VISHNU IAS

UPSC - CSE 2024

MAINS EXAM

GENERAL STUDIES -03

SUBJECT: ECONOMY, ENVIRONMENT, S&T, DISASTER MANAGEMENT & INTERNAL SECUIRTY

MODEL ANSWERS

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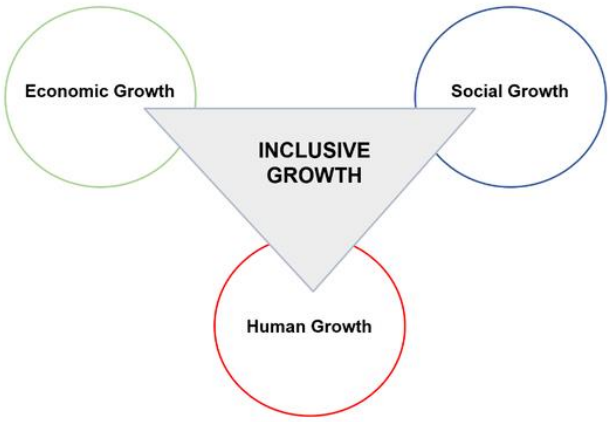
DISASTER MANAGEMENT & INTERNAL SECUIRTY

1. Examine the pattern and trend of public expenditure on social services in the post-reforms period in India. To what extent this has been in consonance with achieving the objective of inclusive growth?

Inclusive growth, as defined by the OECD, prioritizes equitable distribution of economic benefits across society, creating opportunities for all. Sustainability, on the other hand, emphasizes meeting present needs without compromising future generations' ability to do the same. India's economic reforms in the early 1990s significantly altered government expenditure on social services, impacting sectors like education, healthcare, and social welfare. This shift raises questions about the balance between economic growth and social equity in the country.

Pattern and trend of public expenditure on social services in post-reforms period in India



Initial Post-Reform Period (1991–2000): Expenditure on social services as a percentage of

GDP was relatively low, around 5–6%. It led to disparities in access and quality to social services.

Growth Phase (2000–2010): Gradual increase in public expenditure on social services. Public spending on social services as a percentage of GDP increased to around 7–8%.

Eg: Programs like Sarva Shiksha Abhiyan (Universal Education), the National

Rural Health Mission (NRHM).

Post-2010 Period (2010–2020): Public expenditure on social services increased further.

Eg: Right to Education Act (RTE), National Health Mission (NHM), Swachh

Bharat Abhiyan (Clean India Mission) and Ayushman Bharat Mission.

Recent Period (Post-2020): The COVID-19 pandemic forced the government to rethink its spending priorities. The emphasis on healthcare infrastructure and digitization of social services gained momentum during this period.

Eg: Initiatives for students during the Covid-19 pandemic include, PM e-Vidya, National Digital Education Architecture, NIPUN Bharat Mission

Alignment with Inclusive Growth Objectives

Increased Access to Basic Services:

Higher spending on social services has improved access to basic services like education, healthcare, and social security, essential for reducing poverty and promoting equity.

Example: The Mid-Day Meal Scheme in schools increased school attendance and nutrition among poor children, aligning with inclusive growth objectives.

Reduction in Regional Disparities:

Public expenditure has been directed toward reducing regional disparities by focusing on underdeveloped states and rural areas.

Programs like MGNREGA aimed at providing employment in rural areas, reducing urban-rural disparities.

Challenges in Health and Education:

Despite increased spending, challenges remain in terms of quality and equitable distribution. Rural and marginalized communities continue to face access issues, leading to partial achievement of inclusive growth.

Example: While literacy rates improved due to programs like Sarva Shiksha Abhiyan, disparities persist in educational outcomes between urban and rural areas.

Social Protection for Vulnerable Sections:

Increased spending on social protection schemes like pensions for the elderly, subsidies for marginalized communities, and employment guarantees helped in achieving inclusivity.

However, the effectiveness of these schemes in fully eradicating poverty and providing sustainable livelihoods is debated.

Overall Evaluation:

Public expenditure on social services has moved towards achieving inclusive growth, especially by targeting education, health, and social protection.

Nevertheless, the effectiveness of this spending in achieving the desired inclusiveness is constrained by issues like inefficiency in implementation, regional inequalities, and insufficient funding in critical sectors like health (around 1.5% of GDP, lower than global standards).

The post-reform period in India has witnessed a notable increase in public expenditure on social services. This reflects a growing recognition of the link between social service spending and inclusive growth. While progress has been made, further investment and reforms are essential to address the remaining challenges and ensure that the benefits of growth are shared equitably among all citizens.

2. What are the causes of persistent high food inflation in India? Comment on the effectiveness of the monetary policy of RBI to control this type of inflation.

Food inflation in India has emerged as a persistent challenge, significantly impacting the cost of living for millions of people. This ongoing issue is driven by a complex interplay of factors, including supply-side constraints, global market dynamics, and increasing demand pressures. As highlighted by the World Bank, food price inflation is particularly concerning in developing economies like India, where rising costs can have a severe impact on poverty rates.

Causes of High Food Inflation

Supply Side Constraints:

Agricultural Productivity: Low productivity in agriculture due to inadequate investment in technology, infrastructure, and research limits the supply of food.

Climate Variability: Dependence on monsoon rains makes agriculture vulnerable to climate change, leading to erratic weather patterns that can disrupt crop yields.

Post Harvest Losses: Inefficient supply chains and lack of proper storage facilities result in significant postharvest losses, reducing the overall supply of food.

Demand Side Pressures:

Population Growth: Rapid population growth increases demand for food, putting pressure on existing supply systems.

Changing Dietary Patterns: Rising incomes lead to changes in dietary preferences, increasing demand for protein rich foods, fruits, and vegetables.

Government Policies:

Minimum Support Prices (MSP): While MSP aims to protect farmers, it can distort market prices and contribute to inflation if set too high.

Food Subsidies: Subsidies can lead to higher demand without necessarily increasing supply, causing upward pressure on prices.

Global Factors:

International Prices: Fluctuations in global food prices due to supply chain disruptions, geopolitical tensions, or changes in demand can affect domestic prices.

Import Dependency: For certain food items, reliance on imports can lead to vulnerability to global price changes.

Effectiveness of Monetary Policy of RBI in Controlling Food Inflation

Limited Direct Impact on Food Prices: Food inflation is primarily driven by supply-side factors like weather conditions, agricultural production, and supply chain issues. The RBI's monetary policy tools, such as interest rate hikes, are more effective in controlling demand-driven inflation rather than supply-driven food inflation.

Raising Interest Rates:

The RBI can raise interest rates to curb inflation, which reduces the money supply and cools off demand for goods and services. However, this does little to address the root causes of food inflation, such as poor crop yield or supply chain issues.

Example: In 2013, despite interest rate hikes, food inflation remained high due to poor monsoons and rising input costs.

Liquidity Control: By tightening liquidity in the market, the RBI attempts to reduce overall inflationary pressures. But again, food inflation often persists due to non-monetary reasons such as poor agricultural output or distribution inefficiencies.

Currency Value and Imports: A strong rupee can reduce the cost of imported food products like pulses or edible oil, which can help in reducing food inflation. However, the effectiveness of this is limited to import-dependent commodities.

Coordination with Fiscal Policy:

To effectively control food inflation, monetary policy needs to work in tandem with government fiscal policies, including food subsidies, buffer stocks, and agricultural infrastructure improvements.

Example: Despite RBI's tightening monetary policy, food inflation in 2019-2020 was high due to supply disruptions and limited fiscal intervention in agricultural markets.

Food inflation in India poses a significant threat to economic stability and household welfare. Addressing this complex issue requires a comprehensive approach that tackles both supply-side and demand-side factors. By improving supply chain infrastructure, managing input costs, and implementing effective policies, the government can work towards stabilizing food prices and ensuring food security for all citizens. The persistence of food inflation underscores the need for urgent and decisive action to address the underlying structural issues within the agricultural sector.

3. What were the factors responsible for the successful implementation of land reforms in some parts of the country? Elaborate.

Land reforms, which involve the redistribution of land from the wealthy to the poor, are essential for addressing issues of land inequality, poverty, and social justice. By redistributing land to landless or small farmers, land reforms aim to reduce inequality in land ownership and empower marginalized communities. These reforms typically include regulations governing land ownership, operation, leasing, sales, and inheritance.

Factors Responsible for the Successful Implementation of Land Reforms in Some Parts of India

Political Will and Strong Leadership

States like West Bengal and Kerala had strong political leadership that was committed to implementing land reforms.

Example: In West Bengal, the Left Front government played a crucial role in redistributing land under Operation Barga, benefitting a large number of sharecroppers.

Presence of Active Civil Society

In some regions, active civil society organizations and social movements helped create awareness about land reforms.

Example: In Kerala, social movements such as the peasant movement were instrumental in ensuring that land reforms were successfully implemented.

Legal Framework and Government Support

States where land reforms had clear legal frameworks and government support saw better implementation. The introduction of land ceilings and redistribution was backed by legislation.

Example: In Maharashtra, the tenancy reforms and the implementation of land ceiling laws helped redistribute land to landless farmers.

Efficient Administrative Machinery

States with efficient administrative systems were able to implement reforms more effectively. The presence of a well-functioning bureaucracy ensured that the laws were enforced.

Example: In Jammu and Kashmir, the administrative machinery was active in implementing the Big Landed Estates Abolition Act, which led to significant land redistribution.

Agricultural Backwardness

In areas with large disparities in land ownership and agricultural backwardness, land reforms were perceived as essential for reducing inequality and promoting economic development.

Example: Bihar initiated land reforms because of its agricultural backwardness, although the implementation was slow.

Mass Movements and Social Pressure

Social and political pressure from below often pushed governments to carry out land reforms.

Example: In Telangana, the peasant uprisings in the 1940s created immense pressure for land reforms, resulting in large-scale redistribution in the following decades.

Cooperative Movements

In regions with strong cooperative movements, land reforms were implemented smoothly, and farmers were able to manage redistributed land more efficiently.

