift in focus from loose to branded packaging.
- The government's 'Atmanirbhar Bharat' initiative places priority on this sector and offers support through various policies.

Combining entrepreneurial talent with opportunities in India

Food Processing is all set to become the most robust sector in India to contribute majorly to India's growth. In the last two years, there have been several developments in enhancing access to FSSAI regulation. This regulation has the food processing industry, improvements in cold storage, and international partnerships. Players such as Amazon, Grofers, and Big Basket have added to the marketability of processed food. Additionally, export benefits have opened vistas of opportunities beyond the borders of India.

Road ahead

Various factors, such as rise in health issues, the ongoing COVID-19 pandemic, busy lifestyles and increase in food adulteration, have witnessed a change in the consumer's buying behaviour, which includes demand for ready-to-cook, ready-to-eat meals and healthy, immunity boosting snacks. Safe and processed food categories such as biscuits and snacks have seen growth amid the COVID-19 crisis.

Deloitte India, highlighted that opportunities in the Indian food processing sector are yet to be leveraged. India ranks much lower in the sector as compared with the world and has only a 10% share among the Asian countries. The size of the Indian food processing sector is 1.5x that of the agricultural sector, while it is 4-5x for the developed countries. Compared with other developed economies, the ratio of food retail sales to GDP from agriculture in India is relatively low, signifying an opportunity to scale up the food processing industry. At present, India is processing <10% of its agricultural output; thus, presenting immense opportunities to boost processing levels and attract investments in this sector.

The growth of food processing sector will be led by the demand in retail and rise of health-conscious consumers, who opt for safe, branded food. Currently, the Indian food processing industry has a good mix of operational MSMEs. A strong crop value chain with adequate funding and technology applications will boost the food processing sector via the MSME sector.

GS-III EXPLANATIONS

Q5. The increase in life expectancy in the country has led to newer health challenges in the community. What are those challenges and what steps need to be taken to meet them? 10

The term "life expectancy" refers to the number of years a person can expect to live.

Life expectancy stats

WHO report states that the average age in India has increased.
In 1970, the average Indian lived 47 years, but it increased to 70 years in 2020.
Life expectancy at birth among Indian women increased by 24 years between 1970 and 2016, more than that of men, who experienced an increase of 20 years over the same period. In 1970, out of 1000, 132 infants died at the time of birth. The latest data shows improvement as in 2020, 32 out of 1,000 newborns were killed.
The cases of death of women during delivery have also decreased. According to 1990 data, 556 out of 10,000 women died during delivery. By 2018, this figure has come down to 113 per 10,000.

India has made great strides in reducing the needless suffering and premature deaths that arise from preventable and treatable diseases. Yet, the country faces persistent and daunting public health challenges, particularly for the poor. These include **child undernutrition and low birth weights or lifelong health problems; growth in noncommunicable diseases such as obesity, diabetes, and tobacco use, leading to cancer and other diseases; and high rates of road traffic accidents etc.**

World Health Organization (WHO) report shows that the nation requires more efforts to overhaul its health facilities. According to the report,70 per cent of OPD services, 58 per cent of admitted patients and 90 per cent of the medicines and tests are still in private hands.

Population Ageing- a new challenge

The Decline in the Working-Age Population

Between the Census of 2001 and 2011, the country added 18 per cent more people to its population — translating to around 181 million. It is the **second-most populous country** in the world. According to a report titled Youth in India **2022**, by the Ministry of Statistics and Programme Implementation (MoSPI), by the year 2036, those above the age of 30 will form the majority of the country's population. Also, If India does not create enough jobs and its workers are not adequately prepared for those jobs, its demographic dividend may turn into a liability. A rapidly aging population means there are fewer working-age people in the economy. This leads to a supply shortage of qualified workers, making it more difficult for businesses to fill in-demand roles.
An economy that cannot fill in-demand occupations faces adverse consequences, including declining productivity, higher labor costs, delayed business expansion, and reduced international competitiveness. In some instances, a supply shortage may push up wages, thereby causing wage inflation and creating a vicious cycle of price/wage spiral.

Other Public Health Challenges

Health Infrastructure

- NITI Aayog report 2021 titled 'Reimagining Healthcare in India through Blended Finance' highlighted that 50 per cent of India's population has access to 35 per cent of hospital beds, thus indicating a strong need to strengthen healthcare infrastructure to ensure access to healthcare facilities for all.
- According to rural Health Statistics 2018 only 8% subcentres, 12% PHCs and 13% CHCs met Indian Public Health Standards.
- Overall there is a **shortfall of 86.5% surgeons; 74.1% obstetricians &gynaecologists; 84.6% general physicians and 81% paediatricians at CHCs in the country.**
- **Private health care market occupies a large share of hospitals (75%), hospital beds (50.7%) and medical institutions (54.3%) largely located in urban areas**.

GS-III EXPLANATIONS

No proper regulatory mechanism and monitoring

- According to WHO report published in 2016 **Only one in five doctors in rural India is qualified to practice medicine.**
- The report said that 31.4% of those calling themselves allopathic doctors were educated only up to class 12 and 57.3% doctors did not have a medical qualification.
- **Due to poor regulatory mechanism and monitoring, private health care services and doctors are following unethical, greedy practices treating medical services as a business and hospitalisation as a source of profit, writing unnecessary diagnostic tests, high rate medicines instead of generic one, organ theft (kidney racket) etc. even denying treatment to poor people though getting land from government on a subsidised rate**.

Lack of Affordability:

- The contribution of private sector in healthcare expenditure in India is around 80 percent while the rest **20 percent is contributed by Public Sector**.
- The private sector also provides for 58 percent of the hospitals and 81 percent of the doctors in India.

Social Inequality:

- The growth of health facilities has been highly imbalanced in India. Rural, hilly and remote areas of the country are under served while in urban areas and cities, health facility is well developed.

Unmanageable patient-load

- Even prior to the outbreak of the Covid-19 pandemic, healthcare facilities had been feeling the strain due to unmanageable patient-load. Moreover, serving a population of 1.4 billion remains a Herculean task in itself when it comes to suitably managing healthcare facilities.

Shortage of efficient and trained manpower

- One of the most pressing problems in India remains a severe shortage of trained manpower in the medical stream, this includes doctors, nurses, paramedics and primary healthcare workers. The situation remains worrisome in rural areas, where almost 66 per cent of India's population resides.
- The doctor-to-patient ratio remains abysmally low, which is merely 0.7 doctors per 1,000 people. This is compared to the World Health Organisation (WHO) average of 2.5 doctors per 1,000 people.

Out-of-pocket Expenditure

- **Out-of-pocket expenditure on healthcare by households** — a key reason pushing Indians into poverty — is 48.2 per cent. It was even higher in 2004-2005, at 69.4 per cent. Still the figure **remains significantly higher than the global average, which stands at 18.1 per cent in 2019, as per the World Bank.**

Other

- Inadequate Quality, Accessibility and Affordability of Health Services.
- High out-of-pocket expenses.
- Shortage of Infrastructure, Equipment and Skilled Manpower.
- Rigid regulatory Framework Combined with Corrupt enforcement.
- **Primary Health Care Centres are not Present in many villages and wherever Present they lack basic facilities.**
- Inefficiencies in Procurement Process result in both Shortages and Wastage.
- **Nearly 70% of Healthcare delivery is through Private Players which are largely regulated**.
- Lack of Sanitation, disease Surveillance, Political will and Public Health response.
- **Government spends only 1.5% of GDP on Public Health Care.**
- Rising incidence of non-Communicable diseases with income growth, lifestyle changes and environmental degradation, resulting in a **rising total burden of disease.**

Way Ahead

A holistic and sustainable approach needs to be at the heart of healthcare delivery improvement so that the requirements of the growing population can be met. Some of the key steps to strengthen healthcare infrastructure, particularly in rural India, are:

Long-term Public-Private Partnerships (PPPs) to ensure inclusive healthcare

PPP partnerships can transform India's rural healthcare system with a long-term sustainable model in more ways than one. Given the growing population of our country, state efforts alone will not be enough to strengthen the health system. The PPP can help to overcome financial, technological, educational and human limitations.

Ongoing support and skills development

According to a report released by the Union Ministry of Health and Family Welfare, there is a 76.1 per cent shortage of medical specialists in 5,183 community health centres in rural areas. Qualification courses and continuing education programs for physicians can help to remedy the shortage of trained doctors in rural areas.

Continuous upgradation of testing equipment and training of medical staff

Rural areas lack essential facilities such as state-of-the-art medical equipment and trained medical staff to operate the equipment. While medical devices can still be constantly updated, training workshops for medical personnel to know how to effectively handle, operate and manage these devices are also crucial. As new technologies emerge, the need for training becomes constant and needs to be identified.

Establishment of a field oversight committee

A local oversight committee should be set up to develop a set of basic and complementary strategies to promote access to better health care and to oversee the implementation of rural health care initiatives. A field oversight committee is needed to revitalise rural health through effective oversight of rural health improvement activities.

A strong healthcare system can only be built with continuous commitment and consistent effort. It has become equally important to strengthen the AYUSH network to further improve the health outcomes. The main objective should be to improve preparedness beyond COVID and not just focus on short-term fixes that will restore the system to the same old state once outside help is withdrawn.

Other

- **Raising Public Health expenditure to 2.5% of GDP.**
- **Provide accessible, affordable and quality health care.**
- **Inform and educate people about the traditional Systems of medicine.**
- **Ayurveda Doctors and Yoga Teachers for Rural Areas**.
- Improve Hospital access, Health worker density, and Access to essential medicine.
- **Mobile Medical Units to Provide outreach Services in rural and remote areas.**
- Reduce the Pressure on Secondary and tertiary hospitals by investing in Preventive and Primary Health Care facilities.
- A **National Health Regulatory and Development Framework** needs to be made for improving the quality (for example registration of health practitioners), performance, equity, efficacy, and accountability of healthcare delivery across the country.
- **Increase the Public-Private Partnerships** to increase the last-mile reach of healthcare.
- **Generic drugs and Jan Aushadi Kendras should be increased** to make medicines affordable and reduce the major component of Out-of-Pocket Expenditure.
- The government's National Innovation Council, should **encourage a culture of innovation in India** and help develop policy on innovations that will focus on an Indian model for inclusive growth.

- **India should take cue from other developing countries like Thailand to work towards providing Universal Health Coverage.** UHC includes three components: **Population coverage, disease coverage and cost coverage.**

Q6. Each year a large amount of plant material, cellulose, is deposited on the surface of Planet Earth. What are the natural processes this cellulose undergoes before yielding carbon dioxide, water, and other end products? 10

Cellulose is an organic compound belonging to the category of polysaccharides. It is a polymer made up of glucose subunits. It is found in bacterial and plant cells and is abundantly present in their cell walls. Cellulose plays an important role in the structure and strength of plants.

Breakdown (cellulolysis)

Cellulolysis is the process of breaking down cellulose into smaller polysaccharides called cellodextrins or completely into glucose units; this is a hydrolysis reaction. Because cellulose molecules bind strongly to each other, cellulolysis is relatively difficult compared to the breakdown of other polysaccharides.

Breakdown (thermolysis)

At **temperatures above 350 °C**, cellulose undergoes thermolysis (also called 'pyrolysis'), decomposing into solid char, vapors, aerosols, and gases such as carbon dioxide. The maximum yield of vapors that condense to a liquid called bio-oil is obtained at 500 °C.

Semi-crystalline cellulose polymers react at pyrolysis temperatures (350–600 °C) in a few seconds; this transformation has been shown to occur via a solid-to-liquid-to-vapor transition, with the liquid (called intermediate liquid cellulose or molten cellulose) existing for only a fraction of a second. Glycosidic bond cleavage produces short cellulose chains of two-to-seven monomers comprising the melt. Vapor bubbling of intermediate liquid cellulose produces aerosols, which consist of short chain anhydro-oligomers derived from the melt.

Continuing decomposition of molten cellulose produces volatile compounds including levoglucosan, furans, pyrans, light oxygenates, and gases via primary reactions. Within thick cellulose samples, volatile compounds such as levoglucosan undergo 'secondary reactions' to volatile products including pyrans and light oxygenates such as glycolaldehyde.

Industry Use

Cellulose is used in different industries for the welfare of mankind. Following are some of its uses:

- Cellulose is used to make paper, paperboards, cardboards, cardstock and other paper products.
- It is used in the textile industry to make clothes. Different clothes are made using cotton and other plant fibers.
- It is used to make electrical insulation paper in the electric industry.
- It is used to make bio-fuel.
- Cellulose is used in gunpowder.
- It is used as a stabilizer in different drugs.
- It is used in biological labs as a stationary phase for chromatography.

GS-III EXPLANATIONS

Q7. Discuss in detail the photochemical smog emphasizing its formation, effects and mitigation. Explain the 1999 Gothenburg Protocol. 10

Photochemical smog is a mixture of pollutants that **are formed when nitrogen oxides and volatile organic compounds (VOCs) react to sunlight, creating a brown haze above cities.**
Photochemical Smog is **derived from vehicular emissions from internal combustion engines and industrial fumes**. These pollutants react in the atmosphere with sunlight to form secondary pollutants that also combine with the primary emissions to form photochemical smog.

Primary pollutants-The two major primary pollutants, nitrogen oxides and VOCs combine to change in sunlight in a series of chemical reactions, to create what are known as secondary pollutants.
Secondary pollutants- The secondary pollutant that causes the most concern is the ozone that forms at ground level. While ozone is produced naturally in the upper atmosphere, it is a dangerous substance when found at ground level. Many other hazardous substances are also formed, such as peroxyacetyl nitrate (PAN).

In short, Nitrogen oxides (the mixture of NO and NO2 together referred to as NOx) and volatile organic compounds (VOCs) are primary air pollutants, released in the atmosphere by automobiles and industrial processes. Nitrogen dioxide absorbs ultraviolet light and formation of nitric oxide and atomic oxygen takes place. Ozone is generated by the reaction of oxygen gas with this atomic oxygen. Ozone, aldehydes and peroxyacetyl nitrate so formed are thus secondary air pollutants. Photochemical smog is a mixture of primary and secondary air pollutants.

How is smog formed?

Below is a simplified explanation of the chemistry of smog formation.

Nitrogen dioxide (NO_2) can be broken down by sunlight to form nitric oxide (NO) and an oxygen radical (O):

1) NO_2 + sunlight → NO + O

Oxygen radicals can then react with atmospheric oxygen (O_2) to form ozone (O_3):

2) $O + O_2 \rightarrow O_3$

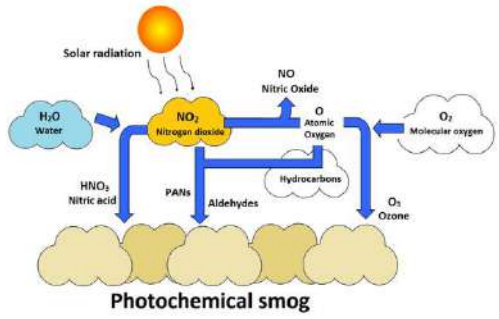
Ozone is consumed by nitric oxide to produce nitrogen dioxide and oxygen:

3) $O_3 + NO \rightarrow NO_2 + O_2$

Harmful products, such as PAN, are produced by reactions of nitrogen dioxide with various hydrocarbons (R), which are compounds made from carbon, hydrogen and other substances:

4) NO_2 + R → products such as PAN

The main source of these hydrocarbons is the VOCs. Similarly, oxygenated organic and inorganic compounds (RO_x) react with nitric oxide to produce more nitrogen oxides:



Photochemical smog

Effects of Photochemical Smog

- All the major constituents of photochemical smog are detrimental to human health and the environment. Being a cocktail of chemical oxidants such as ozone, nitrogen dioxide and peroxy compounds, it is often termed as oxidising smog.
- The brown nitrogen dioxide in smog **affects visibility.**
- Nitrogen dioxide, ozone, VOCs and peroxyacetyl nitrates, all **result in eye irritation and respiratory problems**.
- Prolonged exposure to NO2 **lowers resistance towards respiratory infections.**
- VOCs are also carcinogenic.
- Ozone has a harsh odour and causes coughing, wheezing and eye irritation. Ozone causes oxidative damage to plant and animal tissue.

GS-III EXPLANATIONS

Pollutant	Effects
NOx	• can contribute to problems with heart and lungs • links to decreased resistance to infection
VOCs	• eye irritation • respiratory problems • some compounds are carcinogens
Ozone	• coughing and wheezing • eye irritation • respiratory problems (particularly for conditions such as asthma)
PAN	• eye irritation • respiratory problems

5) $NO + RO_x \rightarrow NO_2$ + other products

The significance of the presence of the VOCs in these last two reactions is paramount. Ozone is normally consumed by nitric oxide, as in reaction 3. However, when VOCs are present, nitric oxide and nitrogen dioxide are consumed as in reactions 4 and 5, allowing the build up of ground level ozone.

Enviromental and Health Effects
• Decreased visibility due to yellowish colour of NO_2 • High levels of NO_2 exposure give rise to cough and shortness of breath • Eye irritation • May increase the cases of cancer • NO_2 is responsible for supressing growth of plants • Nitrogen dioxide when exposed in high concentration increases respiratory infection. • NO_2 reacts in the atmosphere to form acid rain, which can harm plants and animals.

