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India's Digital Future Begins with Trusted AI, Not Just Powerful AI

Trusted AI: The Foundation of India's Digital Future

Why is it in News?

Artificial Intelligence (AI) is rapidly transforming sectors such as governance, healthcare, education, finance, agriculture, and national security. As AI adoption accelerates, the focus has shifted from building powerful AI systems to ensuring they are ethical, transparent, secure, and accountable.

India's AI Journey

India is emerging as one of the world's fastest-growing digital economies. Government initiatives promoting AI innovation, digital public infrastructure, and research are creating opportunities to improve public service delivery, boost economic growth, and enhance governance. AI has the potential to bridge developmental gaps and make essential services more accessible.

Why Responsible AI Matters

The rapid expansion of AI also raises concerns about privacy, misinformation, algorithmic bias, cybersecurity, and job displacement. Responsible AI aims to ensure that AI systems are fair, transparent, explainable, and aligned with constitutional values while protecting citizens' rights and promoting public trust.

Challenges

- Algorithmic bias leading to unfair outcomes.
- Concerns over data privacy and security.
- Spread of misinformation through AI-generated content.
- Lack of transparency in AI decision-making.
- Need for a skilled workforce to adapt to AI-driven changes.

Way Forward

India's long-term success in AI depends on balancing innovation with regulation. Strengthening data governance, encouraging ethical AI research, investing in digital skills, and promoting collaboration between government, academia, industry, and startups will help build a trustworthy and globally competitive AI ecosystem.

UPSC Prelims Practice Question

Q. With reference to Responsible Artificial Intelligence (AI), consider the following statements:

1. Responsible AI emphasizes transparency and accountability in AI systems.
2. Bias in AI models can arise due to biased training data.
3. Responsible AI primarily focuses only on improving computational efficiency and model accuracy.

Which of the statements given above is/are correct?

- | | | | | |
|----|---|-----|---|------|
| A. | | 1 | | only |
| B. | 1 | and | 2 | only |

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- C. 2 and 3 only
D. 1, 2 and 3

Answer: B

Explanation

- Statement 1 is correct because Responsible AI promotes transparency, fairness, and accountability.
- Statement 2 is correct because biased training data can produce biased AI outcomes.
- Statement 3 is incorrect because Responsible AI also includes ethics, privacy, safety, and inclusiveness, not just performance.

Seeds of Sustainability: Ensuring India's Food Future

Strengthening India's Food Security Through Sustainable Agriculture

Why is it in News?

Agriculture remains the backbone of India's economy, supporting nearly half of the country's workforce. However, climate change, depleting groundwater, soil degradation, and changing rainfall patterns have highlighted the need for sustainable agricultural practices.

India's Agricultural Challenges

India faces multiple challenges, including declining soil fertility, groundwater depletion, fragmented landholdings, rising input costs, and the increasing impact of climate change. These issues threaten both food security and farmers' livelihoods.

Government Initiatives

The Government has introduced several measures to promote sustainable agriculture, such as the Soil Health Card Scheme, Pradhan Mantri Krishi Sinchayee Yojana (PMKSY), promotion of natural farming, crop diversification, and digital agriculture.

Way Forward

Ensuring long-term food security requires scientific farming methods, efficient water management, climate-resilient crops, greater investment in agricultural research, and sustainable use of natural resources. A balanced approach can improve farmers' income while protecting the environment.

UPSC Prelims Practice Question

Q. With reference to the Soil Health Card Scheme, consider the following statements:

1. It provides information on the nutrient status of soil.
2. It recommends appropriate fertilizer use based on soil testing.
3. The scheme is implemented exclusively by private agricultural companies.

Which of the statements given above is/are correct?



- A. 1 only
- B. 1 and 2 only
- C. 2 and 3 only
- D. 1, 2 and 3

Answer: B

Explanation

- Statement 1 is correct because the Soil Health Card provides information on soil nutrients.
- Statement 2 is correct because it recommends balanced fertilizer application based on soil testing.
- Statement 3 is incorrect because the scheme is implemented by the Government with the support of State Governments.

Waves of Opportunity: India's Maritime Growth Story

Blue Economy: Unlocking India's Maritime Potential

Why is it in News?