Example: In Gujarat, cooperative movements were crucial in making land reforms a success, particularly in promoting cooperative farming.

Associated challenges

- Under Land Ceiling, the Benami transaction ensured control of landlords. Also, the plantation gardens and religious and charitable institutions were exempted.
- Tenancy reforms provided tenants with rights, but only on 4% of the total operated areas in the country (14.4 million hectares of the operated area by 11 million tenants by 1992).
- Redistribution of ownership rights of the land took place only up to 2% of the total operated area in the country (less than 2 million hectares among the 4.76 million people by 1992).

Land reforms play a vital role in addressing land inequality, poverty, and social justice. Successful implementation in certain regions has positively impacted farmers and marginalized communities. To further strengthen land reforms, it is essential to focus on improving land administration systems, promoting efficient land use, ensuring transparency and accountability, and providing necessary support to small and marginal farmers. By addressing these areas, land reforms can contribute to poverty reduction and sustainable development in rural areas.

4. Explain the role of millets for ensuring health and nutritional security in India.

Millets, often referred to as "nutri-cereals" or "Shree Anna," are a resilient and nutritious grain option that can thrive in arid conditions. As global food systems face challenges in feeding a growing population, millets offer a sustainable and affordable alternative. The United Nations recognized the importance of millets by declaring 2023 the International Year of Millets. These ancient grains are rich in essential nutrients and well-suited for addressing malnutrition and promoting sustainable agriculture.

Role of Millets for Ensuring Health Security in India

Rich in Essential Nutrients:

Millets are packed with essential vitamins and minerals like calcium, iron, zinc, and B vitamins that contribute to overall health.

Example: Ragi (finger millet) is rich in calcium, supporting bone health, especially in children and the elderly.

High Fiber Content:

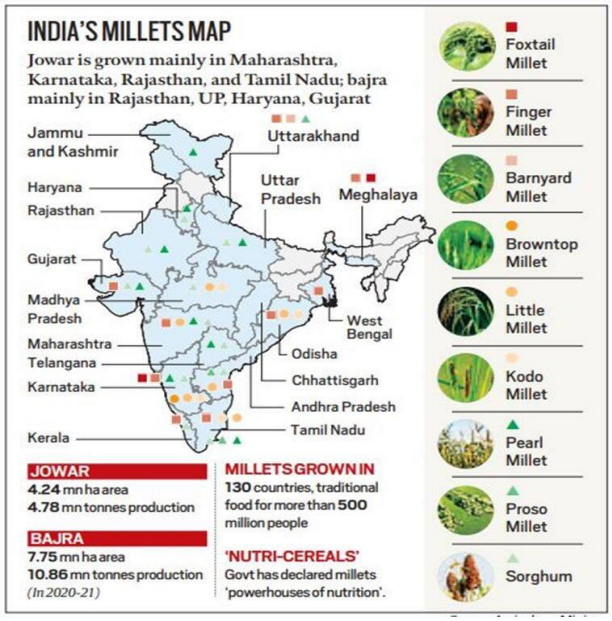
The high fiber content in millets helps maintain a healthy digestive system and prevents lifestyle diseases like obesity and diabetes.

Example: Pearl millet (bajra) is known for its ability to improve digestion and prevent constipation.

Low Glycemic Index:

Millets release glucose slowly into the bloodstream, making them an ideal food for people with diabetes, helping to prevent blood sugar spikes.

Example: Foxtail millet is commonly recommended for diabetes management.



Gluten-Free:

Millets are naturally gluten-free, providing a healthy option for those with gluten intolerance or celiac disease.

Example: Kodo millet is a popular gluten-free option used in various recipes.

Role of millets in nutritional security

Rich source of essential nutrients: Millets are highly nutritious, offering high levels of protein,fibre, iron, calcium, and vitamins.

E.g.: Finger Millet (Ragi)- Rich in calcium, making it excellent for bone health.

Pearl Millet (Bajra)- High in iron, which helps combat anaemia.

Alleviating hidden hunger: refers to micronutrient deficiencies that affect a large portion of the population.

E.g.: According to the World Health Organisation, nearly 30% of Indian women (15-49 years of age) suffer from iron deficiency anaemia.

Food security: drought-resistant and can grow in poor soil conditions with minimal water, making them a sustainable option for ensuring food security.

E.g.: In Maharashtra and Rajasthan, millet cultivation has been promoted to support farmers in drought-prone areas.

Government Initiatives:

- ➔ The National Millet Mission (NMM) is an initiative by the Government of India to promote the cultivation and consumption of millets.
- ➔ The government promotes millets through various schemes and includes them in the Public Distribution System (PDS).

- ➔ R&D investment improves millet varieties and their marketability.
- ➔ India's initiative to declare 2023 as the International Year of Millets and the MAHARISHI initiative further promote awareness and global research.
- ➔ Apart from the central government, various state government schemes and initiatives are also implemented such as the Rani Durgavati Shri Anna (Millets) Promotion Scheme of Madhya Pradesh

Millets offer a valuable solution to India's health and nutritional challenges. Their nutritional benefits, resilience, and sustainability make them an ideal crop for addressing malnutrition and food security. By promoting millet cultivation, improving market access, and raising awareness, India can fully harness the potential of millets to enhance the health and well-being of its population while promoting sustainable agriculture and food security.

5. What is the present world scenario of intellectual property rights with respect to life materials? Although, India is second in the world to file patents, still only a few have been commercialized. Explain the reasons behind this less commercialization.

IPR protects creations and innovations, but their application to life materials like genes and organisms presents unique challenges. As biotechnology and genetic research rapidly evolve, the intersection of IPR and life materials has become a global focus. India, a powerhouse in patent filings, faces a paradox: a disconnect between innovation and commercialization in the life sciences sector. This raises critical questions about the effectiveness of India's IPR ecosystem

Present World Scenario of Intellectual Property Rights (IPRs) with Respect to Life Materials

Biotechnology and Patents:

Advances in biotechnology, especially in gene editing and bioengineering, have raised complex questions around the patenting of life forms. Countries vary in how they handle patents on genetically modified organisms, stem cells, and microorganisms.

International agreements like TRIPS (Trade-Related Aspects of Intellectual Property Rights) require countries to provide patent protection for innovations, including in biotechnology, but allow some flexibility, especially concerning ethical considerations on life patents.

Ethical Concerns: The patenting of life materials, including seeds, human genes, and microorganisms, is controversial. While it can incentivize innovation, many argue it privatizes common resources and can harm public access, especially in the health and agriculture sectors.

Developing Countries' Stand: Many developing nations, including India, are concerned about the control multinational corporations gain over essential resources like seeds and drugs through patents. This has led to calls for stronger traditional knowledge protections and exceptions within their legal frameworks to protect biodiversity.

Global Organizations: The World Intellectual Property Organization (WIPO) and other international bodies continue to refine the balance between protecting innovators' rights and ensuring ethical access to life-saving medicines and agricultural innovations.

Reasons for Less Commercialization

Weak Industry-Academia Linkages: Innovations in Indian research institutes like CSIR often don't reach the market due to poor industry partnerships.

Inadequate Infrastructure: India's biotech sector lacks the infrastructure needed to scale patented innovations, unlike the U.S. or Germany.

Funding Gaps: Limited venture capital for life sciences startups restricts commercialization. In contrast, U.S. biotech startups receive significantly higher funding.

Regulatory Hurdles: Long approval times, particularly in pharmaceuticals, delay patent commercialization. India's DCGI approval process is often cited as slow.

High Costs: The costs of bringing a patent to market, including clinical trials for biotech products, are prohibitively high for smaller companies.

Low Market Demand: Innovations like GM seeds often face resistance, as seen in the Bt brinjal controversy in India.

Lack of Awareness: Many researchers lack knowledge about patent commercialization, and technology transfer offices are limited in Indian universities.

Few Incentives: Without proper incentives for industries to invest in high-risk technologies, commercialization remains low.

Way Forward

- ➔ Implement efficient, transparent regulatory mechanisms to accelerate market entry for innovative life science products.
- ➔ Integrate IP management courses into science curricula to cultivate a culture of innovation and commercialization.
- ➔ Create dedicated units with skilled professionals to facilitate IP commercialization and industry partnerships. For example, IIT Delhi's FITT model
- ➔ Create targeted approaches for areas like biopharmaceuticals, agribiotech, and bioinformatics to address unique commercialization challenges.
- ➔ Facilitate easier connections between patent holders and potential licensees to increase commercialization opportunities.

Addressing the disconnect between patent filings and commercialization in India's life sciences sector requires streamlined regulations, enhanced industry collaboration, and focused support for biotechnology.The global landscape of IPR for life materials is complex and evolving, with ongoing debates on ethical, legal, and social implications. Policymakers,

researchers, and stakeholders must engage in dialogue and collaboration to ensure that IPR balances innovation, equity, and ethical considerations in the use of life materials.

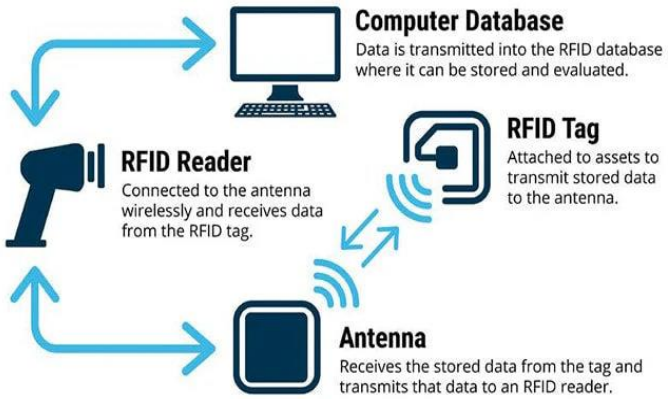
6. What is the technology being employed for electronic toll collection on highways? What are the advantages and limitations? What are the proposed changes that will make this process seamless? Would this transaction carry any potential hazards?