Mitigation

Reduction of nitrogen oxide

The main method of lowering the levels of nitrogen oxides is by a process called **'catalytic reduction',** which is used in industry and in motor vehicles. For example, a catalytic converter fitted to a car's exhaust system will convert much of the nitric oxide from the engine exhaust gases to nitrogen and oxygen. In Australia, all motor vehicles built after 1985 must be fitted with catalytic converters. Nitrogen is not in the actual fuels used in motor vehicles or power stations; it is introduced from the air when combustion occurs. Using less air in combustion can reduce emissions of nitrogen oxides. Temperature also has an effect on emissions—the lower the temperature of combustion, the lower the production of nitrogen oxides. Temperatures can be lowered by using processes such as two-stage combustion and flue gas recirculation, water injection, or by modifying the design of the burner.

Reduction of VOCs

There are various ways to reduce VOC emissions from motor vehicles. These include the use of liquefied petroleum gas (LPG) or compressed natural gas (CNG) rather than petrol, decreasing distances vehicles travel by using other modes of transport, such as buses and bikes, and implementing various engine and emission controls now being developed by manufacturers.

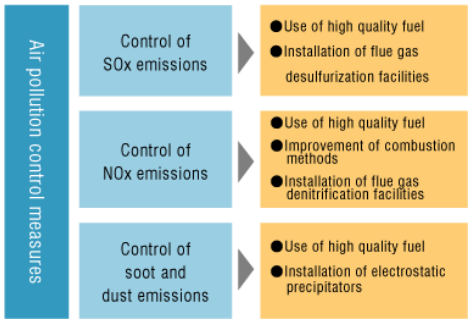
Altering human activity

- Less consumption, no burning of fossil fuel
- Use public/shared transit, walking and cycle paths
- Increase renewable energy
- Decrease consumption of non-essential goods
- Government regulations at points of emission

Controlling the release of the pollutant

- Government regulation on pollution at points of emission - such as petrol/gas/diesel taxation
- Use of catalytic converters to remove primary pollutants from exhaust (tail) pipe of vehicles
- Fuel quality may be regulated by government
- Regulating car-free zones

GS-III EXPLANATIONS



Clean-up and restoration

- Scrubbers.
- Afforestation to increase carbon sinks and filter air.
- Create conservation areas.
- Spraying water at junctions to wash out pollution from atmosphere.
- Re-greening of cities.

1999 Gothenburg Protocol

The **1999 Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-level Ozone** (known as the **Multi-effect Protocol** or the **Gothenburg Protocol**) is a multi-pollutant protocol designed to reduce acidification, eutrophication and ground-level ozone by setting emissions ceilings for sulphur dioxide, nitrogen oxides, volatile organic compounds and ammonia to be met by 2010.

The Protocol is part of the Convention on Long-Range Transboundary Air Pollution. The Convention is an international agreement to protect human health and the natural environment from air pollution by control and reduction of air pollution, including long-range transboundary air pollution.

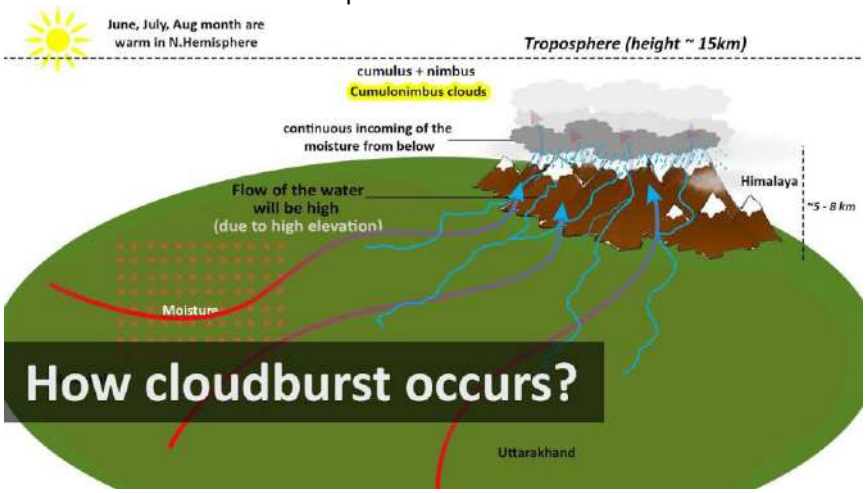
The geographic scope of the Protocol includes Europe, North America and countries of Eastern Europe, Caucasus and Central Asia (EECCA).

Q8. Explain the mechanism and occurrence of cloudburst in the context of the Indian subcontinent. Discuss two recent examples.

Cloudbursts are **short-duration, intense rainfall events over a small area.** According to the India Meteorological Department (IMD), it is a weather phenomenon with unexpected **precipitation exceeding 100mm/h over a geographical region of approximately 20-30 square km.**

Not all instances of very heavy rainfall, are cloudbursts. A cloudburst has a very specific definition: Rainfall of 10 cm or more in an hour over a roughly 10 km x 10-km area is classified as a cloudburst event. By this definition, 5 cm of rainfall in a half- hour period over the same area would also be categorized as a cloudburst.

In Uttarkashi and Rudraprayag, it rained 479 mm in the intervening night of June 16-17, 2013. They are called cloudbursts.



Mechanism

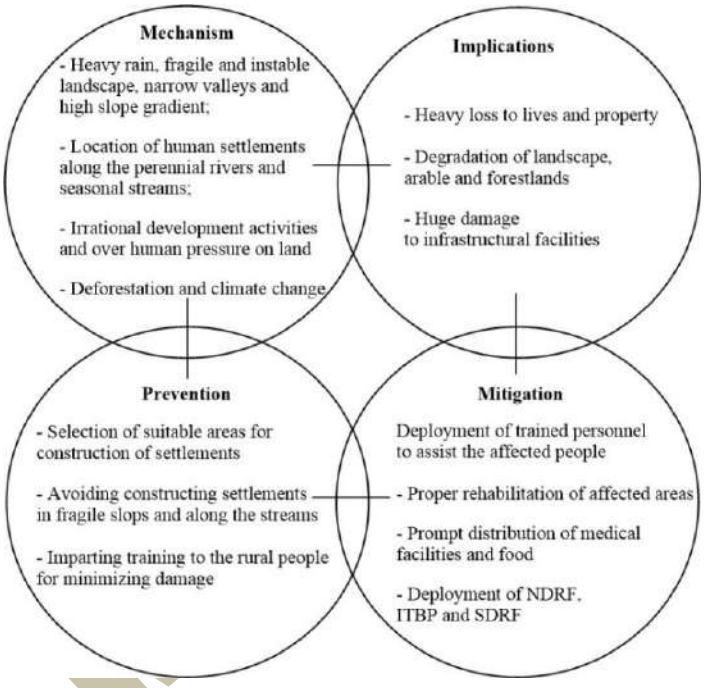
Cloudbursts occur because the warm air current from the ground or below the clouds rushes up and carries the falling raindrops up with it.

The rain fails to fall down in

a steady shower. This results in excessive condensation in the clouds as new drops form and old drops are pushed back into it by the updraft. Then one of them gives in. The air current slows down or the clouds can't hold.
The resulting violent downpour can dump as much as 70,000 tonnes of water over an acre of land.

Meteorological Factors behind the Cloudburst

Atmospheric pressure, atmospheric temperature, rainfall, cloud water content, cloud fraction, cloud particle radius, cloud mixing ratio, total cloud cover, wind speed, wind direction, and relative humidity during the cloudburst, before as well as after the cloudburst.
Relative humidity and cloud cover is at the maximum level with low temperature and slow winds.



Cloudbursts in India

In India, a cloudburst **mostly occurs in the mountains of India** where the low monsoon clouds are stopped by the high mountains.
Cloudbursts are not uncommon events, particularly during the monsoon months. **Most of these happen in the Himalayan states** where the local topology, wind systems, and temperature gradients between the lower and upper atmosphere facilitate the occurrence of such events.
Cloudbursts, occur mostly over **the rugged terrains over the Himalayas, the Western Ghats, and northeastern hill States of India.**

Recent cloudbursts that caused significant devastation occurred over the Himalayan foothills in Himachal Pradesh (in the year 2003), Ladakh (2010), and Uttarakhand (2013). Cloudbursts were reported from the northeastern States and Western Ghats States during the current monsoon season (2022).

Pithoragarh (July 2022)
A cloud burst incident was reported from the Darma valley in Pithoragarh district on July 30, 2022 in Bheti nullah catchment[xxii] near Jhimir village in Sobla area of Dharchula tehsil in evening hours. The subsequent flash flood washed away a baily bridge built by BRO on Tawaghat-Drama road, disconnecting Darma valley with district headquarter.

Dehradun 2022
A devastating cloud burst incident took place near Sarkhet village along Bandal river in Raipur area of the Dehradun district around 02:40 am on August 20, 2022 causing damages in several villages including Sarkhet, Maldevta, Bhutsi, Tauliyakatal, Thatyud, Lavarkha, Ringalgadh, Ghuttu and Ragad Gaon. 5 people went missing after flash flood washed away some homes in Sarkhet village and bodies of 3 were later recovered. Over 72 families were affected and more than 40 homes were damaged by mud and debris flows. Several cattle, vehicles were swept away. Nearly 500 people mostly tourists, had to be rescued and shifted to safer areas. The Disaster Mitigation and Management Centre confirmed the cloud burst incident.

GS-III EXPLANATIONS

Q9. Discuss the types of organised crimes. Describe the linkages between terrorists and organised crime that exist at the national and transnational levels.

Organized crime means the commission of a crime at regular intervals in order to make money or profits. Some examples could include human trafficking, money laundering, smuggling, etc.

Types of organised crimes

Money laundering

Money laundering is one of the most serious crimes which can severely affect any economy in several aspects. This crime is specifically governed by the Prevention of Money Laundering Act, 2002. It is a way by which illegal money earned from sources such as drug trafficking, human trafficking, etc. are diverted to create an impression that such money comes from a legitimate source.

Smuggling

Smuggling is another major economic offence in a form of organised crime. This is mostly governed by the Customs Act, 1962. It is natural that the goods which are illegal in the territory of India or heavily taxed are smuggled to continue their trade or maintain profits. With a change in fiscal policy, the definition of smuggled goods vary but it is mostly items such as contraband substances, valuable jewels, electronics, certain fabrics, etc. which are smuggled in India. Due to the vast coastline, it becomes easy for people to smuggle goods.

Drug trafficking

Drug trafficking is another major crime that poses a threat to the younger population of India, considering its drastic effects on physical and mental health. It is usually considered that the most important reason for the high rate of drug trafficking is the geographical condition of India. It is located between the Golden Triangle (Myanmar, Thailand, and Laos) on the northeast and Golden Crescent (Pakistan, Afghanistan, and Iran) on the northwest- both of which are the two largest sources of illicit drugs in Asia. Resultantly, this form of organised crime has become more prevalent and significant in the country.

Human trafficking

Article 23 of the Indian Constitution explicitly prohibits human trafficking. Further, there are various trafficking prohibition laws discussed in the latter part of the article. Human trafficking is one of the most significant and heinous organised crimes. This involves women trafficking, child trafficking, trading in sex workers, etc

Contract killings and kidnapping

These are governed by the Indian Penal Code. Contract killings means murdering someone for money on a contractual basis. This is usually prevalent among the highly influential and public personalities who are being murdered by their enemies/competitors through some other criminal for a ransom. Similarly, kidnapping incidents are also prevalent wherein people pay a certain sum of money to get someone kidnapped or these criminals ask someone for a ransom. Such crimes are performed by organised criminals who do such tasks on a regular basis.

Linkages between terrorists and organised crime

Organized crime and terrorism result from ineffective governance and have developed a symbiotic relationship. While organized crime involves many activities, its linkages with terrorism stem from illegal trafficking of drugs, arms and human beings and money laundering. Terrorist groups, whether indigenous or sponsored by outside states, need arms and money for their fight against the security forces. Organized crime conglomerates need a clientele and couriers who can smuggle drugs, arms and human beings across the countries and regions.

In India, the linkages between the two exist at national and transnational levels. At the national level, both terrorists and those involved in organized crime are within India. At the international level, collaboration exists between transnational syndicates and terrorists from inside and outside India.

In India's northeast, almost all the militant groups run a parallel government or have their areas of influence and are involved in collecting money directly from the people. Much of the government

funds reach the militants indirectly due to misgovernance. Government officials in conflict zones are either threatened or bribed to award contracts to individuals patronized by the militant groups. Contracts apart, essential commodities like rice and kerosene reach the militant groups directly which are then sold to the public at much higher prices. This cycle, though unnoticed in other parts of India, is a clear example of the linkage between organized crime and terrorism inside India.

Extortion, kidnap, contracts and black marketing still fall short of financing the nefarious activities of the militants. This is where transnational drugs and arms syndicates come into play. Terrorist organizations in India, especially in the northeast, mobilize funds by becoming couriers of illegal drugs and arms and at times even human beings from one point to another within the country. Some of the infamous entry points from Southeast Asia include Moreh and the entire Chittagong Hill tracts, especially Cox's Bazaar. Initially, international criminal syndicates had their own network; however, with these routes being taken over by various terrorist groups in the northeastern states, the syndicates started using these groups instead of bribing them to let their consignments get through.

In Kashmir, the linkages between terrorists and organized crime exist at a different level. Unlike the northeast, reliance on funds from extortion and other related means is minimal. There is no parallel government in Kashmir and government resources do not reach militant hands. However, external funds compensate for inadequate internal mobilization. External funds reach the militant organizations fighting in Kashmir thorough various means. For instance, enormous funds that are mobilized in Pakistan and other Muslim countries, especially in the Gulf, are channeled through various organizations in Pakistan to Kashmir. *Markaz dawa al Arshad*, for example, mobilizes funds from inside and outside Pakistan, to support its militant wing, *Lashkar-e-Toiba*. Besides, external funds are also routed through select organizations and individuals in Kashmir, which finally reach the militants. Money laundering plays a significant role. *Hawala* (money laundering) transactions take place swiftly and effectively in Kashmir. Besides, it is also believed that the ISI uses drug money to fund militant activities in Kashmir.

Another significant relationship between organized crime and terrorism, especially in Kashmir, is through the spread of counterfeit currency. Terrorists are the main couriers of Indian counterfeit currency inside Kashmir, which then spreads all over India. Even guides for the militants from across the border are paid with counterfeit money. In fact, when some of the 'indigenous' militants were also paid with counterfeits, it resulted in squabble between them and the so-called guest militants.

Besides Kashmir and the northeast, sporadic incidents in other parts of India like the Bombay blasts, for instance, have exposed the connection between terrorism and organized crime. This is distinct from the traditional linkages flourishing between organized crime syndicates and local criminals.

Wrapping it up

There are various central and state laws such as the Indian Penal Code, PMLA, NDPS Act, preventive laws, etc. to govern and curb organised crimes. Despite the existence of various legislation, the State has not been successful in curbing these crimes to a considerable extent. This is because of various challenges faced by the State such as lack of proper enforcement, lack of resources, slow trials, difficulty in obtaining proof, etc. In light of these circumstances, it is imperative that the Parliament bring in some laws specifically governing organised crimes and form diplomatic relations with other nations since many of these crimes are transnational in nature.

Q10. What are the maritime security challenges in India? Discuss the organizational, technical, and procedural initiatives taken to improve maritime security.

Maritime security has been defined in the *Indian Maritime Doctrine* (IMD) as relating to the *freedom from threat at or from the sea.* Maritime security is of utmost significance to the world community as there are maritime concerns ranging from piracy at sea to illegal immigration and weapon smuggling. It also deals with threats of terrorist attacks and environmental catastrophes.
India has a **huge coastline of about 7517 km and more than 1200 islands**. Thus, Maritime Security is vital to India's interests.

India's Maritime Security Concerns

GS-III EXPLANATIONS

Recent issues:

- **COVID-19** has highlighted the fragility of the global logistic supply chain, and India too has been affected. India's exports have been hit by the pandemic-induced scarcity of shipping containers, so much so that the country has now decided to make its own containers.
- The **recent Suez thrombosis** caused by the grounding of MV Ever Given in the Suez Canal has lessons for our economy and energy security.

Control of Choke Points

- Access to the Indian Ocean is geographically controlled by a number of choke points leading to and from the Arabian Sea and the Bay of Bengal, and from the Southern Indian Ocean, which are critical for safeguarding the Indian maritime interests.
- Examples: **Straits of Hormuz, Straits of Bab-el-Mandeb, Gulf of Aden, Malacca Strait**.

Regional Instability

- The Indian Ocean littoral has been **witnessing to large areas of political instability** in the recent past. Examples: Yemen, Indonesia, Somalia, Iran-Iraq, Sri Lanka and Myanmar
- Indian maritime security forces then had to conduct dedicated operations to combat this menace, like the Indian intervention in the Maldives in 1988 to foil a coup d'état.