With over 7,500 km of coastline and a strategic location in the Indian Ocean Region, India is increasingly focusing on the Blue Economy as a key driver of sustainable economic growth. The concept has gained importance in policy discussions due to its potential to strengthen economic development while ensuring the conservation of marine ecosystems.

What is the Blue Economy?

The Blue Economy refers to the sustainable use of ocean and marine resources for economic growth, improved livelihoods, and employment while preserving the health of marine ecosystems. It aims to balance economic development with environmental sustainability, ensuring that marine resources remain available for future generations.

Importance for India

The Blue Economy holds immense significance for India as it contributes to sectors such as fisheries, shipping, tourism, offshore renewable energy, marine biotechnology, and port-led development. It also supports food security, employment generation, energy security, and international trade. India's strategic maritime location further strengthens its role in regional connectivity and maritime cooperation.

Challenges

Despite its vast potential, the Blue Economy faces several challenges. Marine pollution, overfishing, coastal erosion, habitat degradation, climate change, illegal fishing, and inadequate maritime infrastructure continue to hinder sustainable ocean-based development. Effective governance and scientific management are essential to address these issues.

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Government Initiatives

The Government of India has introduced several initiatives to promote the Blue Economy, including the Sagarmala Programme for port-led development, the Pradhan Mantri Matsya Sampada Yojana (PMMSY) for fisheries development, the Deep Ocean Mission for marine exploration, and the Maritime India Vision 2030 to modernize the maritime sector.

Way Forward

India's Blue Economy can become a major pillar of economic growth through sustainable resource management, investment in maritime infrastructure, scientific research, coastal community participation, and stronger regional cooperation. A balanced approach that combines economic development with environmental conservation will be essential for achieving long-term maritime sustainability.

UPSC Prelims Practice Question

Q. With reference to the Blue Economy, consider the following statements:

1. The Blue Economy promotes the sustainable use of ocean resources for economic growth.
2. Fisheries, maritime transport, and offshore renewable energy are components of the Blue Economy.
3. The Blue Economy focuses only on marine resource extraction without considering environmental sustainability.

Which of the statements given above is/are correct?

- | | | | | |
|----|------------|-----|---|------|
| A. | | 1 | | only |
| B. | 1 | and | 2 | only |
| C. | 2 | and | 3 | only |
| D. | 1, 2 and 3 | | | |

Answer: B

Explanation

- Statement 1 is correct because the Blue Economy emphasizes the sustainable use of marine resources.
- Statement 2 is correct because fisheries, shipping, and offshore renewable energy are important sectors of the Blue Economy.
- Statement 3 is incorrect because environmental sustainability is one of the core principles of the Blue Economy.

Harvesting Stability: Climate-Smart Agriculture for India

Climate-Resilient Agriculture: Securing India's Food Future

Why is it in News?

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Climate change is increasingly affecting India's agricultural sector through irregular rainfall, rising temperatures, droughts, floods, and extreme weather events. Strengthening climate-resilient agriculture has become essential to ensure food security, protect farmers' livelihoods, and promote sustainable agricultural growth.

What is Climate-Resilient Agriculture?

Climate-resilient agriculture refers to farming practices that improve agricultural productivity while enhancing the ability of crops and farming systems to adapt to climate change. It focuses on sustainable resource management, efficient use of water, improved soil health, and adoption of climate-smart technologies.

Importance for India

Agriculture supports nearly half of India's workforce and remains crucial for the country's economy and food security. Climate-resilient farming helps reduce crop losses, improves farmers' income, conserves natural resources, strengthens rural livelihoods, and ensures long-term agricultural sustainability.

Challenges

Indian agriculture faces several challenges, including erratic monsoons, declining groundwater levels, soil degradation, excessive dependence on chemical fertilizers, fragmented landholdings, and increasing frequency of extreme weather events. Limited access to technology and climate information further affects agricultural productivity.

Government Initiatives

The Government of India has introduced several initiatives to strengthen climate-resilient agriculture, including the National Mission for Sustainable Agriculture (NMSA), Pradhan Mantri Krishi Sinchayee Yojana (PMKSY), Soil Health Card Scheme, Pradhan Mantri Fasal Bima Yojana (PMFBY), and the promotion of natural farming and micro-irrigation.