Electronic toll collection (ETC) systems have transformed highway toll payments, offering a more efficient and convenient alternative to manual processes. In India, the FASTag system, introduced in 2016, utilizes RFID technology to automate toll payments, reducing congestion, fuel consumption, and transaction times. This shift towards electronic toll collection has significantly improved the efficiency and convenience of highway travel.

Technology Employed for Electronic Toll Collection

Radio Frequency Identification (RFID):
RFID technology is used for automatic toll collection. Vehicles are fitted with RFID tags linked to a user's bank account or prepaid balance.

The toll plaza has RFID readers that scan the tag as the vehicle passes through.



Global Positioning System (GPS): In advanced systems, GPS can be used to track vehicle movement and calculate tolls based on the distance traveled, eliminating the need for toll booths.

Advantages

- **Reduced Congestion**: ETC eliminates the need for vehicles to stop at toll booths, thus reducing traffic congestion.
- **Faster Processing**: The system automatically charges the toll, reducing the transaction time significantly compared to manual toll collection.
- **Lower Operational Costs:** ETC requires fewer staff at toll booths, leading to cost savings for toll operators.
- **Better Revenue Collection:** Automated systems reduce human error and the risk of cash leakage or fraud, ensuring better toll revenue management.
- **Environmental Benefits:** Reduced idling time at toll booths results in lower emissions from vehicles, contributing to environmental conservation.

Limitations

- **Initial Setup Costs**: The infrastructure needed for RFID and GPS-based tolling systems can be expensive to implement and maintain.
- **Technical Failures:** Issues with RFID tag readability or malfunctioning of equipment can lead to disruptions in toll collection and traffic delays.
- **Privacy Concerns:** GPS-based systems that track vehicle movement raise privacy concerns, as they involve real-time tracking of vehicles.
- **Non-compliance by Users:** Some users may not install RFID tags or may face issues with linking them to their payment accounts, causing delays.

Proposed Changes for a Seamless Process

- **Nationwide Standardization**: Introducing uniform ETC technology across all highways in the country ensures seamless travel and toll collection.
- **Interoperability:** Creating a system where RFID tags work across different toll plazas managed by various agencies allows smoother transitions between toll zones.
- **Integration with Navigation Systems:** Integration with navigation apps like Google Maps or dedicated toll management apps can provide real-time toll information and balance updates to users.
- **Automated Enforcement Systems:** Use of cameras and license plate recognition to penalize users without RFID tags or to automate toll collection for users without proper balance.
- **Improved Infrastructure:** Modernizing toll plazas with better sensors, faster processing units, and more efficient power backup systems can reduce downtime and enhance user experience.

Potential Hazards

- **Data Security Risks:** Increased digitization raises the risk of cyber-attacks, where sensitive data like vehicle movements and financial details can be compromised.
- **Technical Glitches:** Any glitch in the RFID or GPS system could result in incorrect toll charges or unregistered toll crossings, leading to disputes.
- **Accidents Due to Fast Lanes:** Vehicles moving at high speeds through ETC lanes without slowing down can increase the risk of accidents, especially if other vehicles are stopping for manual toll payment.
- **System Downtime:** Power failures or system crashes can disrupt the toll collection process, leading to traffic jams and user dissatisfaction.

- **Resistance from Public:** Some drivers may resist the adoption of new technology, preferring manual payment methods, which could slow down the transition to a fully automated system.

While ETC systems, such as FASTag, have significantly improved toll collection efficiency, they face challenges like technical failures and cybersecurity risks. To ensure the long-term success of ETC, it is essential to address these challenges through measures like enhanced data privacy, improved system resilience, and technological advancements such as GPS and blockchain integration. By addressing these issues, ETC can continue to revolutionize toll collection and provide a more seamless and efficient experience for drivers.

7. Industrial pollution of river water is a significant environmental issue in India. Discuss the various mitigation measures to deal with this problem and also the government's initiatives in this regard.

Industrial pollution of rivers in India is a critical environmental issue, with severe repercussions for ecosystems, human health, and economic sustainability. Rapid industrialization, coupled with inadequate enforcement of environmental regulations, has led to widespread contamination of major river systems.

Some Major Sources of Industrial Pollution

Textile and Dyeing Industries release toxic dyes, bleaching agents, heavy metals like chromium, and chemical residues.

Paper and Pulp Industries

Tanneries in Kanpur, near the Ganges, are a major source of chromium contamination.

Oil Refineries and Petrochemical Industries release pollutants like Oil and hydrocarbons.

Impact of Industrial Pollution on the River Systems

Ecosystem Disruption: Toxic effluents from industries disrupt river ecosystems by killing species critical to ecological balance.

Decreased Water Quality: Heavy metals, oils, and hazardous substances from industrial discharge significantly reduce the quality of river water, making it unfit for drinking and irrigation.

Health Hazards: Polluted river water from industrial waste leads to serious health problems for communities relying on these rivers for drinking, cooking, and bathing.

Biodiversity Loss: The toxic nature of industrial effluents destroys aquatic biodiversity, pushing many species toward extinction in affected river systems.

Mitigation Measures to deal with this problem

Effluent Treatment Plants (ETPs):

Industries are mandated to install Effluent Treatment Plants to treat wastewater before discharging it into water bodies.

Example: Tannery industries in Kanpur are required to operate common effluent treatment plants (CETPs) to reduce pollution levels in the Ganga.

Zero Liquid Discharge (ZLD):

An approach where industries are expected to recycle wastewater, ensuring no discharge into rivers.

Example: The textile industry in Tamil Nadu has adopted ZLD to combat pollution in the Noyyal and Cauvery rivers.

Strict Enforcement and Penalties:

Regular monitoring by pollution control boards and imposition of penalties for industries that fail to meet pollution control standards.

Example: The closure of highly polluting industries along the Ganga under the National Green Tribunal (NGT) directives.

Bioremediation:

Using natural organisms (microbes, plants) to clean up pollutants in water bodies.

Example: Phytoremediation techniques are being explored in Yamuna to clean heavy metals and other toxins.

Adoption of Cleaner Technologies:

Encouraging industries to adopt eco-friendly technologies and processes that reduce pollutant generation at the source.

Example: Green manufacturing in the pharmaceutical sector to reduce effluent discharge.

Government Initiatives

National Mission for Clean Ganga (NMCG): Implements the "Namami Gange" initiative to control industrial effluent discharge into the Ganga.

Zero Liquid Discharge (ZLD) Norms: Enforced on industries like textiles and tanneries to eliminate wastewater discharge into rivers.

Swachh Bharat Mission (Urban): Indirectly addresses river pollution by improving urban waste management.

Effluent Treatment Plants (ETPs) and Common Effluent Treatment Plants (CETPs): Industries are required to set up ETPs to treat their wastewater before discharging into rivers, and smaller industries can use CETPs.

National Green Tribunal (NGT): The NGT enforces environmental laws, adjudicating cases of industrial pollution and holding polluters accountable.

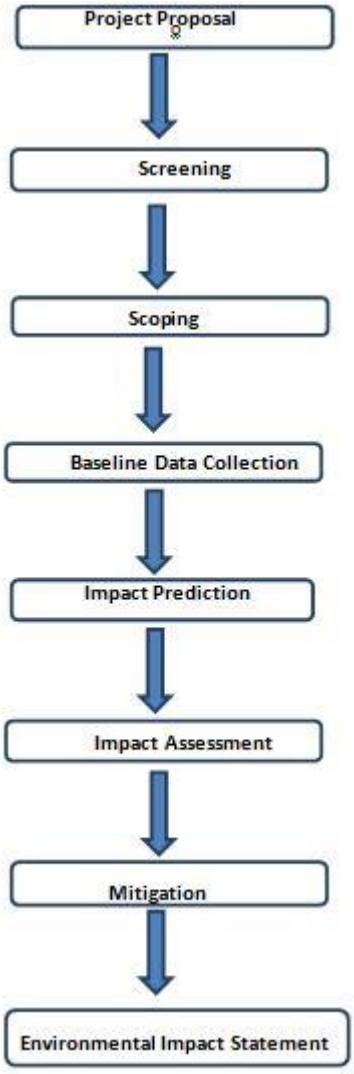
Industrial river pollution demands urgent action. Strengthening regulations, adopting advanced treatment technologies, and enforcing government initiatives are crucial for sustainable water management. Collaboration between industries and the state, alongside learnings from best practices like Denmark's wastewater treatment model, can revitalize India's rivers and safeguard future ecosystems.

8. What role do Environmental NGOs and activists play in influencing Environmental Impact Assessment (EIA) outcomes for major projects in India? Cite four examples with all important details

Environmental Impact Assessment (EIA) is a crucial process in India, regulated by the Environmental Protection Act, 1986, and the EIA Notification, 2006. It aims to evaluate the potential environmental impacts of major projects. Environmental NGOs and activists play a vital role in influencing EIA outcomes by raising public awareness, contesting flawed data, offering legal assistance, and amplifying the concerns of affected communities. These NGOs act as watchdogs, ensuring that EIA processes are transparent, inclusive, and environmentally sustainable.

Role of Environmental NGOs and Activists in EIA Outcomes

Advocacy and Awareness:



Environmental NGOs and activists in India play a significant role in advocating for the protection of the environment. They raise awareness about the ecological impact of projects, often informing the public and government about the potential harm caused by major industrial or infrastructural projects.

NGOs like the Centre for Science and Environment (CSE), Greenpeace India, and Kalpavriksh have campaigned extensively to ensure thorough Environmental Impact Assessments (EIA) for large-scale projects.

Legal Interventions:

Environmental activists often engage in legal battles to ensure that EIA norms are followed strictly. For example, the National Green Tribunal (NGT) has been approached numerous times by NGOs to challenge decisions where environmental regulations were flouted.

Teesta Setalvad and the Narmada Bachao Andolan are examples of activists using legal routes to halt projects that did not meet environmental safeguards.

Public Consultations and Hearings:

NGOs ensure that public consultations—a mandatory step in the EIA process—are conducted transparently. Activists often represent marginalized communities and help voice concerns regarding displacement and environmental damage.