Piracy

- India has not only escorted numerous merchant ships of all countries but concerted efforts of its maritime security forces has ensured that this piracy has been controlled.
- Statistics have shown an **increase in piracy, off the coast of Bangladesh, Malaysia, and Indonesia.**

Trafficking

- The Indian Ocean Region is regrettably home to the world's most notorious areas of **drug production, the Golden Crescent and the Golden Triangle.**
- The trans-national networks established by the drug smugglers also serve as conduits for other destabilising activities like **gunrunning and human trafficking.**

Maritime Terrorism

- India's huge coastline, a thriving maritime commercial community along its coast with nearly **200,000 fishing boats and a fishermen population of 4 million** make the job of monitoring maritime activity an unenviable task.
- The ability of adversarial interests to exploit this vast maritime activity for launching attacks on land is therefore quite high, as was witnessed in the **26/11 terrorist acts.**

Extra Regional Military Presence

- It is intended to **further strategic interests of various nations**.
- The ongoing international naval effort has also benefited nations in terms of **operational intelligence gained and an expanded military maritime footprint.**

Illegal Unreported and Unregulated (IUU) Fishing

- A World Wildlife Fund report on illegal fishing has found that **87 percent of the fish stocks surveyed in the Western and Eastern Indian Ocean were experiencing high levels of IUU fishing.**

- **Maritime Territory:** India's coasts are characterised by a **diverse range of topography such as creeks, small bays, back waters, rivulets, lagoons, swamps, beaches, small islands (inhabited as well as uninhabited) etc.**

Challenge of Maritime security management:

- The challenge of maritime security management today is the **multiplicity of maritime stakeholders,** who often work at cross-purposes.
- Narrow organisational loyalties, turf wars and reluctance to share information characterise most of them.

- **Decision makers of the civilian generalist bureaucracy lack maritime domain knowledge** and may never have stepped on to a ship, let alone have spent a day in heavy seas.
- Most of their **solutions therefore often tend to adapt a land-centric approach** and are often too little and too late.
- Further, the country has nine coastal states and four Union territories, most of whom believe that maritime and coastal security is the Centre's responsibility.
- In fact, some **states are yet to set up 'maritime boards'**, despite the Centre's advice to do so.
- Absence of physical barriers on the coast and presence of vital industrial and defence installations on it enhances the vulnerability of the coasts to illegal cross border activities.
- **Shortage of manpower, Inadequate training for marine police, Lack of a cooperative mechanism between different agencies, below par state-level monitoring mechanisms**.

'Non-traditional' Security Challenges:

- Such as **climate change, haphazard urbanisation of coastal regions, natural disasters and pandemics.**
- Weak oceanic governance has meant high degree of pollution, depletion of fishing stocks and damage to environment.
- Other challenges include **technology capacity build up** to leverage on the resource base of Indian Ocean
- Oceans have become **dumping grounds for waste and issues like oil spills**

Geopolitical shifts:

- Geopolitical shifts have led to great power contestation at sea, generating various maritime flashpoints in different waters, naval rivalries and build-up and more aggressive naval war fighting doctrines.
- There are rising tensions between China and Japan, China and US, China and ASEAN in South China Sea, tensions in the Mediterranean and the Black Sea and the northern Atlantic.
- The aggravating factor is the growing tension between Russia and US affecting different seas.
- The pattern of naval modernisation includes capabilities for asymmetric warfare, amphibious warfare, pressure on chokepoints and second submarine-based nuclear strike capability.

Infiltration, Illegal Migration and the Refugee Influx:

- India's land boundaries have always been porous to infiltration by terrorists/militants and large scale illegal migration. Example: **creek areas of Gujarat have been highly vulnerable.**

Maritime Terrorism

Maritime terrorism, according to one maritime analyst, maybe manifested in the following ways:

- Armed robbery to finance terror activities
- Direct attack on offshore oil/gas platforms and Single Buoy Moorings
- Direct attack on ships at anchorage or alongside or on a port facility/harbour
- Direct attack on near-coast nuclear/industrial installations
- Indirect attack from hijacked ships on shore installations/cities
- Infiltration for attacks in the hinterland
- Disrupting safe navigation by sinking ships/boats in straits/narrow channels

For India, perhaps the most visible act was the Mumbai terror attack of November 2008 by Pakistan-supported terrorists.

REGIONAL SECURITY ARCHITECTURE:

India has always espoused a cooperative approach and participation of all states in promoting maritime security as enunciated by it in its vision of SAGAR – Security and Growth for All in the Region.

- **Indian Ocean Rim Association (IORA):** Launched in 1997 for promoting intra-regional economic cooperation and development.
- **Indian Ocean Naval Symposium (IONS):** is a voluntary initiative formed in 2008 that seeks to increase maritime co-operation among navies of the littoral states of the Indian Ocean Region.

- **Regional Cooperation Agreement on Combating Piracy and Armed Robbery against Ships in Asia (ReCAAP):** is a regional government-to-government agreement, brought into force in September 2006 to promote and enhance cooperation against piracy and armed robbery in Asia.
- **ASEAN Regional Forum (ARF):** objectives are to foster dialogue and consultation on political and security issues of common interest and make efforts towards confidence-building and preventive diplomacy in the Asia-Pacific region.
- At the multilateral level, India has played a key role in shaping **BIMSTEC and Mekong-Ganga Cooperation.**
- In south-east Asia, it has played an important and supportive role in **ADMM Plus and Expanded ASEAN Maritime Forum and East Asia Summit** as regards maritime security issues there.
- In the western Pacific, it participates in **US-led Western Pacific Naval Symposium**. It is also an Observer at the **Arctic Council**.

INDIAN MARITIME AGENCIES:

- **Indian Navy:** Aims to be the 'net security provider' in the maritime neighbourhood, including deployments for anti-piracy, maritime security, Non-combatant Evacuation Operations and HADR (Humanitarian Assistance and Disaster Relief) operations.

Objectives	Missions	Tasks
· Coastal Defence	üCounter-terrorism	Ø Counter-Infiltration
· Security of EEZ	üPolicing	Ø Anti-Piracy
· Good order at Sea		Ø Anti-Poaching
		Ø Anti-Trafficking

Table 1: Objectives, Missions and Tasks of the Indian Navy in Constabulary Role

Source: Indian Maritime Doctrine – 2009, p. 116

Objectives	Missions	Tasks
· Promote civil safety and security	ü HADR	Ø Provision of relief material and supplies
· Project National Soft power	ü Aid to Civil Authorities	Ø Medical assistance
		Ø Diving assistance
		Ø Hydrographic assistance etc.

Table 2 – Objectives, Missions and Tasks of Indian Navy in the Benign Role

Source: Indian Maritime Doctrine – 2009, p. 120

- **Coast Guard**: Protects India's EEZ from criminals, pirates, smugglers, poachers, human-traffickers and foreign subversion. It also carries out rescue missions in India's search and rescue zone. It is also engaged in developing bilateral and multilateral cooperation.
- **Coastal police**: Confining its activities to largely coastal waters up to 24 nautical miles, with the help of other agencies, it has a surveillance network comprising coastal villagers, CISF personnel and data from radar chain and sensors installed on sailing vessels.
- **Maritime shipping and shipbuilding**: A major task for the government is to enhance its capacity for Indian commercial shipping as well as infrastructure.
- **Ocean Affairs**: Ministry of Earth sciences (2006) is responsible for development of technology for exploitation and exploration of marine resources, weather services, climate change and geo-hazards, including tsunamis and vulnerability mapping for the purpose.
- **Customs Marine Organisation:** created following the recommendations of the Nag Chaudhari Committee.

- **Multi-layered Surveillance System:** Under the system, the outer layer (beyond 200 nautical) was patrolled by the Indian naval ships and aircraft; the intermediate layers (12-200 nautical miles) was patrolled by Indian Coast Guard; and the inner layer i.e. the territorial waters (shoreline to 12 nautical miles), was patrolled by the marine police.
- **National Committee for Strengthening Maritime and Coastal Security:** Coordinates all matters related to Maritime and Coastal Security and periodically reviews coastal security against threats from the sea with all stakeholders.
- **Coastal Surveillance Network:** Comprising of static sensors along coasts, **automatic identification systems** (AIS), long range tracking, day-night cameras and communication devices has been put in place.
- **Vessel Traffic Management System** (VTMS) radars are installed on all major & minor ports to facilitate surveillance.
- Commissioning of **Information Management & Analysis Centre** (IMAC) in Gurugram for easy collection and dissemination of shipping data for increased awareness.
- The Navy established **the Information Fusion Centre for the Indian Ocean Region** (IFC-IOR) at IMAC for 24/7 regional information sharing on commercial shipping.
- **Central Industrial Security Force** (CISF) now guards ports. Moreover, **Sagar Prahari Bal** was constituted as a special force from navy for protection of naval bases.

Strategies to address non-traditional maritime challenges

After 26/11, the Government of India effected a major overhaul of its coastal security structures, assets and operating procedures. The Indian Navy was designated as the lead agency, charged with overall Coastal Security, in coordination with the Indian Coast Guard, state marine police forces, port authorities, and other central/state government organisations. The main steps initiated in order to preclude any recurrence of 26/11 include the following:

- Joint Operation Centres (JOC) were set up at Mumbai, Visakhapatnam, Kochi, Port Blair; jointly manned and operated by Navy and Coast Guard.
- A National C3I Network was established for real-time maritime domain awareness, linking the Navy and Coast Guard, both, at field and apex levels.
- The 'Sagar Prahari Bal', comprising 1,000 men and 80 Fast Interceptor Craft (FIC) was formed for the protection of naval bases, Vulnerable Assets (VAs) and Vital Points (VPs) along the coast.
- Surface and air surveillance was enhanced by Indian Navy, Coast Guard Ships and aircraft along the coast and offshore development areas.
- Coastal Radar Stations and Auto Identification System (AIS) Chains were set up.
- Marine Police of coastal states and Union Territories were strengthened.

Controlling Traditional Threats: Business-end of Warfare

- **Anti-Submarine Warfare (ASW) Operations**. Potential employment of modern submarines and other potent undersea hardware — including unmanned submarines, manned submersibles and UUVs — by Pakistan and China, for sea denial, calls for priority enhancement of the Indian Navy's ASW capabilities at strategic, operational, and tactical levels.
- **Air Defence and Anti-Air Operations**. The Indian Navy's capacity for the conduct of anti-air operations has certainly been enhanced with the induction of modern carrier-based aircraft, UAVs, and airborne surveillance systems. In this context, the procurement of AWACS — including carrier-based Airborne Early Warning (AEW) aircraft — needs no further emphasis.
- **Joint Expeditionary Mission-Capabilities**. Since the influencing of events on land is one of the primary roles of a maritime force, the Indian Navy must create strategic sealift capabilities through the acquisition of heavy-lift helicopters and air-cushion vehicles, to prepare for large scale amphibious operations in the IOR littoral. Concurrently, the Indian Army must allocate more role-specific land-force formations, which would require to be closely integrated with amphibious, marine, and special forces of the three Services.

Mine Counter-Measure (MCM) Warfare

The Indian Navy's ability to keep designated channels across choke points and entrance/exit routes from harbours open for the safe transit of warships during a conflict would have a direct bearing on the conduct of further maritime operations. The ongoing critical deficiency in MCM hardware —mine-sweeping and mine-hunting ships and equipment —may cost the nation dearly in either of the above discussed scenarios, and the highest priority must be accorded to made good these deficiencies.

- **Special Operations**. The creation of a combined 'Special Operations Division' under the Integrated Defence Services Headquarters, to counter State-sponsored or non-State acts of terrorism, at very short notice, is a revolutionary step and one that must be further built upon.
- **Joint Operations**. Future wars will invariably be undertaken by forces acting jointly. Coordination and cooperation amongst the three Defence Services and other associated forces such as the Indian Coast Guard, including the promulgation of common doctrines, the coordination of strategies, achieving commonality in equipment and standard operating procedures, etc., are essential to the success of joint missions.

OTHER INITIATIVES UNDERTAKEN BY THE GOVERNMENT:

- To leverage the potential of being present on the oceanic trade route, Indian Government has called for the blue economy development, modernization of its ports, **Sagarmala programme**, **Industrial parks and logistic parks**. This will provide the port led development in the Indian coastal states thus fuel the Indian economy.
- **Operation Sagar Kavach** was put in operation post 26/11 to improve coordination between security agencies including Indian Navy, Coast Guard and the local police.
- **Indian Maritime Security Strategy (IMSS) 2015** of Indian Navy: envisages greater coordination between different maritime agencies; securing SLOCs; Maritime Security Operations for contemporary assessments of maritime terrorism, piracy etc.; multilateral maritime engagement, local capacity building, technical cooperation etc.
- **Coastal Security Scheme** to strengthen security infrastructure of Marine Police Force in coastal states/UTs.
- Enhance Maritime Domain Awareness through **National Command Control Communication and Intelligence Network (NC3I),** an over-arching coastal security network which collates and disseminates data about all ships, dhows, fishing boats and all other vessels operating near our coast.

Suggestions

- **State police agencies may be integrated** leveraging their unique access to fishermen and local communities, facilitating the flow of vital human intelligence.
- **Comprehensive legislations** must be enacted to place systems and processes for the protection of India's maritime infrastructure.
- The government must promulgate a **National Commercial Maritime Security Policy Document**, to articulate its strategic vision for maritime security.
- Given India's geostrategic location, it could sherpa a cluster of Indo-Pacific nations into a **"Sagar Panchayat"** and uphold the rule of law at sea.
- Given India's stakes in the Indian ocean, it is very significant for India to **develop blue-water naval capabilities.**
- India should **develop sea-denial capability** mainly **at choke points** in Indian ocean such as Strait of Hormuz, Bab-el-Mandeb, Strait of Malacca.
- **One Border One Force**: Kargil Review Committee had recommended, that **to enforce accountability, the principle of 'one border one force' may be adopted** while considering the deployment of forces at the border. The manning of land borders by the respective border guarding forces is independent of the boundaries of hinterland Indian Border States. However, in the maritime domain, the system fragments India's frontiers.

Conclusion

- The persisting weaknesses in India's maritime security prevent the realisation of impregnable maritime borders. Post-Mumbai attacks in 2008, an overhaul of the maritime security apparatus was witnessed with "emphasis on surveillance, intelligence gathering and information sharing amongst the various stakeholders". And the GoI took some concrete steps such as the setting up of **National**

Committee on Strengthening Maritime and Coastal Security (NCSMCS), **State Coastal/Marine Police (SCP/SMP)** and the Coastal **Security** Scheme (**CSS**), and making the Indian Coastal Guard responsible for Coastal Security.

- However, the measures remained largely conservative. Doable solutions exist, as has been demonstrated by the GoI in several matters involving national security. The appointment of National Maritime Security Coordinator is one such example. It is hoped that the NMSC would examine the core issues affecting India's maritime security and advise tangible measures to unlock the maritime potential of India.
- The most vital facet of maintenance of 'Core Competencies' over the long term would entail specific focus on niche areas related to warship and submarine building, aircraft production, and the development of a future-ready defence industrial base. Towards these ends, the recent **reorganization and corporatisation of the ordnance factories** by the Indian Government is a step in the right direction.
- Finally, **investment in future technology should be progressed as a national-level project**. This will not only catalyse the Indian naval preparedness to comprehensively deal with non-traditional maritime security challenges, but also ensure that asymmetric advantages that China and Pakistan, acting in collusion with each other, seek vis-à-vis India, are balanced in the maritime domain.

Q11. Economic growth in the recent past has been led by an increase in labour activity." Explain this statement. Suggest the growth pattern that will lead to the creation of more jobs without compromising labor productivity.

Labour productivity is an indicator of the efficiency of a country's workforce, providing a measure of the average output generated per worker (or per hour worked). In the long run, labour productivity is a key determinant of Economic Growth. Recently, the labour force in India increased to 437.2 million one of the largest with working age people who were out of the labour force joining back the labour market.

Labour and Economic Growth

During the initial years of India's development process, **labour was a key factor in contributing to building and enabling the growth of basic and heavy industries, which in turn was instrumental in strengthening India's infrastructure**.

In the last few decades, there has been a major spurt in the growth of India's services sector, which presently accounts for the largest share (nearly 55 per cent) of India's GDP. Here again, the contribution of labour has been particularly significant as some of the core services sector activities, such as education and health, are relatively employment intensive. The last two decades have witnessed rapid strides in technological advancements in India; what is remarkable how labour has responded to this transformation by equipping itself to reap the maximum advantage of new and emerging technologies and thus contributing to enhanced productivity and growth.

Promotion of remunerative jobs and provision of social protection to the workers have been accorded top priority in India's development policies. In fact, in recent years, a number of innovative and historic initiatives have been initiated with the objective of positioning labour at the centre of India's development strategies. These include the Enactment of Labour Codes; Universalisation of the Coverage of the Minimum Wages; Provision of Social Protection to Gig and Platform Workers; Significant Increase in Budget Allocation to Public Employment Programmes; Extension of Pensions to Unorganised Sector Workers; and Incentivisation of Quality Employment Generation. India is currently passing through a historic demographic transition. The fact that more than two-thirds of the country's population will be in the working-age group (15-64 years) for the next three decades further signals the tremendous potential of labour to contribute to India's development.

Recent past: Unprecedented productivity growth in 2020

The impact of the COVID-19 pandemic on the global economy and labour market resulted in unprecedented developments in labour productivity. The world's output per hour worked surged by 4.9 percent in 2020, more than double the long-term average annual rate of 2.4 percent registered

between 2005 and 2019. This is the fastest global growth in hourly productivity observed since data have been available. A similar trend is found across all major country income groups.

Situating India

In its World Economic Outlook, the IMF projected 6.8 per cent growth for India in 2022 and 6.1 per cent in 2023, the highest for any large economy. This makes India the **fastest-growing economy in the world**, this assumes significance as some countries in Europe like Germany and Italy are staring at recession next year. This year India overtook the U.K. to become the world's fifth-largest economy. 'Labour' represents the bedrock of this economic development.

Creation of more jobs without compromising labor productivity

Expanding Volume of Work

- Enlarging the opportunities for work needs to be completed to clear the backlog of unemployment and to provide jobs to the large additions being made to labour-force.
- The work to be expanded has to be both in the sphere of wage employment and self-employment.
- The ultimate avenue of more employment has to be found in the industrial sector, as also in the service sector.

Appropriate Mix of Production Techniques

- It is also necessary to choose such a combination of capital-intensive and labor-intensive technologies of production may generate maximum employment.
- Labour-intensive activities such as cottage/household activities and also many agricultural operations, provide employment but capital-intensive technologies, are, by and large, more employment-creating, labour when employed in capital intensive industries, give rise not only to capital goods but also generate employment in industries which provide inputs to them.
- Hence, the right mixes of technologies which may provide maximum employment at a higher wage rate and provide a surplus for further investment.

Implementation of Labour Codes

- The Indian state has to step in to boost the bargaining power of workers by ensuring decent minimum wage and adequate social security. The new labour codes incorporate these safety cushions, but everything will boil down to implementation.
- Setting a uniform minimum wage soon can provide significant economic security to Indian workers, especially those working at low-paying jobs. Another notable move is that the Code on Social Security allows the government to extend social security benefits to unorganised, platform, and gig workers.

Skilling

- In recent times, skill-development has become a priority for the government. The creation of the Ministry of Skill Development and Entrepreneurship in 2014 was a step towards the creation of a framework for skilling/re-skilling the population. Subsequently, the launch of the Skill India campaign in 2015 was aimed at imparting some 40 crore individuals with requisite skills by 2022. Such initiatives need to become more commonplace across the nation, with an emphasis on skilling young people about to enter the labour force. Estimates indicate that over 120 million workers will require to be retrained as a result of wider implementation of automation and artificial intelligence.

Conclusion

At present, the Indian economy is faced with a conundrum of simultaneously securing the future of an ever-increasing labour-force and sustaining high levels of economic growth through the adoption of capital-intensive technology in production. Inaction on these two fronts can have calamitous ramifications; without upskilling the working population and imparting necessary proficiency to young individuals, economic inequality will only rise and the working population with marginal financial stature may submerge into indigence.

We need to start by accepting the labour challenge at hand, steer policy towards not just labor-intensive manufacturing sectors but also the service sector, raise productivity and address skill mismatch issues, and capitalize on the expanding digital services as an engine of employment growth.

Government support for enhancing infrastructure is particularly essential for small and medium-sized enterprises to yield increased profits. Skill development for workers needs to be given the highest

priority for achieving faster and inclusive growth. This is also important for taking advantage of the demographic dividend in India.

Q12. Do you think India will meet 50 percent of its energy needs from renewable energy by 2030? Justify your answer. How will the shift of subsidies from fossil fuels to renewables help achieve the above objective? Explain. 15

As of August 2022, Renewable energy sources, including large hydropower, have a combined installed capacity of 163 GW.

The following is the installed capacity for Renewables:

- Wind power: 41.2 GW
- Solar Power: 59.34 GW
- Biomass/Co-generation: 10.2 GW
- Small Hydro Power: 4.88 GW
- Waste To Energy: 0.47 GW
- Large Hydro: 46.85 GW

India has set a target to reduce the carbon intensity of the nation's economy by less than 45% by the end of the decade, achieve 50% cumulative electric power installed by 2030, and achieve net-zero carbon emissions by 2070. The question is if we can meet the targets or not.

Achievements of India

India has progressively decoupled economic growth from greenhouse gas emissions. The global power sector is undergoing an accelerated transformation due to technological innovations and response to climate change protocols. At COP-21 in Paris in 2015, India committed to a 40% share of power generation from non-fossil fuel sources. **We have achieved this target a decade ahead of the 2030 timeline.**

India has been ranked amongst top 5 countries in the world, and the best among the G20 countries, based on its Climate Change performance. India jumps 2 spots higher, and is now ranked 8th as per Climate Change Performance Index (CCPI, 2023).

India was ranked fourth in wind power, fifth in solar power and fourth in renewable power installed capacity, as of 2020. According to the analytics firm British Business Energy, **India ranked 3rd globally in terms of its renewable energy investments and plans in 2020.**

India ranked **third on the EY Renewable Energy Country Attractive Index 2021.**

Even though it supports the second largest population in the world, India's sustained efforts have ensured that its per capita CO2 emissions are much lower than the global average. The US emits 14.7 tonnes per capita, China emits 7.6 tonnes per capita, while India's CO2 emissions amount to 1.8 tonnes per capita.

All these indicate that India can meet 50 percent of its energy needs from renewable energy by 2030.

Efforts taken in this direction

The Net Zero Emissions target by 2030 by Indian Railways alone will reduce emissions by 60 million tonnes annually.

Similarly, India's massive UJALA LED bulb campaign is reducing emissions by 40 million tonnes annually. To further complement these ongoing efforts, India launched the **National Hydrogen Mission** in 2013 to make India the world's largest hydrogen hub.

Grid Connected Solar Rooftop Programme

Objective: For achieving cumulative capacity of 40,000 MW from Rooftop Solar (RTS) Projects by the year 2022.

Solar Park Scheme

MNRE has come up with a scheme to set up a number of solar parks across several states, each with a capacity of almost 500 MW. The scheme proposes to offer financial support by the Government of

India to establish solar parks to facilitate the creation of infrastructure required for setting up new solar power projects in terms of allocation of land, transmission, access to roads, availability of water, etc.

International Solar Alliance

The International Solar Alliance (ISA) is an alliance of 121 countries initiated by India, most of them being sunshine countries, which lie either completely or partly between the Tropic of Cancer and the Tropic of Capricorn. The primary objective of the alliance is to work for efficient consumption of solar energy to reduce dependence on fossil fuels.

The initiative was launched by Prime Minister Narendra Modi at the **India Africa Summit,** and a meeting of member countries ahead of the 2015 United Nations Climate Change Conference (COP 21) in Paris in November 2015. The framework agreement of the International Solar Alliance opened for signatures in Marrakech, Morocco in November 2016, and 200 countries have joined. **HQ**- Gurugram, Haryana

PM KUSUM

Pradhan Mantri Kisan Urja Suraksha even Utthan Mahabhiyan (PM KUSUM) Scheme for farmers aims for installation of solar pumps and grid connected solar and other renewable power plants in the country.

The scheme aims to add solar and another renewable capacity of 25,750 MW by 2022.

National Green Corridor Project

The green energy corridor is grid connected network for the transmission of renewable energy produced from various renewable energy projects.

National Wind-Solar Hybrid Policy

This policy essentially aims at establishing a structure on the basis of which large-scale wind-solar hybrid power projects can be promoted.

National Offshore Wind Energy Policy

The objective is to develop the offshore wind energy in the Indian Exclusive Economic Zone (EEZ) along the Indian coastline.

Sustainable Rooftop Implementation for Solar Transfiguration of India (SRISTI) scheme

The Central government will offer with financial incentive to the beneficiary for installing Solar power plant rooftop projects within the country.

Biomass power & cogeneration programme

It is being implemented with the main objective of promoting technologies for optimum use of country's biomass resources for grid power generation.

Draft National Wind-Solar Hybrid Policy

The main objective of the Policy is to provide a framework for promotion of large grid connected wind - solar PV hybrid system for optimal and efficient utilization of transmission infrastructure and land, reducing the variability in renewable power generation and achieving better grid stability.

FDI Policy

100% FDI is allowed in the renewable energy sector under the Automatic route and no prior Government approval is needed.

Akshay Urja Portal and India Renewable Idea Exchange (IRIX) Portal

Promotes the exchange of ideas among energy conscious Indians and the Global community.

National Biogas and Manure Management Programme

Central Sector Schemes that provide for setting up of Family Type Biogas Plants mainly for rural and semi-urban/households.

GS-III EXPLANATIONS

Production Linked Incentive (PLI) Scheme

Incentives for High Efficiency Solar PV Modules for Enhancing India's Manufacturing Capabilities and Enhancing Exports.

Mission Innovation CleanTech Exchange

In June 2021, India launched the Mission Innovation CleanTech Exchange, a global initiative that will create a whole network of incubators across member countries to accelerate clean energy innovation.

India Renewables Dashboard

In April 2021, the Central Electricity Authority (CEA) and CEEW's Centre for Energy Finance (CEEW-CEF) jointly launched the India Renewables Dashboard which provides detailed operational information on renewable energy (RE) projects in India.

National Electricity Policy (NEP) 2021

In April 2021, the Ministry of Power (MoP) released the draft National Electricity Policy (NEP) 2021 and has invited suggestions from all stakeholders such as Central Public Sector Undertakings, Solar Energy Corporation of India, power transmission companies, financial institutions like Reserve Bank of India, Indian Renewable Energy Development Agency, HDFC Bank, ICICI Bank, industrial, solar, and wind associations, and state governments.

National Mission on advanced ultra-supercritical technologies

The Government of India has announced plans to implement a US$ 238 million National Mission on advanced ultra-supercritical technologies for cleaner coal utilisation.

Indian Railways Efforts

Indian Railways is taking increased efforts through sustained energy efficient measures and maximum use of clean fuel to cut down emission level by 33% by 2030.

Renewable energy park at the Rann of Kutch in Khavada, Gujarat

In July 2021, the Ministry of New and Renewable Energy (MNRE) gave the go ahead to NTPC Renewable Energy Ltd., a 100% subsidiary of NTPC, to build a 4,750 MW renewable energy park at the Rann of Kutch in Khavada, Gujarat. This will **be India's largest solar park to be developed by the country's leading power producer.**

Way Ahead: Shifting subsidies from Fossil Fuel to Clean Energy

India has to do a lot more to meet its net-zero emission target as Fossil fuel subsidies by the Union government have fallen 72% since 2014 but the subsidies on coal, oil and gas increased by nine times in 2021-22 - study by the think tanks International Institute for Sustainable Development (IISD) and the Council on Energy, Environment and Water (CEEW).

The energy sector received over Rs 5,40,000 crore in support from the government in 2021 with Rs 2,17,737 crore in subsidies. Subsidies to renewable energy dropped 59 percent to settle at Rs 6,767 crore after a high of Rs 16,312 crore in 2017.

The **government should move public support away from fossil fuels, and to clean energy, in a socially responsible way.** PSUs, PFIs, and the ministries should prepare roadmaps and scenarios on net-zero, identifying short-term actions to contribute to energy transition, including strategies on stranded asset risk, compliance with emerging environmental, social, and governance norms, **phasing out finance for fossil fuels, and increasing investment and lending for clean energy to crowd in private investments.**

There is a need for new support to meet clean energy targets to ensure a just transition and a formal channel, like **an electricity council, to shift subsidies**. Ministries should mandate energy PSUs to diversify into clean energy and adjust corporate social responsibility rules to push for sustainability. The revenue from fossil fuel should be set aside for social protection and public services to reduce living costs while backing clean energy.

The centre and the states must ensure **adequate support and financing models for clean energy in the medium and long term, in line with India's stated decarbonization goals.** Our policymakers should also find ways to offer affordable clean cooking energy to the poor and vulnerable sections.

Electric vehicle (EV) subsidies have more than tripled since FY 2017 to INR 849 crore in FY 2021. During the year, India announced a production-linked incentive program to attract investments in the domestic manufacturing of EVs and components. **With manufacturing receiving a boost, clean energy financing will be the next step to further scale-up deployment.**

India's non-banking financial companies are now playing a major role in shifting public finance away from fossil fuels, but as of today, no public finance institutions (PFIs) have established clear plans for phasing out finance for fossil fuels. In fact, annual disbursements by the largest PFIs were three times higher for fossil generation than renewable energy in FY 2021. While several public sector undertakings (PSUs) announced new clean energy partnerships and targets, they **need to set out clear strategies for adjusting business models to clean energy transition and net-zero.**

To accelerate the pace of India's energy transition, public finance institutions need to increase the clean energy sector lending targets, in line with stated policy targets, and develop a medium- to long-term roadmap for phasing out public finance for fossil fuels and managing possible stranded assets. They should seek to swiftly end new public finance for coal-based power plants or mining to minimize the already high levels of exposure to fossil assets.

Q13. What are the main bottlenecks in upstream and downstream process of marketing of agricultural products in India? 15

Agricultural marketing system is an efficient way by which the farmers can dispose their surplus produce at a fair and reasonable price. It includes all those activities which are mostly related to the procurement, grading, storing, transporting and selling of the agricultural produce. Improvement in the condition of farmers and their agriculture depends to a large extent on the elaborate arrangements of agricultural marketing.

Bottlenecks

Too Many Intermediates

One of the biggest shortcomings of Indian farming marketing is so many intermediaries and their manipulation of farmers. These intermediaries manipulate producers, on one side, by buying the produce at cheaper rates, and on the other, by seeking higher prices from them, exploit the consumers. The only objective is to obtain higher income from middle-processes from a variety of commission agents, brokers etc. These intermediaries use their financial capital in an unfair way for the former deprived.

Lack of Organised Marketing System

In India, the marketing of agriculture is also very poor since structured marketing is not in fashion, for example, cooperative companies, government marketing operations, daily markets, etc. As a consequence, the farmer stays intruded. The absence of a coordinated marketing scheme is also detrimental to farmers.

Lack of Store Houses

Significant amounts of grain are wasted for lack of adequate and unscientific facilities. Around 20 to 30% of the profits are wasted by mice, mosquitoes and so on. Because of the absence of such services, farmers have to suffer crumbles.

Corrupt Policies of the 'Mandis'

Middlemen and merchants make plain farmers foolish together.
→ The improper selling scheme is laden so far in India that approximately 5 per cent in the name of gifts, 'dharmada' and 'chanda' is deducted from the agricultural products etc.
→ Since they lack the understanding of commodity prices, changes in their prices, government policy etc. the farmers are paid lower prices.

→ Significant quantities of grains from farmers are collected as samples prior to auction. The minimum rates are charged for the commodity by claiming it to be of poor quality.

Malpractices in the market

There are huge number of unregulated markets which adopt various malpractices. Prevalence of false weights and measures and lack of grading. Adulteration, Black Marketing and Hoarding, and standardization of products in village markets in India are always going against the interest of ignorant, small and poor farmers.

Producer does not determine the price

The farmer does not realise the price at which his products will be offered to the ultimate buyer. The farmer doesn't choose anything. The ultimate price in the selling of agricultural products is determined only by the intermediaries. In reality, the farmer does not know his income.

Distress Sale

Most of the Indian farmers are very poor and thus have no capacity to wait for better price of his produce in the absence of proper credit facilities. Farmers often have to go for even distress sale of their output to the village moneylenders-cum-traders at a very poor price.

Lack of Transportation

In the absence of proper road transportation facilities in the rural areas, Indian farmers cannot reach nearby mandis to sell their produce at a fair price. Thus, they prefer to sell their produce at the village markets itself.

Lack of Market Intelligence

There is absence of market intelligence or information system in India. Indian farmers are not aware of the ruling prices of their produce prevailing in big markets. Thus, they have to accept any un-remunerative price for their produce as offered by traders or middlemen.

Lack of Institutional Finance

In the absence of adequate institutional finance, Indian farmers have to come under the clutches of traders and moneylenders for taking loan. After harvest they have to sell their produce to those moneylenders at unfavourable terms.

Lack Of Effective Peasants' Organization

There are many peasants organizations affiliated to one or the other political organization. There is lack of peasants' organization which would focus its attention on occupational interest of peasants.So, real farmers are always exploited.

In the meanwhile, many agricultural marketing initiatives/ schemes has been taken/ formulated to facilitate farmers:

- Agricultural Marketing Infrastructure (AMI),
- National Agriculture Market,
- E-NAM (National Agriculture Market),
- Farmer Producer Organizations, Food Corporation of India (FCI), and Agricultural Produce Marketing Committee (APMC).
- Rashtriya Krishi Vikas Yojana - Remunerative Approaches for Agriculture and Allied Sector Rejuvenation (RKVY-RAFTAAR) Scheme,
- Agricultural Marketing Infrastructure (AMI) sub-scheme of Integrated Scheme for Agricultural Marketing (ISAM).
- Agriculture Infrastructure Fund (AIF)- to provide a medium-long term loan facility for post-harvest market infrastructure including warehousing facility and community farming assets through interest subvention and financial support.
- Online platforms such as *Farmkart*, *Agricolos, Khetgaadi* provide input services, precision services, agri-rental services, respectively.
- Third party assaying and warehousing services are provided by platforms such as Intello Labs and Godamvale.
- Kisanmandi.com provide access to market intelligence including price information.

- **Operation Greens** is on the lines of Operation Flood and it is a scheme launched to revitalize the Tomato, Onion, Potato (TOP) supply chain.
- **Market Intelligence and Early Warning System (MIEWS)** to monitor the prices of TOP crops and generate alerts for farmers.
- 86% of Indian farmers are small and marginal and are still exploited by middlemen. To solve this challenge, governments have been pushing for the organization of small and marginal farmers in **Farmer Producer Organisations (FPOs) and Self Help Groups (SHGs)** to link them to benefits that come with economies of scale and injecting professionalism in their management.