In cases like the POSCO steel project in Odisha, NGOs helped local communities raise their concerns during public hearings, affecting the project's approval process.

Monitoring and Reporting:

After the EIA, NGOs play a crucial role in monitoring the implementation of environmental safeguards promised during the assessment phase. They report on deviations and ensure compliance with environmental standards.

Greenpeace India has monitored and reported the environmental fallout from coal mining projects and power plants.

Examples:

Tata Mundra Power Plant:

NGO: Machimar Adhikar Sangharsh Sangathan (MASS) filed complaints, leading to tighter environmental controls by the IFC.

Koodankulam Nuclear Plant:

NGO: PMANE and S.P. Udayakumar organized protests, resulting in additional safety measures.

Posco Steel Project:

NGO: POSCO Pratirodh Sangram Samiti and Abhay Sahoo led protests, halting the project over environmental concerns.

Vedanta Niyamgiri Mining:

NGO: Survival International and Prafulla Samantara successfully stopped the project, protecting tribal rights.

Environmental NGOs influence EIA outcomes by advocating for transparency, public participation, and comprehensive assessments. They ensure that environmental considerations are prioritized in decision-making for development projects. While balancing environmental concerns with development is crucial, NGOs play a vital role in ensuring sustainable and responsible development.

9. Explain how narcoterrorism has emerged as a serious threat across the country. Suggest suitable measures to counter narcoterrorism.

Narco-terrorism, a dangerous combination of illegal drug trafficking and terrorist activities, has emerged as a serious threat to national security and public safety. This phenomenon, where drug profits are used to finance terrorism, is particularly concerning in India due to its proximity to drug-producing regions like the Golden Crescent. The collaboration between drug cartels and terrorist organizations poses a significant risk to the country's security and stability.

Narco-Terrorism Has Emerged as a Serious Threat Across the Country

Nexus Between Drugs and Terrorism: Narco-terrorism refers to the alliance between drug traffickers and terrorist organizations, where the proceeds from drug trafficking are used to finance terror activities.

In India, this connection is becoming more pronounced with groups like Lashkar-e-Taiba (LeT) and other insurgent outfits financing operations through the drug trade.

Cross-Border Drug Trafficking: India's geographical proximity to major drug-producing regions, particularly the "Golden Crescent" (Afghanistan, Pakistan, Iran), has made it a transit and destination point for narcotics.

Cross-border drug smuggling is often linked with terrorism, especially along the India-Pakistan and India-Myanmar borders. For instance, heroin smuggled from Afghanistan through Pakistan often funds terrorism in Kashmir.

Involvement of Organized Crime: Organized crime syndicates, with strong links to terrorist organizations, control large portions of the drug trade in India.

These syndicates, such as the D-Company, have historical ties to terror financing and use drug money to fund activities like bombings and insurgencies.

Increased Use of Drones for Smuggling: The use of drones to smuggle drugs, arms, and ammunition across the Punjab border has significantly escalated the threat of narco-terrorism. This method bypasses conventional security measures, making it difficult to control.

Impact on Society: The proliferation of narcotics, particularly in states like Punjab and northeastern regions, has led to widespread addiction.

This not only affects public health but also fosters a climate of unrest and vulnerability, which extremist groups can exploit for recruitment and support.

Measures required to Counter Narco-Terrorism

Strengthening Border Control:

Deploy advanced surveillance and technology like drones and sensors at vulnerable border points.

Enhance coordination between Border Security Forces (BSF), Narcotics Control Bureau (NCB), and local police to combat drug smuggling across international borders.

Tightening Legal Frameworks:

Amend existing laws like the Narcotic Drugs and Psychotropic Substances (NDPS) Act to make penalties for drug trafficking and narco-terrorism more stringent.

Implement fast-track courts for quick adjudication of drug-related crimes.

Improving Intelligence Coordination:

Establish better intelligence-sharing mechanisms between agencies like the NIA, RAW, and state police forces to disrupt narco-terrorism networks.

Create specialised task forces to track narco-financing of terrorist organisations.

International Cooperation:

Strengthen cooperation with countries like Afghanistan, Myanmar, and Pakistan under international frameworks like the UN Office on Drugs and Crime (UNODC) to curb cross-border trafficking.

Engage in intelligence-sharing with global agencies like Interpol and regional forums like the SAARC to dismantle international drug syndicates.

Addressing Drug Demand:

Launch nationwide de-addiction and rehabilitation programs to reduce drug consumption, particularly among youth.

Raise public awareness through media campaigns about the dangers of drug addiction and its links to terrorism.

Strengthening Financial Oversight:

Track and freeze financial flows related to drug trafficking through strong enforcement of anti-money laundering laws.

Ensure that the Financial Intelligence Unit (FIU) monitors suspicious transactions that could be linked to narco-terrorism.

Rehabilitation and Social Programs:

Invest in rehabilitation programs for drug addicts to reduce the demand side of the drug trade.

Implement job-creation and education initiatives in drug-affected areas to prevent vulnerable populations from being drawn into trafficking.

Narco-terrorism poses a significant threat to India's security, economy, and society. Addressing this complex issue requires a comprehensive approach that combines stringent law enforcement, international cooperation, demand-side management, and community-based solutions. By effectively countering narco-terrorism, India can safeguard its national security, reduce drug addiction and crime, and promote social stability.

10. Describe the context and salient features of the Digital Personal Data Protection Act, 2023.

The Digital Personal Data Protection Act, 2023, a significant milestone in India's data protection landscape, aims to safeguard individual privacy and personal data while fostering innovation and economic growth. Rooted in the recommendations of the 2017 Justice Srikrishna Committee, the Act represents years of deliberation and revisions aimed at addressing the evolving concerns surrounding data security.

Context of Digital Personal Data Protection (DPDP) Act, 2023

The growing digital economy in India raised concerns about data privacy. India aimed to align its laws with global standards to protect citizens' data. The Supreme Court recognized privacy as a fundamental right, paving the way for data protection laws. The need to protect citizens from data misuse in the digital era led to the Digital Personal Data Protection Act, which ensures transparency and accountability in data handling.

Salient Features of the DPDP Act, 2023

Applicability:

The DPDP Act applies to the processing of digital personal data in India, whether collected online or offline and later digitised.

It also applies to data processing outside India if the data pertains to providing goods or services to data principals (individuals) within India.

Key Stakeholders:

Data Principal (DP): The individual or entity whose personal data is being processed. The DP has the right to provide consent, withdraw it, and even restrict the use of their data.

Data Fiduciary: The entity that collects, stores, or shares personal data. A fiduciary can also act as a "Consent Manager" to enable the data principal to manage and review their consent. Significant Data Fiduciaries will be identified based on their systemic impact.

Data Processor: An entity that processes data on behalf of the data fiduciary. Both can be the same in some cases, particularly in small entities.

Citizen's Rights:

Right to Information: The DP has the right to know how their data is being used.

Right to Correction and Erasure: The DP can request corrections or erasure of their personal data.

Grievance Redressal: The DP has the right to approach authorities for grievances related to data breaches or misuse.

Right to Nominate: In case of death or incapacity, the DP can nominate someone to exercise their rights.

Data Protection Board of India (DPBI):

An independent body responsible for resolving disputes related to privacy and data protection. It has the authority to impose penalties for non-compliance and breaches of the Act. Appeals against DPBI orders can be made to the High Court, which can also take up breaches suo moto.

Penalty Provisions:

Financial penalties can range from ₹250 crores for significant breaches by data

fiduciaries or processors, down to ₹10,000 for data principals for minor infractions. The Act does not impose criminal penalties but focuses on financial deterrents to ensure compliance.

Conflict with Existing Laws:

The DPDP Act does not supersede other laws but takes precedence in case of conflict with any other legislation.

The DPDP Act, 2023, is key to protecting personal data and privacy in the digital age. Its success depends on strong implementation, grievance redressal, and balanced regulation.

As India shifts to a data-driven economy, the Act can bridge innovation and privacy, marking a milestone in digital governance.

11. Discuss the merits and demerits of the four 'Labour Codes' in the context of labour market reforms in India. What has been the progress so far in these regards?

The four Labour Codes—Code on Wages, Industrial Relations Code, Social Security Code, and Occupational Safety, Health, and Working Conditions Code—represent a significant overhaul of India's outdated labour laws. These reforms aim to simplify the legal framework, improve the ease of doing business, and provide enhanced protection for workers. India's large labour force of approximately 501 million workers faces challenges such as poor working conditions and insufficient incomes, particularly in the unorganized sector. The journey towards labour reforms has been driven by the need to balance economic growth with labour rights.

Merits of Four Labour Codes in the Context of Labour Market Reforms in India:

Simplification of Labour Laws:

Consolidation of Multiple Laws: The four Labour Codes simplify and consolidate over 44 central laws into 4 codes, making compliance easier for businesses.

Clarity for Employers and Workers: Simplified regulations provide clarity and reduce ambiguity, aiding both employers and employees in understanding their rights and obligations.

Flexibility in Hiring and Employment:

Ease of Hiring and Firing: The reforms make it easier for employers to hire and fire workers based on market needs, particularly benefiting industries requiring flexible workforce arrangements.

Promoting Contract Employment: The introduction of fixed-term contracts allows for temporary but formal employment, which is beneficial in sectors with fluctuating demand.

Encouragement of Formalization:

Incentivizing Formal Employment: The codes aim to bring informal workers into the formal sector by extending benefits like social security, thereby promoting more formal job creation.

Social Security Coverage:

Broader Social Security Net: Expands social security benefits such as provident fund, gratuity, and health benefits to more workers, including those in the gig economy.

Demerits of the Labour Codes:

Inspector-cum-Facilitator Role: While the codes introduce the Inspector-cum-Facilitator to promote compliance and resolve disputes, the dual nature of this role may result in conflict of interest and weaken enforcement. Inspectors might prioritize facilitation over ensuring strict compliance.

Non-Inclusion of Charitable or Non-Profit Establishments: The Occupational Safety, Health and Working Conditions Code does not include charitable or non-profit organisations, which leaves a significant part of the social service sector out of these protections.