Remedial Measures for Improvement of Agricultural Marketing

- Establishment of more regulated markets.
- Establishment of more cooperative marketing societies.
- Extension and **construction of additional storage and warehousing facilities** for agricultural produce of the farmers.
- Expansion of market yards and other allied facilities for the new and existing markets.
- Provision is made for **extending adequate amount of credit facilities** to the farmers.
- Timely supply of marketing information's to the farmers.
- Improvement and extension of road and transportation facilities for connecting the villages with mandis.
- Provision for **standardisation and grading of the produce** for ensuring good quality to the consumers and better prices for the farmers.
- Formulating suitable agricultural price policy by the Government for making a provision for remunerative prices of agricultural produce of the country.
- There is a need to **set up a marketing cell** in every line department of State governments to bring about the perspective of market driven production in agriculture and allied sector. The cell should promote all the modern instruments of marketing on the extension platform such as contract farming, retail chain linkages, farmers-exports / processor linkages, spot markets, direct marketing, aggregation mechanisms such as FPCs, SHGs, cooperatives etc,. for their respective commodities.
- The **unemployed youth** in rural areas have to be **incentivized to set up enterprises** to directly supply different agriculture/horticultural produce to households, hotels, restaurants, hospitals, etc. This will go a long way towards bringing about direct linkages and shortening of long marketing chains.
- Enhancing processing / export / value addition, and participation of farmers in the modern instruments like Futures Market, Spot market etc., will ensure better returns to the farmers.
- **Reforming APMC Mandis:** The monopoly of APMC Mandis needs to be reduced to ensure competition and choices for farmers.
- **Learning from Karnataka:** The Rashtriya e-market Services Ltd. (ReMS), a joint by the Karnataka government and NCDEX Spot Exchange, offers automated facilities like weighting, invoicing, market fee collection, accounting assaying facilities in the markets, facilitates the warehouse-based sale of produce and price dissemination. Mandis in Karnataka have also been integrated into a single licensing system. The Karnataka model is enabling the '**ease of doing business** and needs to be replicated by other states Mandis need to be built close to the farmers.
- The **Swaminathan Committee Report** envisages a mandi within a 5km radius of a farmer.
- The **layers between producers and consumers needed to be cut** to ensure benefits to both-farmers and consumers. Examples of farmers' markets include- Apni Mandi in Punjab and Rajasthan, Hadapsar in Pune, Rythu Bazars in AP, and Uzhavar Santhai in Tamil Nadu. These experiments need to be replicated In other states.
- The government needs to hold broad-based consultations with stakeholders and **re-introduce the Farm Laws with the requisite changes.** Changes in laws like the Essential Commodities Act, Agriculture Produce Marketing Acts of states are necessary to create an enabling framework and encourage private sector investment.

Conclusion

The shift from a supply-pushed to a demand-led production system is only possible with the creation of a strong agri-marketing ecosystem. All the schemes and programs mentioned above need to be implemented on mission mode to realize the goal of '**One Nation, One Market**.

Q14. What is an Integrated Farming System ? How is it helpful to small and marginal farmers in India ? 15

Integrated farming **means combining crop production with livestock management** that complement each other in a way that is a well-symbiotic relationship that is currently economically viable and profitable, environmentally friendly, and benefiting from the diversity of production. In the integrated farming system, agriculture can be integrated with livestock, poultry, and fish are kept in one place to create year-round employment and additional income.

Aim – It is a combination of different agricultural activities in a unit area of land aimed at;

1. Maximum return from unit area
2. Maintaining soil status and fertility
3. Ensuring supplementary and complementary enterprise relationships to use the by-products of one component of the farming system as inputs to the other
4. To reduce environmental pollution.

Elements of integrated farming system

- Farm Ponds.
- Biological Pesticides.
- Biogas.
- Bio-fertilizers.
- Solar Energy.
- Vermicompost making.
- Green manuring.
- Rainwater harvesting.
- Watershed management.

Advantages of an integrated farming system

- The integrated farming systems approach introduces changes in farming techniques for **maximum productivity in crop samples and maximizes resource utilization.**
- Ensures field waste is recycled in an integrated system for production purposes. A reasonable combination of agribusinesses such as dairy, poultry, pig, fisheries, silk farming, etc., **can bring prosperity in agricultural activities** according to the given agro-climatic conditions and socio-economic status of the farmers.
- Increasing crop production to supply the exploding population of our country. **Increase farm income** due to proper use and recycling of residues and by-products.
- Environmental pollution can be reduced by effective recycling of animal waste such as dairy, pig, poultry, etc. **Reduction in input costs** through recycling of related activities by-products.
- Integrated farming **can generate a steady income** through products such as eggs, meat, milk, vegetables, silkworms, and cocoons. Cultivation of fodder crops such as intercropping and border cropping will result in the availability of nutritious fodder for animals.
- **Energy-saving –** The IFS system effectively reduces the additional dependence on fossil fuels as a source of energy by providing alternative fuel sources as by-products of various enterprises. Example of biogas.
- **Meeting the fodder crisis** – Perennial legume fodder trees can be grown within the boundaries of the farm. These bean trees not only fix nitrogen for the field but also provide quality fodder for the animals.
- **Solving the Fuel and Timber Crisis** – Fuel and industrial wood production is achieved through IFS. It also reduces deforestation and helps protect the natural ecosystem.
- **Employment Generation** – The combination of agricultural and livestock enterprises will increase the demand for labor and increase employment opportunities.

- **Agro-industries** – The high production of agro-products in IFS also greatly contributes to the growth of agro-industries and agribusiness in the country.
- **Increased input efficiency –** Input efficiency in this farming system has increased significantly as dependence on external inputs such as fertilizers, food, agrochemicals, and energy has decreased.
- **Yearly income** – Due to the variety of businesses in IFS, the farmer earns year-round income. It has a positive effect on farmers' lifestyle components such as food, shelter, health, and education.
- The improved production system is one of the most important benefits of integrated farming. An increase in productivity means that **economic yield per unit area per unit increases over time due to the intensity of crops and allied farming enterprises.**
- **As productivity increases, so does the profit margin.** This is because we are using the waste material or by-product of one enterprise as input to another farming enterprise.
- Adopting new technology is one of the major benefits of an integrated farming system. This is because money is needed to adopt the technology. Large farmers have finances so they can easily adopt it. However, small farmers generally face financial constraints. But because of the integrated farming system, they have the opportunity to increase their profits from farming and adapt to new technologies.
- It improves soil fertility and soil physical structure from appropriate crop rotation and using cover crops and organic compost. It also minimizes the nutrient losses.
- It reduce weeds, insect pests and diseases through appropriate crop rotation.
- There is higher net returns to land and labour resources of the farming family.

Closing Thought

In a nutshell, an integrated farming system fulfils the multiple objectives of making farmers self-sufficient by ensuring the family members a balance diet, improving the standard of living through maximizing the total net returns and provide more employment, minimizing the risk and uncertainties and keeping harmony with environment. India has the rich diversity of livestock, poultry, crops and horticulture. Utilization of our national resources efficiently is very much important for sustainable development. Thus, this system of farming is very promising for improving overall farm productivity, profitability, generating employment opportunities, conserving natural resources and maintain the sustainability of agroecosystem by effective recycling the farm by-products and efficient utilization of available resources. Integrating Farming System is the unique approach for overall upliftment of rural community and conserving the natural resources and crop diversity. Integrated farming system (IFS) is considered as one of the best option towards intensification of small holder farm income to ensure sustainable livelihood.

Q15. Launched on 25th December, 2021, James Webb Space Telescope has been much in the news since then. What are its unique features which make it superior to its predecessor Space Telescopes? What are the key goals of this mission? What potential benefits does it hold for the human race?

NASA's James Webb Space Telescope was launched on 25 December 2021 on an Ariane 5 rocket from Kourou, French Guiana, and it arrived at the Sun–Earth L2 Lagrange point in January 2022. It succeeded the Hubble Space Telescope as NASA's flagship astrophysics mission.

Webb is the **largest, most powerful telescope ever launched into space**. The Ariane 5 deployed the telescope **directly into the second Lagrange point (L2),** a location nearly four times farther away than the Moon and 1.5 million kilometres from Earth in the direction away from the Sun.
With its 6.5 m primary mirror **it is detecting the faint light of distant stars and galaxies.**

The James Webb Space Telescope (JWST) is be more powerful than its predecessors and will be able to see further into space to discover distant planets in far-off galaxies. It will even give us the tools to search for indications of an atmosphere that could sustain life.

Features

Mass

The James Webb Space Telescope has **a mass that is about half of Hubble Space Telescope's mass**. The JWST has a 6.5-meter (21 ft)-diameter **gold-coated beryllium primary mirror** made up of 18 separate hexagonal mirrors. The mirror has a gold coating **to provide infrared reflectivity** and this is covered by a thin layer of glass for durability.

Technology

It boasts many new technological advances, including a **deployable sunshield and a folding segmented mirror.** The mirror has to be kept cold — minus 400 degrees Fahrenheit — so it has a sun shield the size of a tennis court that acts as a giant beach umbrella.

Wavelength

The James Webb Space Telescope will observe primarily in the infrared range and provide coverage from 0.6 to 28 microns. The instruments on Hubble see mainly in the ultraviolet and visible part of the spectrum. It could observe only a small range in the infrared from 0.8 to 2.5 microns.

Orbit

Hubble orbits around the Earth at an altitude of ~570 km. Webb will not orbit the Earth. It will orbit the sun at about 1.5 million kilometres away from Earth.

Mirror Size Comparison

Compared to mirrors available on the current generation of space Telescopes, **Webb's primary mirror has a diameter of about 6.5 meters,** giving it a substantially bigger collecting area.

Webb has an almost 6.25 times larger collecting area than Hubble because of Hubble's mirror's significantly smaller 2.3 meter diameter and 4.5 metre square comparable collecting area. **Compared to Hubble's NISMOS Camera, Webb's field of view is around 15 times greater and its spatial resolution is about 100 times higher than Spitzer's infrared counterpart.**

Object Observation

JWST is designed primarily for near-infrared astronomy, but can also see orange and red visible light, as well as the mid-infrared region, depending on the instrument. It **can detect objects up to 100 times fainter than Hubble can**, and objects much earlier in the history of the universe, back to redshift z≈20 (about 180 million years cosmic time after the Big Bang).
JWST can also observe objects in the Solar System at an angle of more than 85° from the Sun and having an apparent angular rate of motion less than 0.03 arc seconds per second. This includes Mars, Jupiter, Saturn, Uranus, Neptune, Pluto, their satellites, and comets, asteroids and minor planets at or beyond the orbit of Mars.

Webb, is able to see back in time to the earliest objects in the universe for the first time. Also, for the first time, we will be able to characterize other planets going around other stars, distant exoplanets, and see if there are oceans, an atmosphere, what chemical elements are there.

Key Goals

The key goals of the telescope include-

- Looking back over 13.5 billion years to see the first stars and galaxies forming out of the darkness of the early universe,
- Help astronomers compare the faintest, earliest galaxies to today's grand spirals and ellipticals and
- See right through and into massive clouds of dust where stars and planetary systems are being born.
- Measure Planetary Systems and investigate for potential life.
- Observe the formation of stars and evolution of galaxies.
- Search for the first galaxies found in the early Universe.
- Explore the early phases of cosmic history, looking back in time to only a few hundred million years after the Big Bang.
- Discovery of exoplanets, meaning planets outside the solar system.

- The telescope will observe the universe in the near-infrared and mid-infrared at wavelengths longer than visible light. To do so, it carries a suite of state-of-the-art cameras, spectrographs and coronagraphs.
- Webb will see farther into our origins: from the formation of stars and planets to the birth of the first galaxies in the early Universe.

Significance

James Webb telescope will allow researchers to observe far-flung asteroids, some with moons, to learn more about the makeup and history of our solar system. The Webb telescope won't be able to decisively say there's definitely life on a planet or not, but it **begins to map out that space** and say, 'That may be an ocean there,' which gives us **a road map to probe further and really investigate.**
Using the Telescope scientists are planning to **investigate the nature of dark energy in the universe**, and understand the nature of these very old objects. And characterizing planets around other suns **puts humanity on the path to finding out if there's another Earth out there**. The Webb **will also assist in the hunt for exoplanets**.

Webb can detect infrared wavelengths for fingerprinting chemicals such as water and methane present in the atmosphere of exoplanets, which are planets beyond our solar system. If life exists outside of Earth, it will release distinct chemical signatures, such as by breathing carbon dioxide and photosynthesizing out oxygen, that can transform a planet. **Analyzing the chemicals in a planet's atmosphere will not only allow scientists to look for life**, but **also enable them to assess a planet's habitability.**

Q16. What is the basic principle behind vaccine development? How do vaccines work? What approaches were adopted by the Indian vaccine manufacturers to produce COVID-19 vaccines? 15

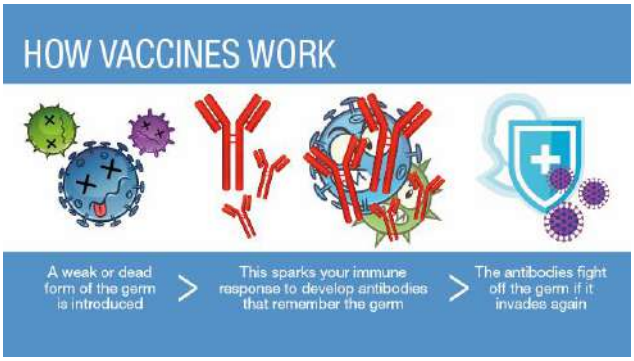
A **vaccine** is a biological preparation that provides active acquired immunity to a particular infectious or malignant disease. A vaccine typically contains an agent that resembles a disease-causing microorganism and is often made from weakened or killed forms of the microbe, its toxins, or one of its surface proteins. The agent stimulates the body's immune system to recognize the agent as a threat, destroy it, and to further recognize and destroy any of the microorganisms associated with that agent that it may encounter in the future.

Basic principle behind vaccine development

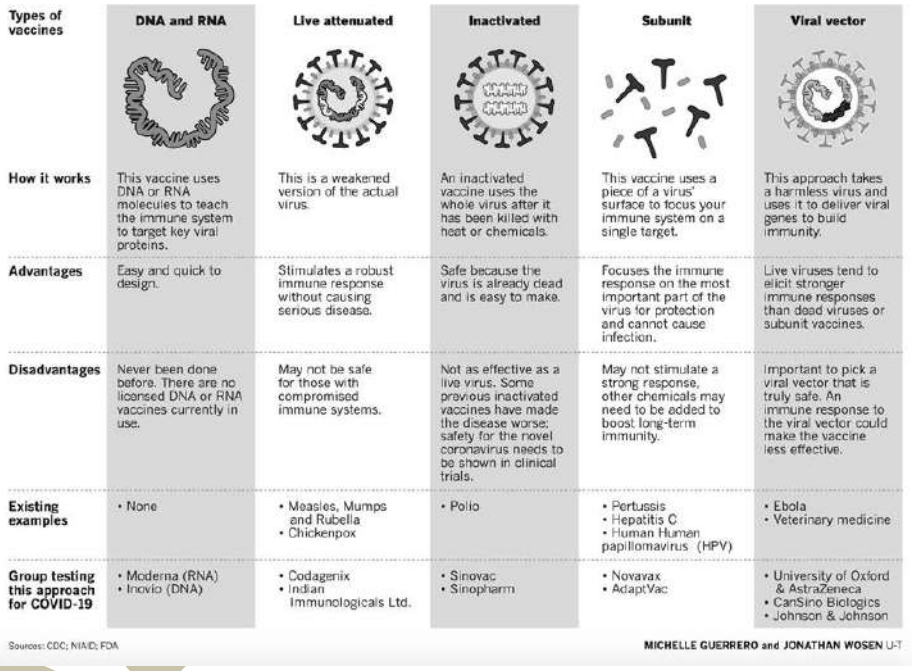
Vaccination constitutes a major advance in the prevention of infectious diseases. The principle of vaccination is **to induce protection against a pathogen by mimicking its natural interaction with the human immune system**. The vaccine reduces the risk of complications and mortality following subsequent exposure to an infectious agent. Vaccines induce the immune system to produce an immunological memory based on **T and B lymphocytes** in order to produce a rapid and effective response to exposure to the targeted pathogen.
The improvement of existing vaccines and the discovery of new vaccines requires an understanding of the immunological principles of vaccination. Great challenges remain, particularly in terms of target pathogens for future vaccine candidates and also the acceptance of vaccination. Understanding the principles of vaccination allows development of vaccines and the control of infectious diseases.

Working of Vaccines

Vaccines work by stimulating a response from the immune system to a virus or bacterium. This creates a 'memory' in the immune system. This immune memory allows the body to 'remember' a specific virus or bacterium, so that it can protect itself against this virus or bacterium and prevent disease that it causes.
Most vaccines contain a weakened or an inactivated (killed) form of a virus or bacterium, or a small part of the virus or bacterium that



cannot cause disease. This is called an **antigen**.
When a person gets a vaccine, their immune system recognises the antigen as **foreign**. This activates the immune cells so that they kill the disease-causing virus or bacterium and make antibodies against it.
It also activates **immune cells** - called T-cells and B-cells - in the blood, in the bone marrow and throughout the body.
Later, if the person comes into contact with the actual virus or bacterium, their **immune system** will remember it.
It can then produce the right **antibodies** and activate the right immune cells quickly, to kill the virus or bacterium. This protects the person from the disease.
Different vaccines bring about different levels of **protection**. How long protection lasts also depends on the disease it protects against. Some vaccines can only protect against a disease for a short period and may need booster doses; for others, immunity can last a lifetime.
Vaccination does not only protect people who have received a vaccine. By decreasing the risk of being exposed to infection, it also indirectly protects unvaccinated people in the community, such as children who are too young to be vaccinated or people with weakened immune systems.
This **community immunity** (also called herd immunity) needs enough people in an area to be vaccinated.



Types of vaccines	DNA and RNA	Live attenuated	Inactivated	Subunit	Viral vector
How it works	This vaccine uses DNA or RNA molecules to teach the immune system to target key viral proteins.	This is a weakened version of the actual virus.	An inactivated vaccine uses the whole virus after it has been killed with heat or chemicals.	This vaccine uses a piece of a virus' surface to focus your immune system on a single target.	This approach takes a harmless virus and uses it to deliver viral genes to build immunity.
Advantages	Easy and quick to design.	Stimulates a robust immune response without causing serious disease.	Safe because the virus is already dead and is easy to make.	Focuses the immune response on the most important part of the virus for protection and cannot cause infection.	Live viruses tend to elicit stronger immune responses than dead viruses or subunit vaccines.
Disadvantages	Never been done before. There are no licensed DNA or RNA vaccines currently in use.	May not be safe for those with compromised immune systems.	Not as effective as a live virus. Some previous inactivated vaccines have made the disease worse; safety for the novel coronavirus needs to be shown in clinical trials.	May not stimulate a strong response, other chemicals may need to be added to boost long-term immunity.	Important to pick a viral vector that is truly safe. An immune response to the viral vector could make the vaccine less effective.
Existing examples	• None	• Measles, Mumps and Rubella • Chickenpox	• Polio	• Pertussis • Hepatitis C • Human Human papillomavirus (HPV)	• Ebola • Veterinary medicine
Group testing this approach for COVID-19	• Moderna (RNA) • Inovio (DNA)	• Codagenix • Indian Immunologicals Ltd.	• Sinovac • Sinopharm	• Novavax • AdaptVac	• University of Oxford & AstraZeneca • CanSino Biologics • Johnson & Johnson

Sources: CDC; NIAID; FDA

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India's Vaccine Manufacturing approach during Covid 19

India's capabilities in the manufacturing of vaccines came to the fore during the COVID-19 pandemic. The world became witness to India's vaccine manufacturing prowess as India provided equitable access to resilient supply chains and logistics - further strengthening its position in the vaccine segment.
India began administration of **COVID-19 vaccines** on 16 January 2021. Till now India has administered over **2.19 billion** doses overall.

India initially approved the Oxford–AstraZeneca vaccine (manufactured under license by Serum Institute of India under the trade name Covishield) and Covaxin (a vaccine developed locally by Bharat Biotech). They have since been joined by the Sputnik V (manufactured under license by Dr. Reddy's Laboratories, with additional production from Serum Institute of India being started in September, Moderna vaccines, Johnson & Johnson vaccine and ZyCoV-D (a vaccine locally developed by Zydus Cadila).

India's National Covid-19 Vaccination Strategy was based on scientific and epidemiological evidence and focuses on systematic end-to-end planning.

Phase-I of the National Covid-19 Vaccination Strategy was launched on 16th January 2021 and focussed on protecting Health Care Workers (HCWs) and Front Line Workers (FLWs).

Phase-II was initiated from 1st March 2021 and 1st April 2021 and focussed on protecting the most vulnerable i.e. population more than 45 years of age.

Phase- III Liberalised Pricing and Accelerated National Covid-19 Vaccination Strategy came in effect from 1st May 2021 under which COVID-19 Vaccination was opened for persons 18-44 years of age groups.

Closing Thoughts

Although COVID-19 initiated the necessary boost to streamline and optimise manufacturing processes, India's growth in the vaccine segment has been steady. India has emerged as a dominant force in vaccines for diseases such as measles, Bacillus Calmette–Guérin (BCG), and Diphtheria, Tetanus and Pertussis (DPT). For instance, India accounts for nearly 90% of the global demand for the measles vaccine. India now supplies ~60% of the global demand for vaccines, with ~33% of vaccines supplied by Telangana's life sciences ecosystem only. Biologicals and formulations (including vaccines) account for 77.5% of India's pharmaceuticals' export portfolio. During the pandemic, by utilising the vibrant vaccine manufacturing ecosystem and adhering to the core Indian philosophy of **Vasudhaiva Kutumbakam – the world is one family,** India not only provided vaccines to 1.4 billion population but also catered to the world community with India supplying 242 million low-cost and high-quality vaccines to 101 countries.

Q17. Discuss Global Warming and mention its effects on the global climate. Explain the control measures to bring down the level of greenhouse gasses which cause global warming, in the light of the Kyoto Protocol, 1997. 15

Global warming is the long-term heating of Earth's surface observed since the pre-industrial period (between 1850 and 1900) due to human activities, primarily fossil fuel burning, which increases heat-trapping greenhouse gas levels in Earth's atmosphere.

Effects of Global Warming on the Global Climate

- Global warming is closely associated with a broad spectrum of climate changes, such as:
  - Increases in the frequency of intense rainfall,
  - Decreases in snow cover and sea ice,
  - More frequent and intense heat waves,
  - Rising sea levels, and
  - Widespread ocean acidification.

Rise in Global Temperature

One of the most immediate and obvious consequences of global warming is the increase in temperatures around the world. The average **global temperature has increased by about 1.4 degrees Fahrenheit (0.8 degrees Celsius) over the past 100 years,** according to the National Oceanic and Atmospheric Administration (NOAA). As global average temperatures warm, weather patterns are changing. An immediate consequence of global warming is extreme weather.
Rising temperatures **are affecting wildlife and their habitats**. Vanishing ice has challenged species such as the Adélie penguin in Antarctica, where some populations on the western peninsula have collapsed by 90 percent or more. As temperatures change, many species are on the move. Some butterflies, foxes, and alpine plants have migrated farther north or to higher, cooler areas.

Rainfall

Precipitation (rain and snowfall) has increased across the globe, on average. **Yet** some regions are experiencing more **severe drought, increasing the risk of wildfires, lost crops, and drinking water shortages.**

Snow Cover

Ice is melting worldwide, especially at the Earth's poles. This includes mountain glaciers, ice sheets covering West Antarctica and Greenland, and Arctic Sea ice. In Montana's Glacier National Park the number of glaciers has declined to fewer than 30 from more than 150 in 1910. Much of this melting ice contributes to sea-level rise. Global sea levels are rising 0.13 inches (3.2 millimeters) a year. The rise is occurring at a faster rate in recent years and is predicted to accelerate in the coming decades.

Heat Waves

March 2022 was the hottest in India since records began 122 years ago. The Sixth Assessment Report of the Inter-governmental Panel on Climate Change (IPCC) warned that the Indian subcontinent would suffer more frequent and intense heat waves over the coming decade. An increase in heat-absorbing greenhouse gases intensifies an unusual atmospheric circulation pattern already observed during heat waves in Europe and North America.

According to IPCC Report, for 1.5°C of global warming, there will be increasing heat waves, longer warm seasons and shorter cold seasons. At 2°C of global warming, heat extremes would more often reach critical tolerance thresholds for agriculture and health, the report shows.

Sea Level Rise

Sea level rise is **caused primarily by two factors related to global warming: the added water from melting ice sheets and glaciers, and the expansion of seawater as it warms**.

According to the **Intergovernmental Panel on Climate Change (IPCC)** "about 93% of the excess heat energy stored by the Earth over the last 50 years is found in the ocean" As the oceans warm, they increase in volume, raising global sea levels.

Global average sea level has risen **8–9 inches (21–24 centimeters) since 1880**. In 2021, global sea level set a new record high—97 mm (3.8 inches) above 1993 levels.

Widespread ocean acidification

Seas are acidifying ten times faster today than 55 million years ago when a mass extinction of marine species occurred. Current changes in ocean chemistry due to the burning of fossil fuels may portend a new wave of die-offs.

Climate change triggered by Global Warming is likely to cause more storms, floods, droughts, heatwaves and other extreme weather events.

In a nutshell,

- Emissions from human activities followed by Global Warming are increasing the frequency of extreme weather events. In particular, there are likely to be many more heatwaves, droughts and changes in rainfall patterns.
- The temperature is estimated to increase by 2 to 6^{o} Celsius within year 2100, which is a tremendous increase from our current average temperature of 1.7^{o} Celsius (IPCC).
- By the mid-2020s, sea level rise around Manhattan and Long Island could be up to 10 inches, assuming the rapid melting of polar sea ice continues. By 2050, sea-rise could reach 2.5ft and more than 4.5ft by 2080 under the same conditions.
- Global warming threatens the planet in a new and unexpected way – by triggering earthquakes, tsunamis, avalanches and volcanic eruptions.

Measures to control GHG emissions

- **Reduce the use of fossil fuels**. The main contributor to greenhouse gas emissions is the burning of fossil fuels. We need to reduce our dependency on oil, gas, and coal. Renewable energy needs to be the future.
- **Use of Renewable Energy:** Renewable energy sources include solar energy, geothermal energy, wind turbines, ocean wave and tidal energy, waste and biomass energy, and hydropower. Because they do not burn fossil fuels, these renewable energy sources do not release greenhouse gases.
- **Nuclear Energy:** Nuclear energy also creates no greenhouse gas emissions, so it can be thought of as a solution to climate change. However, it does generate radioactive waste that needs long-term, secure storage.
- **Change our diets**. Livestock production and farming methods are one of the main drivers of environmental damage, causing deforestation, biodiversity loss and greenhouse gas emissions. Today, about a fifth of global carbon emissions come from raising farm animals for meat. By eating less meat and more locally produced food, we can make a collective impact on emissions.
- **Conserve forests**. The destruction of rainforests releases carbon dioxide into at atmosphere. By preserving the remaining forests and restore that which we've lost, we can mitigate some of the damage done by greenhouse gases.
- **Fuel Blending**: Blending biofuels with gasoline creates fewer emissions and has the potential to offset greenhouse gas emissions.
- **Reduce Industrial Emission:** Manufacturing, mining for raw materials, and dealing with the waste all take energy. Most of the products that we buy — everything from phones and TVs to clothing and shoes — are created in factories, which produce up to about 20% of the greenhouse gases emitted worldwide. There are ways to decrease emissions from manufacturing. Using materials that aren't made from fossil fuels and don't release greenhouse gases is a good start. For example, cement releases carbon dioxide as it hardens, but there are alternative products that don't create greenhouse gases. Similarly, bioplastics made from plants are an alternative to plastics that come from fossil fuels. Companies can also use renewable energy sources to power factories and ship the products that they create in fuel-saving cargo ships.
- **Travelling without releasing GHGs:** Burning fossil fuels for transportation adds up to 14% of global greenhouse gas emissions worldwide. We can reduce emissions by shifting to alternative technologies that either don't need gasoline (like bicycles and electric cars) or don't need as much (like hybrid cars). Using public transportation, carpooling, biking, and walking leads to fewer vehicles on the road and less greenhouse gases in the atmosphere. Cities and towns can make it easier for people to lower greenhouse gas emissions by adding bus routes, bike paths, and sidewalks.
- **Take carbon dioxide out of the air:** Planting trees, bamboo, and other plants increases the number of carbon sinks. Conserving forests, grasslands, peatlands, and wetlands, where carbon is held in plants and soils, protects existing carbon sinks. Farming methods such as planting cover crops and crop rotation keep soils healthy so that they are effective carbon sinks. There are also carbon dioxide removal technologies, which may be able to pull large amounts of greenhouse gases out of the atmosphere.

Kyoto Protocol: An attempt to reduce GHGs

The Kyoto Protocol included clear regulations on how greenhouse gases were to be reduced. It came into force in 2005 and was replaced by the Paris Agreement in 2021.

The Protocol

The Framework Convention on Climate Change (UNFCCC) was adopted at the United Nations Conference on Environment and Development in Rio de Janeiro in 1992, with the aim of stabilising greenhouse gas concentrations in the atmosphere at an acceptable level in order to combat the serious consequences of climate change. After ratification by the 50th nation, it came into force in 1994.

The signatories have since met at regular intervals at what are known as COPs (Conference of the Parties), in order to agree on how to proceed with international climate protection efforts. In 1997, this meeting was held in Kyoto, Japan, where the "Kyoto Protocol" was adopted as the first document with legally binding obligations to limit and reduce greenhouse gas emissions for the ratified industrial

countries. Two periods of validity were established: 2008 to 2012 (1st commitment period) and 2013 to 2020 (2nd commitment period).

Aim and Objectives

During the first period, industrial countries were to reduce their greenhouse gas emissions by an average of 5.2 per cent compared to 1990. The countries of the European Union along with Switzerland made it their goal to reduce their greenhouse gas emissions by an average of eight per cent compared to 1990. No fixed reduction targets were defined for emerging and developing countries at that time.

The Kyoto Protocol presented mechanisms that were to help industrial countries achieve their emissions reduction targets. These so-called flexible mechanisms or Kyoto mechanisms allowed the industrial countries to deliver some of their reduction commitments abroad. The Clean Development Mechanism (CDM) represented an important framework for the voluntary offsetting market.

Kyoto Protocol applies to **6 greenhouse gasses; carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride.**

Countries Involved

The Kyoto Protocol was Ratified by over 191 countries. It came into force in 2005, after which it was signed by over 55 countries, which were responsible for at least 55 per cent of the CO_2 emissions of industrial countries in 1990. The USA never joined the Kyoto Protocol, while Canada left it before the end of the first period.

Achievements

The emissions reductions for the first commitment period were achieved. However, the trend shows that countries such as the USA, as well as emerging countries such as China, Mexico, Brazil and India, steadily increased their CO_2 emissions over the same period.

Looking Forward

Paris Agreement replaced Kyoto Protocol and at COP21 in Paris in 2015, the “Paris Agreement” was adopted, which for the first time included a specific goal for limiting global warming to significantly below 2°C, with a target of preferably 1.5°C compared to the pre-industrial level of 1750. The Paris Agreement rightly states that all signatories – not just industrial countries as in the case of the Kyoto Protocol – **must commit** to binding targets for CO_2 reduction, a steadily increasing ambition and the net-zero target.

Final thoughts

The issue of greenhouse gas emissions is evidently a serious one. The damage we humans have caused is already at a critical point, and without some serious interventions, the future is looking bleak.

However, by learning about the impacts of the greenhouse effect and climate change, we can start to take steps to correct it. The greenhouse gasses we release into our atmosphere today will stay there for thousands of years The actions— and inactions—we take right now will have a significant impact future generations. We need to take collective responsibility for our planet and ensure that we preserve the precious environment we live in.

Q18. Explain the causes and effects of coastal erosion in India. What are the available coastal management techniques for combating the hazard? 15

Coastal erosion is **the process by which local sea level rise, strong wave action, and coastal flooding wear down or carry away rocks, soils, and/or sands along the coast**.

Natural Causes behind Coastal Erosion

Hydraulic Action

Hydraulic Action is the sheer force of water crashing against the coastline causing material to be dislodged and carried away by the sea.

Compression

Compression occurs in rocky areas when air enters into crack in rock. This air is trapped in cracks by

the rising tide, as waves crash against the rock the air inside the crack is rapidly compressed and decompressed causing cracks to spread and pieces of rock to break off. Compression is one of the main processes that result in the creation of caves.

Abrasion

Abrasion is when rocks and other materials carried by the sea are picked up by strong waves and thrown against the coastline causing more material to be broken off and carried away by the sea.

Attrition

Attrition is when material such as rocks and stones carried by waves hit and knock against each other wearing them down. As these materials are worn down sand and rounded beach pebbles are formed.

Anthropogenic Causes of Coastal Erosion

Sand and Coral Mining, and Dredging

The mining of sand and gravel along beaches and in the surf-zone will cause erosion by depleting the shore of its sediment resources. In connection with maintenance dredging of tidal inlets, harbours, and navigation channels, sand is very often lost from the littoral budget because the sand, unless otherwise regulated by legislation, is normally dumped at deep water. Coral mining and other means of spoiling the protective coral reefs, for example, fishing by the use of explosives or pollution, will also cause coastal erosion and beach degradation. The protective function of the reef disappears and the production of carbonate sand stops.

Sediment Starvation

Dams built for flood control and water catchment along the rivers leading to these coasts inhibit the transport of large-grained sediments. Lacking new material, the sediment-starved coasts erode and migrate inland.

Sea Walls

Seawalls constructed to protect property along retreating beaches often exacerbate beach erosion. They confine the wave energy and intensify the erosion by concentrating the sediment transport processes in an increasingly narrow zone. Eventually, the beach disappears, leaving the seawall directly exposed to the full force of the waves.

Coastal Degradation

Human actions that lead to the destruction of dune grasses and the disturbance of coastal landforms promote increased erosion and movement of beach materials. Off-road vehicles and foot traffic on sand dunes compact sand, destroying plant roots and animal burrows.
Bulldozing Sand dunes to improve views of the sea destroys this natural protection. Dredging navigation channels and tidal inlets and discharging the material in deep water also remove sediment from the coastal system and interfere with longshore transport. Canals cut in wetlands for navigation, pipelines, and drainage provide channels for salt-water invasion during storms and high tides; the increased salinity often kills marsh plants, leading to accelerated land loss and deterioration of wetlands.