Lack of Provisions for Invisible Labour: Unpaid domestic work or invisible labour, predominantly performed by women, remains outside the scope of the labour codes. These codes do not address the needs of unpaid caregivers, household workers, or those involved in informal, unregistered work.

E.g. In India, unpaid care work contributes an estimated $10 trillion to the global economy but receives no formal recognition.

Limited Worker Protection: The flexibility in hiring and firing workers, particularly in larger enterprises (300 or more workers), raises concerns about reduced job security.

The Industrial Relations Code has provisions that allow employers to lay off workers without prior government approval, making job tenure precarious.

E.g. In June 2024, trade unions protested against implementing the labour codes.

Progress So Far:

- ➔ The Labour Codes were passed by Parliament in 2019 and 2020. However, their implementation has been delayed due to the need for states to frame corresponding rules. Some states have initiated this process, but a nationwide rollout is still pending.
- ➔ The central government has conducted consultations with stakeholders and launched awareness programs to ensure a smoother transition to the new system.
- ➔ Despite these efforts, the reforms' effectiveness will largely depend on the timely and uniform implementation of the codes across states

The Labour Codes offer a promising framework for modernizing India's labor laws, but effective implementation and addressing the concerns of the unorganized sector are crucial for ensuring their benefits for all. Continuous engagement with stakeholders is essential to refine the codes and meet the diverse needs of India's labor market.

12. What is the need for expanding the regional air connectivity in India? In this context, discuss the government's UDAN Scheme and its achievements.

The UDAN (Ude Desh ka Aam Naagrik) scheme, launched by the Government of India in 2017, is a transformative initiative aimed at enhancing regional air connectivity and making air travel accessible to the common citizen. Regional air connectivity in India plays a pivotal role in connecting remote areas to major cities, promoting economic growth in these regions. The government has undertaken several initiatives to improve regional air connectivity, addressing the limited availability of public transport and the need for quick travel for business, medical emergencies, and tourism.

Need for Expanding Regional Air Connectivity:

Economic Growth: Enhanced connectivity between Tier-2 and Tier-3 cities promotes regional economic development, creating new opportunities in trade, tourism, and investment.

Balanced Regional Development: Better air connectivity helps bridge the urban-rural divide by linking remote and economically backward regions to major economic hubs.

Tourism Development: Improved connectivity to remote tourist destinations drive regional tourism, generating local employment and contributing to economic upliftment.

Accessibility in remote areas: Connectivity to Northeast India, hill states, and islands is critical for overcoming geographic challenges and improving access to healthcare, education,and other services.

Reducing Travel Time: Affordable air travel reduces the time and cost burden of long-distance travel, offering a faster alternative to road and rail travel, thus boosting productivity.

UDAN Scheme and Its Achievements

Overview of UDAN (Ude Desh ka Aam Nagrik) Scheme: Launched in 2016 by the Government of India under its National Civil Aviation Policy.

Objective: Make air travel affordable for the common citizen by enhancing regional air connectivity through financial incentives to airlines for operating in unserved or under-served airports.

Achievements of the UDAN Scheme:
Increased Connectivity: Over 400 routes have been operationalized under the UDAN scheme, connecting more than 65 airports and heliports across India.

Affordable Air Travel: It has significantly reduced airfares on regional routes, making air travel accessible to a larger section of the population.

Development of Infrastructure: Many previously dormant or under-utilized airports have been revived and modernized under this scheme, supporting the growth of regional infrastructure.

Boost to Tourism and Trade: The scheme has opened up new tourist destinations and enhanced trade by connecting industrial regions that lacked proper air services earlier.

Economic Growth in Smaller Cities: The increased connectivity has spurred local economies, creating jobs and improving the investment climate in smaller cities and towns.

Increased Operational Airports: The number of operational airports increased from 74 in 2014 to 148 in 2023.

New Routes: Over 425 new routes have been established under UDAN, enhancing connectivity across 29 states and UTs.

Underserved/Unserved Connectivity: 68 underserved/unserved destinations have been connected, including 58 airports, 8 heliports, and 2 water aerodromes.

UDAN scheme has improved regional air connectivity in India, connecting remote areas and promoting economic growth. By investing in regional air infrastructure, India is paving the way for a more integrated and prosperous future. Continued focus on improving regional air connectivity will further enhance accessibility and development in underserved areas.

13. What are the major challenges faced by Indian irrigation systems in recent times? State the measures taken by the government for efficient irrigation management.

Irrigation, essential for India's food security and agricultural growth, faces significant challenges. With nearly 60% of the net sown area relying on irrigation, inefficiencies in this sector have far-reaching consequences. Irrigation involves applying controlled water to land for crop cultivation, landscaping, and revegetation. In India, irrigated land accounts for approximately 48.8% of the total agricultural land, while the remaining 51.2% is rainfed.

Major Challenges Faced by Indian Irrigation System

Overexploitation of Groundwater: India is the largest user of groundwater in the world, but excessive reliance has led to its depletion. Key regions like Punjab and Haryana are critically affected.

Example: Punjab's rice-wheat cropping system wastes 30-40% of irrigation water(Source: ICAR, 2019)

Inefficient Water Use: Traditional irrigation methods like flood irrigation are inefficient and lead to significant water wastage. Less than half of the water used for irrigation reaches crops.

Example: Maharashtra's Jayakwadi Dam has storage capacity of 2.19 BCM, but receives 10 BCM inflow annually (Source: Maharashtra Water Resources Dept.)

Inadequate Infrastructure: The lack of modern and well-maintained infrastructure (canals, dams) hampers the effective distribution of water, especially in remote and rural areas.

Waterlogging and Salinization: Poor drainage systems cause waterlogging and soil salinity, reducing agricultural productivity. This is common in regions dependent on surface irrigation like Uttar Pradesh and Haryana.

Regional Disparities in Water Availability: While Northern India has access to extensive canal systems, Southern and Western states rely heavily on monsoons and lack efficient irrigation networks.

Impact of Climate Change: Erratic rainfall patterns due to climate change exacerbate water availability, making irrigation less predictable and reliable, especially in rain-fed areas like Rajasthan.

Changing rainfall patterns: 10-20% decrease in monsoon rainfall (1951-2015) (Source: IMD, 2019)

Government Measures for Efficient Irrigation Management

Pradhan Mantri Krishi Sinchayee Yojana (PMKSY)

A flagship scheme aimed at improving irrigation coverage and water-use efficiency. It promotes "Har Khet Ko Pani" (water for every field) through modern irrigation systems like drip and sprinkler irrigation.

Example: Successful implementation in Maharashtra has significantly improved water use in sugarcane cultivation.

Micro-Irrigation Schemes

The government encourages the use of micro-irrigation systems (drip and sprinkler) to optimize water use and reduce wastage.

Example: The widespread adoption of micro-irrigation in Gujarat has led to increased efficiency in water-scarce areas.

National Water Mission: Part of the National Action Plan on Climate Change, this initiative aims to improve water-use efficiency by 20% through awareness, regulatory changes, and better water management practices.

Jal Jeevan Mission

Aims at improving water management and access, not only for drinking water but also for agricultural purposes, ensuring that rural areas have better irrigation facilities.

Example: Telangana's "Mission Bhagiratha" project has been instrumental in ensuring irrigation for farmers in drought-prone areas.

Command Area Development Programme

Enhances the efficiency of irrigation projects through better maintenance of canal systems and water management at the farm level, ensuring optimal use of water resources.

Example: Improvement of canal irrigation in Punjab and Haryana has helped in reducing waterlogging.

Watershed Development Projects

Encourages rainwater harvesting and the development of local water storage facilities to reduce dependency on large irrigation systems and groundwater.

Example: Watershed projects in Karnataka have helped increase water availability in drought-prone areas, supporting agriculture.

The Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) aims to improve irrigation coverage and water-use efficiency. The government encourages micro-irrigation to optimize

water use. The National Water Mission seeks to improve water-use efficiency by 20%. The Jal Jeevan Mission aims to improve water management and access for both drinking and agricultural purposes. The Command Area Development Programme enhances irrigation project efficiency, while watershed development projects promote rainwater harvesting and local water storage facilities.

14. Elucidate the importance of buffer stocks for stabilising agricultural prices in India. What are the challenges associated with the storage of buffer stocks?

The buffer stock, primarily managed by the Food Corporation of India (FCI), plays a crucial role in stabilizing agricultural prices in India, ensuring food security, and protecting both consumers and farmers from price volatility. First introduced during the 4th Five Year Plan (1969-74), the buffer stock involves maintaining a reserve of essential commodities like food grains to offset price fluctuations and address unforeseen emergencies.

Importance of Buffer Stocks:

Regulating market supply: Acts as a tool for government intervention to support farmers when market prices drop below the Minimum Support Price (MSP).

- Example: India's wheat stock increased from 13.3 million tons (2019-20) to 31.1 million tons (2020-21).

Price stabilisation: helps stabilise prices by releasing food grains when market prices rise and procuring them when prices fall thus preventing extreme price fluctuations.

Eg: Buffer stocks of rice helped maintain prices during the 2019-20 drought to tackle covid crises.

Food security: Ensures availability of food grains during poor harvests or emergencies, protecting vulnerable sections of society from food shortages.

Eg: 100 million tons of food grains were distributed, 75 crore beneficiaries received food grains under PMGKAY (2020-21).

Inflation control: Helps in controlling food inflation by releasing stocks during high-demand periods, preventing price spikes.

Eg: In 2015, the government has created a buffer stock of pulses of 1.5 lakh tonnes to control the fluctuation of prices of pulses

Protection against Natural Calamities: In the event of droughts, floods, or other disasters, buffer stocks are crucial to meet urgent food requirements.

Challenges Associated with the Storage of Buffer Stock

Inadequate Storage Infrastructure:
India faces a shortage of modern storage facilities, leading to wastage due to improper storage conditions, such as pest infestations and rotting of grains.

Example: Around 5-10% of food grains stored in open areas (CAP storage) are wasted due to inadequate infrastructure.