Impact of Coastal Erosion

Environmental impacts from erosion include the destruction of animal habitats and asthetic losses. Fishing industries that are dependent on coastal habitats can suffer great economic impacts from changes caused by coastal erosion, and the loss of tourism can result in similar repercussions. Coastal features like dunes and mangroves provide a natural defense against several hazards, including tsunamis and storm surges, so their loss due to erosion may signal an increase in vulnerability from these hazards. Major disasters can damage or destroy natural buffers, or simply speed up the rate of ongoing erosion equating to years of non-disaster-related losses in a single event.

Coastal areas are home to major cities around the globe, as well as roughly 40% of the world's population. From lost land and destroyed assets to reduced revenue potential as tourism and other industries are threatened, coastal erosion is a growing concern for nations all around the world.

As wetlands are lost or changed due to erosion, upland regions also become more vulnerable to waves and storm surges. In this way, areas not on the coast can be negatively impacted by coastal erosion as well. Coastal erosion cause direct loss of or damage to property such as buildings and infrastructure.

Coastal erosion and related processes can also disrupt shipping ports by making it more difficult for ships to reach ports and harbors, slowing down or otherwise altering the flow of goods. This has the potential to sharply impact trade in areas most heavily affected by erosion.

Evidence has shown that tourists are less likely to return to areas suffering from continued erosion of beaches. Fishing, agriculture, and many other industries are also liable to be negatively impacted by erosion.

Coastal Erosion in India

According to the National Centre for Coastal Research (NCCR) which analysed the data of 6632 km of the mainland coastline for 26 years (1990-2016), about 2247 km (34%) of mainland coast is under varying degree of erosion ranging from low, moderate and high.
Of the coastline that is eroding, 40% is in four states/UTs alone. West Bengal has lost 99 sq km of land in the past 26 years, making up 63% of the state's coastline and equivalent to the area occupied by 18,500 football fields. Puducherry has lost 57% of its coastline, Kerala 45%, and Tamil Nadu 41%, to heavy erosion..

Human activities particularly urbanisation, hard construction and economic activities in coastal areas turned coastal erosion into a problem of growing intensity. Anthropological effects like **construction of coastal structures, mining of beach sand, offshore dredging and dams** on rivers are prime reasons for triggering erosion.

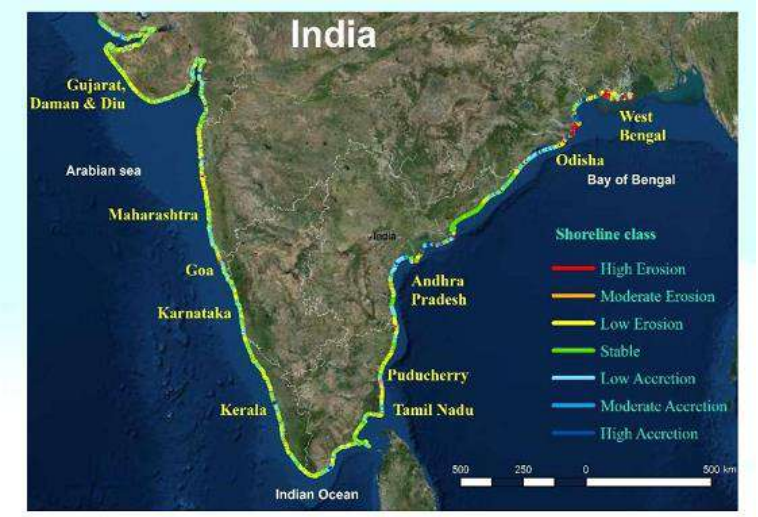

Figure 8: Shoreline change map along Indian coast (1990-2016)

India's coasts are under attack both from man-made activities--such as **growing construction, damming of rivers, sand mining and destruction of mangroves--as well as natural causes linked to climate change such as rising sea levels**.
Meanwhile, **several severe and minor cyclonic storms entering into eastern Indian coasts added to sea erosion** as they damaged the mangrove and other green belt with large sedimentations as well as caused other damage to beaches.

Then, there are **13 major ports, 46 fishing harbour and 187 minor ports on the coast** for the building and maintenance of which sediments are regularly removed. This sediment is rarely ever returned to the coast.

All this has left India's coasts vulnerable to the full impact of climate change. Climate change is making weather systems in the Bay of Bengal erratic. The Lakshadweep lagoons, which are enclosed water bodies, are also getting eroded because of sea level rise.
Coastal erosion hotspots are spread all along India's coastline. There are several hotspots along the Kerala coastline, recently left devastated by floods. Tamil Nadu coast is also impacted by erosion, but the eastern coast, around the Bay of Bengal, is the worst affected.

The Ministry of Environment Forest & Climate Change has issued the Coastal Regulation Zone (CRZ) 2019 notification with a view to conserve and protect the unique environment of the coastal stretches and marine areas, besides livelihood security to the fisher communities and other local communities in the coastal areas. The new constructions in coastal areas are being governed by this notification.
Initiatives like mangrove plantation of about 16000 ha, shelter belt plantation of 1900 ha and installation of Geo-Tubes in 500 m have been taken up. However, the government is at the same time planning to boost the major and minor ports along Indian coasts for the ambitious Sagarmala project and also planning to construct coastal highways.

Techniques to combat Coastal Erosion

Set up a green belt/buffer zone

The purposes of setting up coastal green belts must not be solely for preventing coastal erosion and mitigating other natural hazards, but also for addressing the socio-economic status of the local communities as well as ecological sustainability.
The purposes of coastal green belts/buffer zones must serve to:

- Control and stabilize the shoreline by holding and trapping sediments and consolidate land for areas such as intertidal mudflats with mangrove green belts and sandy coasts with *Casuarina*, pine trees or coconuts and palm trees;
- Attenuate the force of devastating storm surges and waves that accompany cyclones and tsunamis;
- Provide an amenity and a source of food, materials and income for local communities; and
- Benefit biodiversity and create habitat corridors for wildlife that can be used for conservation activities and ecotourism development.

Revegetation and temporary offshore breakwaters/artificial reefs

In some cases, revegetation in a low energy environment is required because deforestation of the coastal forest has led to direct exposure to wave action. There is also a need to establish offshore breakwaters/artificial reefs as temporary wave protection structures for mangroves and saltmarshes; otherwise, seawalls/revetments for vegetation that grows above the highest water mark such as *waru*, *Casuarina*, pine and palm trees can be built. Once the plants have established themselves, the structures may be removed.

Beach nourishment and artificial headlands/groynes

To reduce the frequency of renourishment and downdrift erosion in beach nourishment options, artificial headlands or groynes can be used as they can trap the downdrift movement of sediment.

Jetties

This solution involves constructing a line of long structures perpendicular to the coast that reach into the ocean. These are usually made from stone, concrete, steel, or timber, and are designed to keep sand from entering a ship channel. As sand builds up on against the upcurrent side of the jetties, it can be redistributed along the beach to further reduce erosion. However, much like groins, erosion still occurs on the downcurrent side of the jetties.

Breakwaters

These are barriers that are constructed offshore parallel to or at an angle to the shoreline. Breakwaters act as a wave barrier, allowing the beach to grow while preventing harmful erosion. As waves hit the breakwater, they deposit their load of sediment along it. However, any part of the coast not protected by the breakwater continues to experience erosion.

Vegetation

Strategic planting of vegetation can be used to help control erosion. the roots of coastal plants help to anchor the sand and ensure that it is not carried off in erosion. This is why many areas plant seagrass and build marshes along coasts to prevent erosion. However, this solution means that the beach may not be as functional as it once was, particularly if it is a tourist area.

Coir

Coir is a particularly effective material for helping prevent coastal erosion, especially for beaches that are in danger of washing away or have been nourished with new deposits of sand recently.

Geotextile Installation

Geotextile wall is a popular and highly effective method of controlling erosion and improving soils over which roads, earth-retaining structures, embankments, and pipelines are built.
Geotextiles come in various types, including warp-knitted structure, open mesh woven geotextile, or nonwoven geotextile. The application will determine the type of geotextile wall that will be used.

Mangroves

Mangroves go a long way to reduce wind speeds and the swell of waves during storm surges. They bind the sand together and arrest erosion.

Thermodynamic Shelterbelt Model

There is the thermodynamic shelterbelt model in which four levels of vegetation are planted. Grass is planted closer towards the sea, followed by shrubs, herbs and finally the trees. But these plants take 5-10 years to establish and become effective.

Stopping Construction along coastlines

Avoiding construction close to the coast is one of the easiest steps to take, according to scientists. The technical knowledge to identify areas that are at risk of erosion is available.

Closing Thoughts

Coastal erosion is a natural process but the rate at which the erosion is happening here has accelerated over the past few decades. Artificial techniques to prevent erosion is there but a heavily managed coastline, for example a beach with a seawall, cannot adapt very well to climate change impacts and requires constant attention, whereas a natural coastline, or one that is managed using more sustainable methods on management such as nourishment, can naturally adapt to climate change impacts.
In a new coastal regulatory zone draft **the No Development Zone (NDZ) around coastal areas was reduced from 100 mt to 50 mt allowing for more construction along the coast in rural areas--**the opposite of what scientists advise. Coasts in urban areas don't have NDZ at all. The move is being hailed as one meant to benefit builders.
Coastal erosion is a severe problem for maritime developing countries like India and immediate attention needs to be given to combat coastal erosion in effective manner on a scientific basis for evolving suitable design of coastal protective structure.

Q19. What are the different elements of cyber security? Keeping in view the challenges in cyber security, examine the extent to which India has successfully developed a comprehensive National Cyber Security Strategy. 15

Cyber security is the practice of defending computers, servers, mobile devices, electronic systems, networks, and data from malicious attacks. It's also known as information technology security or electronic information security.

Elements of Cybersecurity

- **Network security** is the practice of securing a computer network from intruders, whether targeted attackers or opportunistic malware.
- **Application security** focuses on keeping software and devices free of threats. A compromised application could provide access to the data its designed to protect. Successful security begins in the design stage, well before a program or device is deployed.
- **Information security** protects the integrity and privacy of data, both in storage and in transit.
- **Operational security** includes the processes and decisions for handling and protecting data assets. The permissions users have when accessing a network and the procedures that determine how and where data may be stored or shared all fall under this umbrella.
- **Disaster recovery and business continuity** define how an organization responds to a cyber-security incident or any other event that causes the loss of operations or data. Disaster recovery policies dictate how the organization restores its operations and information to return to the same operating

capacity as before the event. Business continuity is the plan the organization falls back on while trying to operate without certain resources.

- **End-user education** addresses the most unpredictable cyber-security factor: people. Anyone can accidentally introduce a virus to an otherwise secure system by failing to follow good security practices. Teaching users to delete suspicious email attachments, not plug in unidentified USB drives, and various other important lessons is vital for the security of any.

Challenges in Ensuring Cyber Security

- Widespread digital illiteracy.
- Use of Substandard devices.
- Rampant use of unlicensed software and underpaid licenses also make them vulnerable.
- Lack of adoption of new technology.
- Lack of uniform standards.
- Import dependence.
- Lack of adequate infrastructure and trained staff.
- Anonymity.
- Lack of coordination among various agencies working for cyber security.

Sources

1. a) Nation States
2. b) Cyber Criminal Organisations
3. c) Terrorists, DTOs, etc.,
4. d) Hackers / Hacktivists

Threats

- Malware – Malicious software to disrupt computers
- Viruses, worms
- Theft of Intellectual Property or Data
- Hactivism – Cyber protests that are socially or politically motivated
- Mobile Devices and applications and their associated Cyber Attacks
- Social Engineering – Entice Users to click on malicious links
- Spear Phishing – Deceptive Communications (e-mails, texts, tweets)
- Domain Name System (DNS) Attacks
- Router Security – Border Gateway Protocol (BGP) Hijacking
- Denial of Service (DoS) – blocking access to websites

National Cyber Security Strategy

It was conceptualised by the Data Security Council of India (DSCI), headed by Lt **General Rajesh Pant** report that focuses on 21 areas **to ensure a safe, secure, trusted, resilient, and vibrant cyberspace for India.** The main sectors of focus of the report are:

- **Large scale digitisation of public services** that focus on security in the early stages of design in all digitisation initiatives, developing institutional capability for assessment, evaluation, certification, and rating of the core devices and timely reporting of vulnerabilities and incidents.
- **Supply chain security**: Monitoring and mapping of the supply chain of the Integrated circuits (ICT) and electronics products, scaling up product testing and certification.
- **Critical information infrastructure protection**: Integrating Supervisory control and data acquisition (SCADA) security with enterprise security, monitoring digitisation of devices, evaluating security devices, maintaining a repository of vulnerabilities
- **Digital payments**: Mapping and modeling of devices and platform deployed, supply chain, transacting entities, payment flows, interfaces and data exchange, timely disclosure of vulnerabilities
- **State-level cyber security**: Developing state-level cybersecurity policies, allocation of dedicated funds, critical scrutiny of digitization plans, guidelines for security architecture, operations, and governance
- **Security of small and medium businesses**: Policy intervention in cybersecurity granting incentives for higher level of cybersecurity preparedness, developing security standards, frameworks, and architectures for the adoption of Internet of Things (IoT) and industrialisation.

Concern

- Amid a surge in cyberattacks on India's networks, the Centre is yet to implement the **National Cyber Security Strategy which has been in the works since 2020.**

Why does India need a failproof cybersecurity strategy?

- Government's digital push: Various programs of government such as Aadhaar, MyGov, Government e-Market, DigiLocker, Bharat Net etc. are prompting a larger number of citizens, companies and government agencies to transact online.
- Start-ups digital push
- India the fifth most vulnerable country in the world in terms of cybersecurity breaches.
- India saw at least one cybercrime every 10 minutes during the first half of 2017 including more sophisticated cyber threats such as the WannaCry and Petya ransomware.
- India accounted for 5.09 per cent of all cyberattacks such as malware, spam and phishing attacks detected globally in 2017.
- The estimated cost of cyber-attacks in India stands at four billion dollars which is expected to reach $20 billion in the next 10 years.
- India ranks 3rd in terms of number of internet users after USA and China. By 2020, India is expected to have 730 million internet users with 75% of new users from rural areas. The number has grown 6-fold between 2012-2017 with a compound annual growth rate of 44%.
- India secures a spot amongst the top 10 spam-sending countries in the world alongside USA
- India was ranked among the top five countries to be affected by cybercrime, according to a 22 October report by online security firm "Symantec Corp".
- As per American cybersecurity firm Palo Alto Networks' 2021 report, **Maharashtra was the most targeted state in India — facing 42% of all ransomware attacks**.
- The report stated that **India is among the more economically profitable regions for hacker groups** and hence these hackers ask Indian firms to pay a ransom, usually using cryptocurrencies, in order to regain access to the data.
- **One in four Indian organisations suffered a ransomware attack in 2021 — higher than the global average of 21%.**
- Software and services (26%), capital goods (14%) and the public sector (9%) were among the most targeted sectors. An increase in such attacks has brought to light the urgent need for strengthening India's cybersecurity.

Suggestions

- **Dedicated authority:** Currently National Cyber Security Coordinator (NCSC) and Indian Computer Emergency Response Team (CERT-In) are handling cybersecurity issues in India. There is an urgent need of having a comprehensive and unified government institution for creating a **cyber defence network**
- **Unified inter-regulator:** Currently, RBI, SEBI, IRDAI, TRAI, PFRDA, etc, have different cybersecurity framework for their regulated entities. However, none of the frameworks talk about inter-regulator coordination or integrated approach to handle cybercrime.
- A **holistic cybersecurity strategy** with a possible **amendment in the IT Act,** as some of its provisions have become redundant and can't address issues arising from the evolving threats.
- **Cyber Defence Agency**: Government needs to consider creating a Cyber Defence Agency, which is to be entrusted with the responsibility to implement the cyber defence strategy solely for national security.
- **Constitution of cyber commando force** as a part of the defence program to neutralise any cross-border cyber terrorism or cyber-attack.
- Create **specialised cyber police cadres** in all State police departments.
- **Sectorial CERT and state-level CERT** would be more effective for rapid response on any cyber-attack. The state-level CERT team will need to ensure speedier incident response and coordination with national agencies.
- Building a business ecosystem to leverage artificial intelligence and robotics to improve cyber defence.
- **Pass the proposed Data Protection Bill** to protect critical information like personal data, business information, and financial information.

- **Budgetary provisions:** A minimum allocation of 0.25% of the annual budget, which can be raised upto 1% has been recommended to be set aside for cyber security. Setting up a **Fund of Funds for cybersecurity** and provide Central funding to States to build capabilities in the same field.
- **Research, innovation, skill-building and technology development:** The report suggests investing in modernisation and digitisation of Integrated Circuits (ICT), set up a short and long term agenda for cyber security via outcome-based programs and provide investments deep-tech cyber security innovation.
- **A national framework** should be set in collaboration with institutions like National Skill Development Corporation (NSDC) and ISEA (Information Security Education and Awareness) to provide global professional certifications in security.
- **Crisis management**: For adequate preparation to handle crisis, holding cybersecurity drills which include real-life scenarios with their ramifications. To identify possible weakness and exploitations in systems, DSCI recommend sharing of threat information between government departments.
- **Cyber insurance**: To address cybersecurity risks in business and technology scenarios as well as calculate threat exposures DSCI recommends developing cyber insurance products for critical information infrastructure and quantify the risks involving them.
- **Cyber diplomacy:** Cyber diplomacy plays a huge role in shaping India's global relations. Hence cyber security preparedness of key regional blocks like BIMSTEC and SCO must be ensured via programs, exchanges and industrial support.
- **Cybercrime investigation**: With the increase in cybercrime across the world, the report recommends unburdening the judicial system by creating laws to resolve spamming and fake news.
- **Advanced forensic training for agencies** to keep up in the age of AI/ML, Blockchain, IoT, Cloud, Automation. Creating a special cadre of Cybercrime investigators.

Closing Thoughts

Cyber security is important because it encompasses everything that relates to protecting our data from cyber attackers who want to steal this information and use it to cause harm. This can be sensitive data, governmental and industry information, personal information, personally identifiable information (PII), intellectual property, and protected health information (PHI). Having advanced cyber defence programs and mechanisms in place to protect this data is crucial and in everyone's interest. Cybercrime is an increasingly serious problem, and **to address it, strong cybersecurity is critical.**

Q20. Naxalism is a social, economic and developmental issue manifesting as a violent internal security threat. In this context, discuss the emerging issues and suggest a multilayered strategy to tackle the menace of Naxalism. 15

Introduction

The Naxalite–Maoist insurgency, officially referred to as the Left Wing Extremism (LWE), is an ongoing conflict between Maoist groups known as Naxalites or Naxals (a group of communists supportive of Maoist political sentiment and ideology) and the Indian government.

Maoist motto, "power flows from the barrel of gun", is their motivating force. Naxalites seek to overthrow the State through violent means.

They openly proclaim lack of faith in the democratic means of ballot and adhere to the violence as a means of achieving their ends. **Naxal affected areas in India are known as the 'Red Corridor'. The Naxal movement started with the tribal-peasant uprising against landlords in Naxalbari village of Darjiling district, West Bengal in 1967.**

Later, this militant movement spread all over West Bengal and was carried on by a large number of other groups in different States.

Naxals are also known for their liaison with external terrorist outfits like LTTE for pooling of resources, particularly in the acquisition of weaponry, communication technology and the like. Violence being the driving force of Naxal ideology, they often resort to killing and kidnap.

The Maoist insurgency doctrine glorifies violence as the primary means to overthrow the existing socio-economic and political structures.

Causes of left-wing extremism in India:

- The failure of land reforms especially land redistribution after independence.

- Socio-economic inequities, unemployment, despair about the future.
- Dishonest and self-serving dominant groups
- Political deprivation leading to hopelessness or a sense of powerlessness.
- Lack of title to public land cultivated by the landless poor.
- Governance deficit in the remote parts of Red Corridor regions.
- Lack of food security – corruption in the Public Distribution System (which are often non-functional).
- Disruption of traditional occupations and lack of alternative work opportunities.
- Displacement of people: Eviction from lands traditionally used by tribals.

Strategic challenges to resolve the problem of Naxalism in India

- There are liberated areas like **'Abhujmadh',** an area of 7000 sq km mainly in Chhattisgarh, which has no administrative machinery or police stations to govern this huge mass of land having nearly 237 villages and a population of about 20,000 tribals. This area serves as the **Nerve Centre of Naxalites** housing logistic and training bases. This area has not even been surveyed by the revenue department.
- **Inadequate Police Force, in all the Naxal affected districts**. The density of police force per sq km is just about 30 per cent of the average need. Not only this, the training and equipment profile, which goes to create the desired capability and capacity of the security force, is far from satisfactory.
- **Naxalites themselves do not want any developmental activity to succeed**, they do not allow construction of roads and want the area to remain as such for their designs to succeed and the tribals to remain dependent on them.
- **Naxalites resort to killings, kidnappings, abductions, extortions and IED blasts** with impunity. They are **reported to have developed linkages with terrorist organisations, like Maoists (Nepal), ULFA (Assam)** and with other northeast extremist organisations for training and procurement of modern weapons.
- Naxalites are able to raise adequate funds for their cadres and other needs. It is estimated that **their annual income runs into nearly 14 billion rupees.**
- 80 per cent of coal reserves and nearly 19 per cent of other rich mineral resources are located in naxal affected tribal areas. With pressures building on greater exploitation of national resources, to maintain India's growth trajectory, this has given them an additional weapon and impetus to extract maximum benefits and greater scope for extortion.
- **Exploitation and oppression of dalits, adivasis and landless people**, living in interior areas due to feudal agrarian system and strong interface of caste and class. For the adivasis forest is their natural habitat and their means of livelihood. They have been deprived of their land and even the picking rights of the minor forest produce through the unfair Forest Conservation Act of 1980, which needs immediate relook.
- **Alienation of the population,** due to virtual absence of health care, drinking water, roads, electricity and educational facilities in the interior areas, from the Government machinery.
- There are schemes after schemes for the development of the area – Central Government has allocated thousands of crores, but on ground not even 20 per cent of it has been deployed. The **current system has failed to deliver or implement any of these schemes.**

Steps undertaken

- Though primarily a State subject, Ministry of Home Affairs (MHA) has promulgated a **'National Policy and Action Plan'** since 2015 to address the Left-Wing Extremism (LWE) menace holistically and the progress & the situation is being monitored rigorously and this Policy consists a multi-pronged approach.
- **Review and monitoring mechanisms:** These include intelligence sharing through Multi-Agency Centre (MAC) at the Central and State levels, and Multi Agency Centre (SMAC) at the subsidiary level on a 24x7 basis.
- **Better inter-state coordination:** Government of India has taken a number of steps to improve inter-state coordination which includes frequent meetings and interactions between the official machinery of the bordering districts of Left Wing Extremism affected States across the country.
- **Tackling the challenge of Improvised Explosive Devices (IEDs):** The Union Home Ministry has formulated a Standard Operating Procedure (SOP) on 'Issues related to Explosives/IEDs/Landmines in naxal affected areas' and the same has been circulated to the stakeholders for compliance.

- **Strengthening of air support:** State Governments and the Central Armed Police Forces (CAPFs) have been provided with enhanced air support in terms of UAVs and helicopters for anti-naxal operations, including evacuation of causalities/injured persons.
- **Security Related Measures**
- Deployment of the CAPFs: Battalions of the CAPFs/Naga Battalions (BNs) are deployed for assisting the State Police in the LWE affected States.
- India Reserve (IR)/Specialised India Reserve Battalion (SIRB): Naxal affected States have been sanctioned 45 IR battalions mainly to strengthen their security apparatus and also to enable the States to provide gainful employment to youth, particularly in the severely affected belts.
- Security Related Expenditure (SRE) Scheme: funds are provided for meeting the recurring expenditure relating to insurance, training and operational needs of the security forces, rehabilitation of Left Wing Extremist cadres who surrender, community policing, security related infrastructure for village defence committees and publicity material to create awareness against violence.
- Construction/Strengthening of Fortified Police Stations
- Scheme for Special Infrastructure (SSI): This Scheme was started during the 11th Plan period with 100% funding by the Centre for filling up critical infrastructure gaps, not be covered under any other scheme.

Ministry of Home Affairs is **supporting the State Governments for Capacity Building and strengthening of Security Apparatus** by:

- Deployment of CAPF Battalions,
- Provision of helicopters and uavs and
- Sanction of India Reserve Battalions (irbs)/ Special India Reserve Battalions (sirbs).
- Funds are also provided under Modernization of Police Force (MPF), Security Related Expenditure (SRE) Scheme and Special Infrastructure Scheme (SIS) for modernization and training of State Police.

For **development of LWE Affected States**, Government of India (GoI) has taken several developmental initiatives which include:

- sanction of 17,600 Kilometers of **road under Road Requirement Plan-I.**
- to improve telecom connectivity in LWE affected districts, **Mobile Towers** have been installed
- for financial inclusion of the people in LWE affected districts, **Post Offices, Bank Branches, ATMs and Banking Correspondents have been opened**
- for imparting quality education to the youth in areas affected by LWE, special focus is given to opening of **Eklavya Model Residential Schools (EMRS).**
- under **Special Central Assistance (SCA) Scheme** for further impetus to development in the most affected districts, more than 10000 projects have been taken of which more than 80% are already completed.
- **Integrated Action Plan (IAP)/ Additional Central Assistance (ACA):** commenced in 2010-11 covering 60 Tribal and Backward districts for accelerated development by providing public infrastructure and services
- Implementation of **Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Rights) Act, 2006**
- **Civic Action Programme (CAP):** This Scheme is under implementation from 2010-11.
- **Surrender and Rehabilitation Policy**

MHA had categorized certain districts as LWE affected and covered under Security Related Expenditure (SRE) Scheme for specific resource mobilization to the affected States for counter LWE measure.

- Of these SRE districts, the districts accounting for more than 85% of country-wide LWE violence and are categorized as '**Most Affected Districts**' for focused deployment of resources - both security and development related.
- To arrest the expansion plan CPI (Maoist) and also to restrict them to bounce back in the areas recently taken away from LWE influence, 08 districts have been categorized as **'District of Concern'**. The revised categorization is a more realistic representation of current LWE scenario.
- **Greyhounds**: It was raised in 1989 as an elite anti-Naxal force.

- **Operation Green Hunt**: It was started in 2009-10 and massive deployment of security forces was done in the Naxal-affected areas
- **Aspirational Districts Programme**: Launched in 2018, it aims to rapidly transform the districts that have shown relatively lesser progress in key social areas.
- **SAMADHAN**doctrine is the one-stop solution for the LWE problem. It encompasses the entire strategy of government from short-term policy to long-term policy formulated at different levels. SAMADHAN stands for-
  - S- Smart Leadership,
  - A- Aggressive Strategy,
  - M- Motivation and Training,
  - A- Actionable Intelligence,
  - D- Dashboard Based KPIs (Key Performance Indicators) and KRAs (Key Result Areas),
  - H- Harnessing Technology,
  - A- Action plan for each Theatre,
  - N- No access to Financing.
- **ROSHNI** is a **special initiative** under, **Pandit Deen Dayal Upadhyaya Grameen Kaushalya Yojana (Formerly Ajeevika Skills)**, launched in June 2013 for training and placement of rural poor youth from 27 LWE affected districts in 09 States
- **Intelligence sharing** and raising of a separate 66 Indian Reserved Battalion(IRBs), CRPF battalions like COBRA battalion, Bastariya battalion etc were done by the government to curb the menace of LWE organizations.

Where are we lacking?

The Naxalites have a centralised command and control; whereas, **our response is most diffused**. We have got to **evolve a national strategy and response in a holistic manner** which is **ruthlessly implemented with specific time frame and strict monitoring**. Political considerations must give way to national interest. The strategy must focus on tackling security environment and infrastructure development simultaneously, which would require immediate revamping and capability enhancement of the security forces deployed in these areas apart from improving numbers of security personnel per sq km of the affected area. The Governance per se and an innovative delivery system has to be put in place without any further delay. For all this to happen, **better coordination between Central Government and respective State Governments** has to be there. The present approach of State Governments towards National Counter Terrorism Centre (NCTC) has to give way to what is the need of the hour.

If this strategy can be put in place **our focus should be on economic development** which is the most promising solution to the current state of affairs. Economic development increases accessibility and decreases individual dependence on others for survival. This also would **encourage demographic mobility to reduce the feeling of alienation.** For this, the Government has to be the prime mover and **we cannot indefinitely wait for 'peace to return first' concept.** What, possibly is needed is **'aggressive infusion of developmental effort'** which should be all encompassing as far as essential human needs are concerned. One last thing I want to mention is that we have got to restore the 'dignity' of the Adivasis and evolve a system to get them speedy 'Justice' close to their place of residence.

The Naxalite Maoist insurgency has been festering in India since 1946. Naxalism is a natural outcome of abject poverty, deprivation, exploitation, injustice and poor socio-economic conditions of an area. In India, it is a case of 'rich land but poor people'.

Non implementation of land reform laws, archaic forest laws, corrupt and repressive administration made the situation worse for the lower classes, especially the tribals in these regions. This coupled with illegal and uncontrolled mining activities, clearance of forests for timber, dams and industries led to large scale displacements of the indigenous tribes without any proper rehabilitation programmes.

According to a study by D Bandhopadhyay, Chairman of the Expert Group of Planning Commission on **"Development Issues to deal with Causes of Discontent, Unrest and Extremism",** the villagers in the Maoist dominated areas lost trust and confidence in successive governments because 5.5 crore of the rural population was displaced between 1951 and 2005. These sentiments were fully

exploited by the Naxal leaders to propagate the plight of the people at the hands of the government. Rehabilitation programmes, if any, were also not fully and effectively implemented leading to further discontent. All this has had a profound negative impact on the socio-economic conditions of these areas.

Way Forward

- **Innovative measures are required to be employed in preventing IED** (Improvised Explosive Device) related incidents which have caused significant casualties in recent years.
- Emphasis should be laid on the **capacity-building and modernization of the local police forces**.
- States should **rationalize their surrender policy** in order to bring innocent individuals caught in the trap of LWE in the mainstream.
- States also need to **adopt a focused time-bound approach to completely eliminate LWE groups and ensure all-round development of the affected regions**.
- What makes the **LWE particularly disturbing is its correlation with the demographic youth bulge in the general Indian population**. If the Indian state fails, the widespread unemployment could lead to a serious internal security situation. LWE is its first manifestation.
- The **adverse casualty ratio in police-Naxal operations highlights the fact that insurgencies are best tackled by military forces that are trained and structured for this role.**
- The **Centre and the States should make efforts in sync that are crucial in eliminating such radicalization amongst groups (like confidence-building measures, education, welfare schemes etc).**

Closing Thought

Rightly, there should be no hesitation in using all the instruments of power to gain an upper hand against anti-national segments of the society because they are a threat to National Security. However, from the long-term perspective, partisan political interests coupled with monetary considerations by the non-tribals (mining mafia) were hampering the Government's efforts to evolve and implement an effective plan of action. The Government needs to ensure that issues related to **efficient governance are addressed with utmost honesty and transparency to meet the interests of local inhabitants and tribals fearlessly** – **without favouring any vested interests**. If the Government servants and functionaries fulfill their duties and responsibilities related to improving the tribals living conditions, bringing them into the 'national mainstream' should not take a very long time.

CITATIONS:

https://vakilsearch.com/advice/food-processing-industry-in-india-recent-schemes-developments/
https://www.india.gov.in/spotlight/pradhan-mantri-kisan-sampada-yojana#:~:text=The%20following%20schemes%20will%20be,supply%20chain%20for%20each%20cluster.
https://www.mofpi.gov.in/Schemes/pradhan-mantri-kisan-sampada-yojana
https://www.ibef.org/research/case-study/india-s-food-processing-industry
https://www.investindia.gov.in/sector/food-processing#:~:text=The%20FDI%20equity%20inflow%20in,June%202022%20was%20%24%2011.34%20Bn.
https://timesofindia.indiatimes.com/blogs/voices/indian-food-processing-industry-current-scenario/
https://www.thehindu.com/news/cities/Delhi/pds-helpline-numbers-a-disaster-that-needs-to-be-addressed-hc/article31699215.ece
https://swarajyamag.com/news-brief/parliamentary-panel-recommends-for-setting-up-of-more-quality-control-cells-to-prevent-storage-losses
https://nfsa.gov.in/portal/PDS_page
https://www.iasgyan.in/blogs/public-distribution-system-an-analytical-overview
https://www.bankbazaar.com/personal-loan/financial-inclusion.html
https://www.nelito.com/blog/importance-of-financial-inclusion-in-india.html
https://economictimes.indiatimes.com/topic/doorstep-ration-delivery-scheme
https://dfpd.gov.in/1sGbO2W68mUlunCgKmpnLF5WHm/TPDS-140316.pdf

https://www.ibef.org/blogs/growth-opportunities-for-the-food-processing-industry-in-india
http://www.ipcs.org/focusthemsel.php?articleNo=973
https://www.expresshealthcare.in/news/why-healthcare-infrastructure-in-india-needs-more-attention/436297/
https://www.epa.sa.gov.au/files/8238_info_photosmog.pdf
https://maritimeindia.org/holistic-maritime-security-challenges-facing-india-mitigation-imperatives-and-options/
https://www.idsa.in/issuebrief/indias-maritime-security-five-concerns-abisen-180522
https://www.orfonline.org/topic/defence-security/maritime-security/
https://www.orfonline.org/expert-speak/future-of-unemployment-and-the-informal-sector-of-india-63190/
https://www.ideasforindia.in/topics/environment/expanding-productive-employment-in-india.html
https://www.iisd.org/articles/press-release/india-step-clean-energy-subsidies-2030-targets
https://www.wri.org/insights/4-ways-shift-fossil-fuels-clean-energy
https://theprint.in/environment/fossil-fuel-subsidy-9-times-higher-than-for-clean-energy-says-study-on-indias-net-zero-goal/979457/
https://pib.gov.in/FeaturesDeatils.aspx?NoteId=151141&ModuleId=2
https://www.investindia.gov.in/sector/renewable-energy#:~:text=Renewable%20energy%20sources%20have%20a,Wind%20power%3A%2041.2%20GW
https://pubmed.ncbi.nlm.nih.gov/30579659/
https://www.mohfw.gov.in/pdf/SOPforCOVID19VaccinationofPersonswithoutPrescribedIdentityCards.pdf
https://www.nationalgeographic.com/environment/article/global-warming-effects
https://www.livescience.com/37057-global-warming-effects.html
https://www.intechopen.com/chapters/39170
https://usiofindia.org/publication/usi-journal/problem-of-naxalism-in-india-ground-realities-and-strategic-challenges-towards-conflict-resolution/