High Cost of Maintenance:
The cost of maintaining buffer stocks, including storage, preservation, and transportation, is high and adds a financial burden on the government.

Example: FCI bears huge operational costs for maintaining buffer stocks across the country.

Food Wastage and Spoilage:
Due to improper storage and preservation techniques, a significant portion of grains is lost to spoilage, undermining the purpose of maintaining these stocks.

Example: In 2021, a substantial quantity of wheat was lost due to spoilage in storage facilities in Punjab.

Overstocking and Understocking Issues:
Overstocking can lead to higher storage costs, while understocking may leave the country vulnerable during periods of crisis.

Example: At times, the government has had to sell surplus grain stocks at a loss, incurring financial setbacks.

Logistical Constraints:
Transporting grains from surplus to deficit regions can be a challenge due to India's vast geographical size, poor logistics, and delays in reaching remote areas.

Example: Timely distribution of buffer stocks to regions affected by drought or flood is often delayed due to poor transport infrastructure.

Way Forward:

Enhancing storage infrastructure: FCI plans to create 117.75 LMT of storage capacity under a new 5-year guarantee scheme, approved by DFPD (2023).

Improving supply chain efficiency: ₹500 crore allocated to address price volatility in key agri-horticultural commodities like onion, potato, and pulses to safeguard consumer interests.

The Shanta Kumar Committee's recommendations aim to improve FCI's financial management and operational efficiency. Key suggestions include restructuring FCI, adopting a Public-Private Partnership model for storage, and implementing Direct Benefit Transfers for MSP. Deregulating the fertilizer industry and providing a cash subsidy of ₹7,000 per hectare to farmers, along with introducing a negotiable warehouse receipt (NWR) system, are also proposed. These reforms are essential for modernizing food grain management and enhancing agricultural productivity in India.

15. The world is facing an acute shortage of clean and safe freshwater. What are the alternative technologies that can solve this crisis? Briefly discuss any three such technologies, citing their key merits and demerits.

The world is currently facing a severe water crisis, with billions of people lacking access to clean, safe freshwater. This scarcity is driven by pollution, over-extraction, and climate change. According to the UN Water Development Report (2023), between two and three billion people are already affected by water shortages. UNICEF projects that by 2025, half of the global population could be living in areas suffering from water scarcity. This urgent issue requires immediate action and innovative solutions to secure sustainable water access for all.

The World's Acute Shortage of Clean and Safe Freshwater

Global Crisis: The world is facing an acute shortage of freshwater due to increased population, industrialization, and agricultural activities.

Depletion of Resources: Freshwater resources, such as lakes, rivers, and underground aquifers, are being depleted faster than they can be replenished.

Pollution: Industrial waste, pesticides, and untreated sewage have polluted many freshwater sources, making them unsafe for consumption.

Climate Change Impact: Global warming has led to changing rainfall patterns and the melting of glaciers, further reducing the availability of freshwater.

Urbanization and Demand: Rapid urbanization has increased the demand for freshwater, especially in cities, leading to scarcity.

Consequences: Lack of access to clean freshwater results in health issues, food insecurity, and conflicts between regions over water resources

Alternative Technologies to solve global freshwater shortage

Desalination

Merits:

Abundant Resource: Provides access to seawater, which is an almost inexhaustible resource.

Reduces Water Scarcity: Can supply fresh water to arid and coastal regions facing chronic water shortages.

Consistent Water Supply: Independent of seasonal fluctuations or droughts, ensuring a steady supply of fresh water.

Technological Advancements: Modern technologies like reverse osmosis have made desalination more efficient.

Potential for Growth: With increasing water demand, desalination can scale up to meet urban and industrial needs.

Strategic Utility: Provides an option for countries with limited freshwater sources, ensuring water security.

Demerits:

High Energy Consumption: Desalination processes, especially thermal desalination, require significant energy.

Environmental Impact: Disposal of concentrated brine can harm marine ecosystems and disrupt local biodiversity.

Expensive Infrastructure: Building and maintaining desalination plants involves high capital and operational costs.

Carbon Footprint: If powered by fossil fuels, desalination contributes to greenhouse gas emissions.

Limited to Coastal Areas: Only viable for regions near oceans, limiting its geographical scope.

Salinity Management: High saline content in the output water may require further treatment, adding costs.

Rainwater Harvesting

Merits:

Cost-effective: Involves low investment compared to large water infrastructure projects like dams.

Reduces Flooding: Helps mitigate urban flooding by capturing rainwater and reducing runoff.

Groundwater Recharge: Replenishes depleted aquifers, improving groundwater levels and quality.

Local Resource: Provides an immediate and localized water source, reducing reliance on distant reservoirs.

Sustainable: Environmentally friendly, reduces pressure on conventional water sources.

Scalable: Can be implemented on a small scale (households) or large scale (community buildings).

Demerits:

Seasonal Dependence: Effectiveness is limited to areas with sufficient rainfall; not viable in arid regions.

Storage Limitations: Requires significant storage capacity, which can be costly and space-consuming.

Maintenance: Requires regular upkeep of storage tanks, filters, and gutters to prevent contamination.

Quality Control: Water quality may be affected by contaminants from rooftops and other catchment areas.

Initial Investment: Installing rainwater harvesting systems can involve a high initial cost.

Limited Utility: Not suitable for large-scale industrial or agricultural needs; primarily for domestic use.

Wastewater Recycling

Merits:

Water Conservation: Recycles water, reducing the demand for freshwater and lowering water stress.

Sustainable Agriculture: Treated wastewater can be used for irrigation, reducing freshwater consumption in agriculture.

Pollution Control: Helps in controlling water pollution by treating wastewater before it is discharged into natural water bodies.

Energy Recovery: Can generate energy from biogas produced during wastewater treatment, reducing energy costs.

Scalable: Can be applied to both urban and industrial settings, ensuring wide applicability.

Circular Economy: Supports the concept of water reuse, contributing to sustainability and efficient resource management.

Demerits:

High Treatment Costs: Advanced treatment technologies can be expensive to install and maintain.

Health Risks: If improperly treated, recycled water may carry pathogens and chemicals harmful to health.

Public Acceptance: Resistance from the public due to the "yuck factor," making it challenging to implement at scale.

Energy Intensive: Some wastewater treatment processes, like reverse osmosis, require significant energy input.

Technological Complexity: Requires sophisticated technology and skilled personnel for effective operation.

Infrastructure Dependency: Requires extensive infrastructure, making it less feasible for rural or remote areas.

Examples of Technology use to address freshwater shortage in India

➔ **Uruva Labs:** has developed a patented technology that can produce drinking water from inexhaustible atmospheric moisture.

➔ **WaterATM:** state-of-the-art water ATM system that incorporates advanced purification technologies.

India's Jal Jeevan Mission: A government-led initiative aims to provide clean tap water to every rural household by 2024, focusing on sustainable water use and treatment technologies.

The global water crisis is a complex challenge that demands coordinated action. By addressing the root causes of water scarcity, implementing sustainable water management practices, and promoting conservation efforts, we can ensure a reliable supply of freshwater for generations to come. Governments, organizations, and individuals must work together to protect this precious resource and safeguard the health and well-being of communities worldwide.

16. What are asteroids? How real is the threat of them causing extinction of life? What strategies have been developed to prevent such a catastrophe?

India Space Research Organisation plans to send its spacecraft or collaborate with other space agencies to study asteroid Apophis. Asteroids are small rocky bodies that orbit the Sun, primarily found in the asteroid belt between Mars and Jupiter. They vary in size from a few meters to hundreds of kilometers across and are remnants from the early solar system.

Threat of Asteroids in causing extinction of life

Extinction of Dinosaurs: Recently, a study published in Journal Science confirmed that the asteroid causing the dinosaur extinction 66 million years ago originated beyond Jupiter's orbit.

Chelyabinsk Meteor Explosion: In 2013, an asteroid exploded about 30 km above a Russian town, releasing energy equivalent to 26 to 33 times released by the atom bomb that detonated over Hiroshima. While most of this energy was absorbed by the atmosphere, shock waves traveled to the ground, flattened trees, damaged buildings, and injured many people.

The potential threat of asteroids causing extinction events primarily revolves around larger bodies, particularly those greater than 1 kilometer in diameter.

Potential Consequences: An impact could cause widespread fires, tsunamis, and a "nuclear winter" effect from dust and debris blocking sunlight, disrupting ecosystems and agriculture.

Less likelihood but catastrophic Impact: While the likelihood of such an impact is low in any given year, the consequences of a significant impact could be catastrophic, potentially leading to mass extinctions.

Changing Orbits: The orbits of asteroids can be changed by Jupiter's massive gravity – and by occasional close encounters with Mars or other objects. Stray asteroids and asteroid

fragments have slammed into Earth and the other planets in the past, playing a major role in altering the geological history of the planets and in the evolution of life on Earth.

Strategies to Prevent Catastrophe

Monitoring and detection: Programs like the Near-Earth Object Observations (NEOO) of NASA track asteroids' movements and predict potential collisions.

Deflection using kinetic impactor: This method involves sending a spacecraft to collide with an asteroid, altering its trajectory enough to avoid a collision with Earth.

Eg. Double Asteroid Redirection Test (DART) mission of NASA successfully demonstrated this technique.

Gravity tractor: This concept involves placing a spacecraft near an asteroid and using its gravitational pull to slowly alter the asteroid's trajectory over time.

Nuclear disruption: A nuclear explosion near an asteroid could vaporize part of its surface, creating a jet of material that would push the asteroid off course. However, this method is controversial due to the potential risks involved.

Laser ablation: High-powered lasers could be used to vaporize material from an asteroid's surface, creating a thrust that would gradually change its orbit

Asteroids pose a real threat, but advancements in detection and deflection are helping us prevent catastrophes. ISRO and NASA are actively monitoring and studying asteroids. Continued investment in planetary defense research and international cooperation is crucial for safeguarding our planet from future celestial hazards.

17. What is disaster resilience? How is it determined? Describe various elements of a resilience framework. Also mention the global targets of Sendai Framework for Disaster Risk Reduction (2015-2030).

As per a report from the World Bank, natural disasters such as floods, earthquakes, and cyclones have cost us approximately 2% GDP annually, Hence, understanding and enhancing disaster resilience is crucial for sustainable development.

Disaster resilience refers to the capacity of individuals, communities, and systems to anticipate, prepare for, respond to, and recover from the impacts of disasters effectively. It involves not

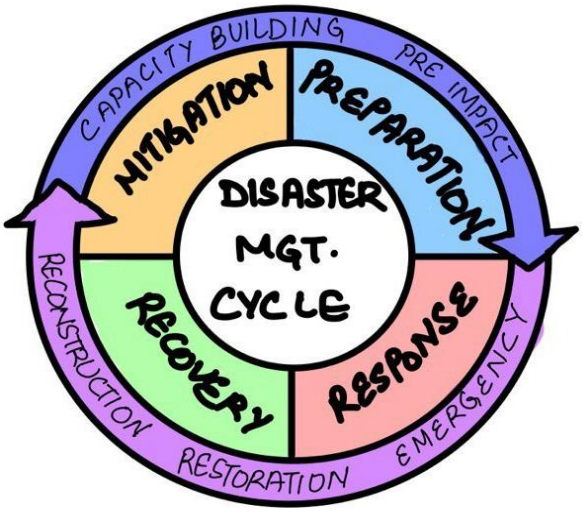
just bouncing back from adverse events but also adapting to changing conditions, minimizing vulnerabilities, and enhancing capabilities.

Elements of a Resilience Framework:

Risk Assessment: Identifying hazards and vulnerabilities to understand potential impacts and risks.

Preparedness: Developing contingency plans and conducting drills to ensure readiness for disasters.

Mitigation Strategies: Implementing measures to reduce risks, such as improving building codes, enhancing drainage systems, and conserving ecosystems.



Mechanisms: Establishing effective communication systems and rapid response teams to provide immediate relief during disasters.

Recovery and Rehabilitation: Focusing on restoring affected communities and integrating resilience-building into recovery efforts to prevent future vulnerabilities.

Disaster resilience is determined through various indicators:

Infrastructure Robustness: The strength and reliability of physical infrastructure such as roads, hospitals, and schools.

Community Preparedness: The level of awareness and preparedness of the local population, including emergency plans and training.

Socioeconomic Factors: Economic stability, access to resources, and social cohesion play significant roles in resilience.

Institutional Capacity: The effectiveness of local governance, emergency services, and community organizations in managing disaster risks.

Risk Awareness and Education: Understanding the risks and educating the community about potential hazards

Global Targets of the Sendai Framework for Disaster Risk Reduction (2015-2030)

The Sendai Framework outlines seven global targets:

Reduce Global Disaster Mortality: Substantially reduce disaster-related deaths by improving early warning and preparedness measures.

Reduce the Number of People Affected: Minimize the impact of disasters on individuals and communities by increasing resilience.

Reduce Economic Losses: Aim to reduce the direct economic losses caused by disasters relative to global GDP.

Reduce Damage to Critical Infrastructure: Focus on minimizing damage to essential services such as hospitals, schools, and infrastructure, enhancing their resilience.

Increase the Number of Countries with National and Local Disaster Risk Reduction Strategies: Encourage the development and implementation of disaster risk reduction policies.

Enhance International Cooperation: Foster global partnerships and cooperation to support disaster-stricken countries, especially developing nations, in building disaster resilience.

Increase the Availability and Use of Multi-hazard Early Warning Systems: Improve early warning systems and make them accessible to everyone, including the most vulnerable populations.

Enhancing disaster resilience is vital for protecting communities, economies, and ecosystems from the growing risks of natural and human-induced disasters. Initiatives like the Coalition for Disaster Resilient Infrastructure (CDRI) are steps in the right direction. By aligning with global frameworks like the Sendai Framework and investing in preparedness, response, recovery, and mitigation, India can strengthen its capacity to manage disasters effectively. These efforts are crucial for building safer, more resilient communities and safeguarding the environment against future crises.

18. Flooding in urban areas is an emerging climate-induced disaster. Discuss the causes of this disaster. Mention the features of two such major floods in the last two decades in India.Describe the policies and frameworks in India that aim at tackling such floods.

Urban flooding is an increasingly frequent disaster, driven by climate change and inadequate infrastructure in cities. Unlike traditional flooding in rural areas, urban flooding occurs in densely populated regions where impervious surfaces prevent water absorption, worsening the impact of intense rainfall. This climate-induced disaster has become a major concern in India, where cities are particularly vulnerable due to poor drainage systems andrapid

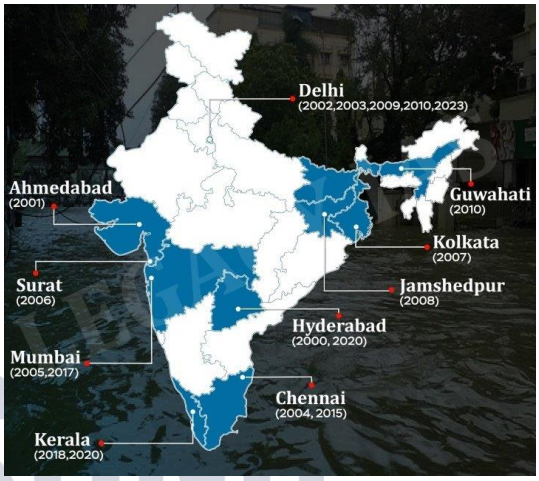
urbanization. Addressing this challenge requires urgent infrastructure improvements and sustainable urban planning to mitigate future risks.

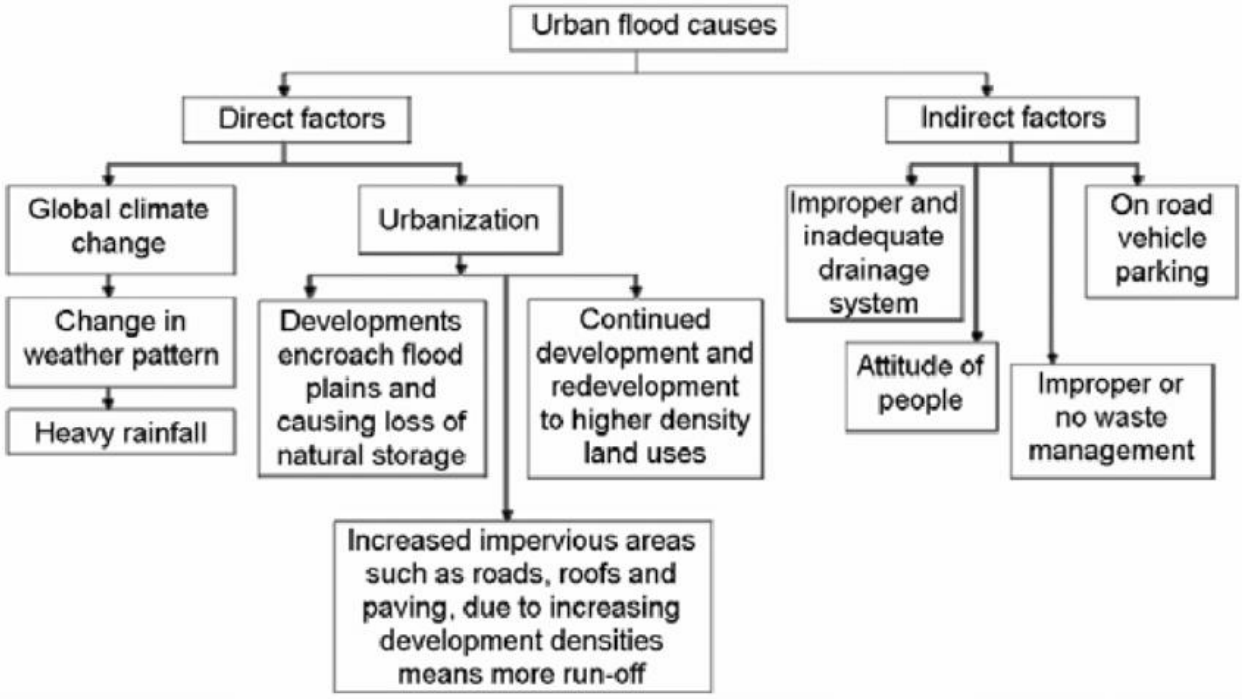
Flooding in Urban Areas: An Emerging Climate-Induced Disaster

Increased Frequency: Urban flooding has become more frequent due to climate change, urbanization, and improper drainage systems in cities.

High Intensity Rainfall: Climate change has led to more erratic and intense rainfall patterns, which urban infrastructure often cannot handle, leading to flash floods.

Impact on Cities: Indian cities like Mumbai, Chennai, and Hyderabad are increasingly vulnerable to flooding due to poor urban planning and inadequate infrastructure.





Causes of Urban Flooding:

Increased Rainfall Intensity: Climate change has led to a rise in the frequency and intensity of heavy rainfall events. According to the India Meteorological Department (IMD), the average annual rainfall in India has increased by about 7% over the last century.

Urbanization: Rapid urban growth has led to the replacement of natural land cover with impermeable surfaces. The World Bank estimates that over 30% of India's population currently lives in urban areas, a number expected to rise to 600 million by 2031.

Poor Drainage Systems: Many urban areas lack efficient drainage systems capable of managing heavy rain. For instance, a study in Delhi showed that only about 40% of the city's drainage network is functional, leading to significant waterlogging during monsoon seasons.

Encroachment on Floodplains: Development in flood prone areas and along riverbanks increases vulnerability to flooding.

Major Urban Floods in India in the Last Two Decades:

Mumbai Floods (2005):

Impact: The floods led to over 1,000 fatalities and extensive economic losses. Critical infrastructure was severely impacted, with significant disruptions to transportation, communication, and power supply.

Causes: The main factors included intense rainfall of about 944 mm of rainfall in just one day,inadequate drainage systems, and encroachment on natural water bodies, which hindered water flow.

Chennai Floods (2015):

Impact: The floods resulted in over 500 deaths and displaced thousands, with economic damages estimated at around $3 billion.

Causes: Contributing factors included 1,000 mm of heavy rainfall in a day, poor urban planning, encroachment on wetlands, and insufficient drainage systems, exacerbating the flooding situation.

Policies and frameworks in India to tackle Urban floods

National Flood Management Programme→ structural and non-structural methods had been adopted depending on the nature of the problem, geographical conditions, and available resources.

NDMA Guidelines (2010) and Preparedness Mechanisms:

Establishment of Urban Flooding Cells within State Nodal Departments and Urban Local Bodies Clearing Natural and Engineered Drainage Systems to prevent clogging from silt and municipal solid waste.

Afforestation: Trees and vegetation act as natural sponges, absorbing rainwater and minimizing surface run-off that contributes to flooding.

Rejuvenation and Conservation of Ponds, Tanks, and Lakes which can act as natural reservoirs, absorbing excess rainwater during heavy downpours.

Emphasis on Rainwater Harvesting at both household and neighbourhood levels Dredging and Desilting for Riverside Cities to maintain clear riverbeds to ensure unobstructed flow for higher volumes of water.

Jal Shakti Abhiyan (JSA): primary aim to effectively harvest the monsoon rainfall through creation of artificial recharge structures, watershed management, recharge and reuse structures, intensive afforestation and awareness generation etc.

Amrit Sarovar Mission: Aim of developing and rejuvenating 75 water bodies in each district of the country.

MoHUA issued SoPs on Urban Flooding (2017) and a Storm Water Drainage Systems Manual (2019) to help States, UTs, and ULBs with planning and maintaining drainage systems.

CITIIS 2.0: It is a part of the Smart Cities Mission and aims to promote integrated waste management and climate-oriented reform actions.

Master Plan for Artificial Recharge to Groundwater (2020) of The Central **Ground Water Board (CGWB)-**> aims at the construction of approximately 1.42 crore rainwater harvesting and artificial recharge structures across the country.

'Integrated Urban Flood Management activities for Chennai Basin Project' expected to serve as a model for developing a broader framework that can be adapted to safeguard other metropolitan areas facing similar risks.

Urban flooding in India is a growing problem due to climate change and rapid urbanization. To address it, we need improved infrastructure, effective disaster management, and sustainable urban planning. Learning from past floods and implementing robust frameworks can help India build resilience against future events. This includes strengthening early warning systems, improving drainage, promoting green infrastructure, and fostering community preparedness.

19. India has a long and troubled border with China and Pakistan fraught with contentious issues. Examine the conflicting issues and security challenges along the border. Also give out the development being undertaken in these areas under the Border Area Development Programme (BADP) and Border Infrastructure and Management (BIM) Scheme.

India shares extensive and complex borders with two of its neighbors, China and Pakistan. The India-China border stretches over approximately 3,488 kilometers, while the India-Pakistan border spans 3,323 kilometers. These borders are marked by contentious issues and disputed territories, posing significant security challenges for both India and its neighbors. The Line of Actual Control (LAC) with China and the Line of Control (LoC) with Pakistan are

particularly contentious areas that have been the site of numerous tensions and conflicts over the years.

Conflicting issues and security challenges along the India-China Border

Territorial disputes

Aksai Chin: China has a presence in this region which is a part of Ladakh. The conflict escalated during the 1962 war and remains unresolved.

Eg. Galwan valley skirmish 2020.

Arunachal Pradesh: China claims this region as part of South Tibet.

Frequent border incursions

The Chinese PLA regularly crosses the LAC.

Eg. Standoffs like Pangong Tso and Doklam.

Infrastructure development by China

China has aggressively built infrastructure near the LAC, including highways and air bases, increasing its military capability and posing a direct security threat to India.

Pakistan Border:

Land Disputes: The Line of Control (LoC) and the International Border (IB) are hotspots for skirmishes and ceasefire violations.

Infiltration and Terrorism: Pakistanbased terrorist groups frequently infiltrate into India, as seen in the 2016 Uri attack and the 2019 Pulwama attack. CrossBorder Incidents: Regular shelling and firing across the LoC result in civilian and military casualties.

Unlawful Activities: Smuggling of arms, drugs, and counterfeit currency is rampant along the border.

Development initiatives in Border areas

Border Area Development Programme (BADP)

Objective: BADP aims at ensuring balanced development of border areas by addressing the special developmental needs of the people living in remote and inaccessible border regions.

Key Focus Areas:

Infrastructure Development: Construction of roads, bridges, schools, health centers, and electrification projects.

Livelihood Promotion: Promoting employment opportunities through agricultural projects, skill development, and livelihood initiatives.

Community Welfare: Projects related to water supply, sanitation, health services, and educational infrastructure.

Security Development:

BADP plays a significant role in enhancing local governance, social cohesion, and integration, which in turn helps curb insurgency and infiltration.

Implementation of Civil Infrastructure: Roads and bridges built under BADP also facilitate better movement of security forces in border areas, enhancing their response to security threats.

Border Infrastructure and Management (BIM) Scheme

Objective: BIM focuses on strengthening border security through the construction and modernization of infrastructure, including fencing, border outposts, and surveillance systems.

Key Initiatives:

Comprehensive Integrated Border Management System (CIBMS): This includes the use of technology such as surveillance systems, sensors, and drones for real-time monitoring along sensitive border areas, particularly along the Line of Control (LoC) and India-China borders.

Construction of Border Outposts (BOPs): BOPs are being set up in strategic locations to ensure the presence of border forces in sensitive zones.

Fencing and Barriers: Modern fencing techniques and physical barriers along the Indo-Pakistan border help prevent illegal crossings and smuggling.

Security Impact:

Enhanced Surveillance: Through the integration of advanced technologies, the BIM scheme enhances real-time monitoring, ensuring better management of border security forces, and reducing illegal activities such as infiltration and smuggling.

Operational Flexibility: The infrastructure developments provide greater mobility to security forces, reducing response time in case of border violations or insurgencies.

Efficient border management and holistic development are vital for ensuring national security and promoting the welfare of border residents. A comprehensive strategy involving infrastructure development, surveillance, diplomatic negotiations, and socioeconomic development is essential to address the challenges arising from the borders with China and Pakistan.

20. Social media and encrypting messaging services pose a serious security challenge. What measures have been adopted at various levels to address the security implications of social media? Also suggest any other remedies to address the problem.

The rise of social media and encrypted messaging services has transformed the way we communicate, but it has also introduced new and concerning security challenges. These platforms have become breeding grounds for cyber threats, privacy breaches, and the spread of harmful content, such as misinformation, hate speech, and even terrorist activities. As these

platforms continue to grow in popularity, it is imperative to address these security concerns to protect individuals, communities, and national security.

Social Media and Encrypted Messaging Services as Security Challenges

Ease of Radicalization & Recruitment:

Terror groups and non-state actors exploit platforms like Facebook, Twitter, and encrypted messaging apps (e.g., WhatsApp, Telegram) to recruit individuals, spread propaganda, and radicalize susceptible populations.

Example: ISIS has used Telegram and other platforms to recruit individuals and coordinate attacks globally.

Coordination of Illegal Activities:

Encrypted communication enables criminals, insurgents, and terrorist groups to coordinate activities without easy detection by law enforcement.

Example: Naxalites in India have used encrypted services to organize attacks on government forces.

Disinformation & Psychological Warfare:

Social media is often misused for spreading fake news, creating unrest, or influencing public opinion, which can fuel violence and instability.

Example: Fake news campaigns have led to communal riots in various parts of India

Measures Adopted to Address Security Implications:

Governmental Measures:

IT Regulations: Laws like India's IT Rules, 2021, require platforms to remove illegal content and appoint compliance officers.

Cybercrime Units: Specialized units monitor threats, track extremist content, and enforce platform compliance.

Social Media Platforms:

AI Moderation: Platforms use AI to flag/remove harmful content.

Transparency: Regular reporting on takedown requests and privacy.

Fact-Checking: Collaborations to curb misinformation.

International Collaboration:

Global Internet Forum (GIFCT): Major platforms collaborate to counter terrorism online.

Cybersecurity Cooperation: Nations share threat data and collaborate on response strategies.

Public Awareness:

Digital Literacy Campaigns: Educating users on online safety and misinformation.

Educational Programs: Cybersecurity integrated into curriculums.

Law Enforcement:

Surveillance Laws: Laws granting access to encrypted data for national security.

Cyber Task Forces: Dedicated units monitor social media for security threats.

Suggested Remedies:

Strengthening Encryption Laws: Introduce policies that allow lawful access to encrypted communication without compromising user privacy, ensuring that law enforcement can act in emergencies.

Advanced AI and Machine Learning Tools: Invest in more sophisticated AI and machine learning systems to detect and prevent the spread of harmful content at a faster rate.

Example: AI-powered Content Analysis: Google's Content ID detects 99% of

copyright infringement (Source: Google, 2020)

Mandatory Identity Verification: Implement policies for identity verification on social media to prevent the anonymous spread of misinformation and online harassment, while safeguarding individual privacy.

Example: Blockchain-based Authentication: Estonia's e-Residency program uses blockchain for secure identity verification (Source: Estonia e-Residency, 2020)

Public-Private Partnerships:

Foster deeper collaboration between governments, tech companies, and civil society to create standardized protocols for handling social media-related security threats.

Cybersecurity Infrastructure:

Build robust national cybersecurity infrastructure to protect critical digital infrastructure from social media-related threats and ensure rapid response in case of cyberattacks.

Addressing the security challenges posed by social media and encrypted messaging services requires a multifaceted approach. A balanced approach that combines regulation, platform responsibility, and user education is key to mitigating the risks associated with these platforms. By implementing appropriate regulations, holding platforms accountable for their content, and empowering users with knowledge and awareness, we can ensure that social media is used as a force for good, promoting creativity, constructive dialogue, and progress for humanity.