Way Forward

Building a climate-resilient agricultural system requires scientific farming practices, efficient irrigation, crop diversification, improved weather forecasting, greater investment in agricultural research, and wider adoption of climate-smart technologies. Strengthening farmers' awareness and institutional support will be key to ensuring sustainable agricultural development.

UPSC Prelims Practice Question

Q. With reference to Climate-Resilient Agriculture, consider the following statements:

1. Crop diversification helps reduce climate-related agricultural risks.
2. Micro-irrigation improves water-use efficiency in agriculture.
3. Climate-resilient agriculture focuses only on increasing crop production without considering environmental sustainability.

Which of the statements given above is/are correct?

A. 1 only

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B. 1 and 2 only

C. 2 and 3 only

D. 1, 2 and 3

Answer: B

Explanation

- Statement 1 is correct because crop diversification reduces dependence on a single crop and improves resilience against climate variability.
 - Statement 2 is correct because micro-irrigation systems such as drip and sprinkler irrigation improve water-use efficiency.
 - Statement 3 is incorrect because climate-resilient agriculture promotes both agricultural productivity and environmental sustainability.
-

Chip Revolution Powering India's Self-Reliant Future

India's Semiconductor Mission: Building a Self-Reliant Electronics Ecosystem

Why is it in News?

Semiconductors have become the backbone of the modern digital economy, powering smartphones, computers, automobiles, medical equipment, telecommunications, defence systems, and artificial intelligence. To reduce import dependence and strengthen technological capabilities, India is making significant efforts to establish a robust domestic semiconductor manufacturing ecosystem.

What are Semiconductors?

Semiconductors are materials whose electrical conductivity lies between that of conductors and insulators. They are used to manufacture integrated circuits (ICs) and microchips, which are essential components in almost every electronic device.

Importance for India

A strong semiconductor industry is crucial for India's economic growth, digital transformation, national security, and technological self-reliance. Domestic chip manufacturing can reduce dependence on imports, strengthen supply chains, generate employment, attract investments, and position India as a global electronics manufacturing hub.

Challenges

Semiconductor manufacturing requires enormous capital investment, advanced technology, skilled manpower, uninterrupted electricity and water supply, and a highly sophisticated manufacturing ecosystem. India also faces intense global competition and depends heavily on imports for semiconductor chips.

Government Initiatives

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The Government of India launched the India Semiconductor Mission (ISM) to promote semiconductor and display manufacturing. Financial incentives are being provided to encourage domestic production, attract global investments, strengthen semiconductor design capabilities, and develop a complete semiconductor ecosystem in the country.

Way Forward

India must continue investing in research and development, develop a highly skilled workforce, strengthen global partnerships, improve infrastructure, and encourage innovation across the semiconductor value chain. A resilient semiconductor ecosystem will play a vital role in achieving the vision of Atmanirbhar Bharat and making India a global technology leader.

UPSC Prelims Practice Question

Q. With reference to semiconductors, consider the following statements:

1. Semiconductors are essential components used in the manufacture of integrated circuits and microchips.
2. India currently meets all its semiconductor requirements through domestic manufacturing.
3. The India Semiconductor Mission aims to promote semiconductor manufacturing in the country.

Which of the statements given above is/are correct?

- A. 1 only
B. 1 and 3 only
C. 2 and 3 only
D. 1, 2 and 3

Answer: B

Explanation

- Statement 1 is correct because semiconductors form the foundation of integrated circuits and electronic devices.
- Statement 2 is incorrect because India continues to depend significantly on imports for semiconductor chips.
- Statement 3 is correct because the India Semiconductor Mission was launched to develop a domestic semiconductor ecosystem.

Human–Animal–Environment Health Continuum

One Health Approach: Integrating Human, Animal and Environmental Health

Why is it in News?

The increasing emergence of zoonotic diseases, antimicrobial resistance (AMR), and environmental degradation has highlighted the importance of the One Health approach. It recognizes that the health

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of humans, animals, plants, and the environment are closely interconnected and must be addressed through coordinated action.

What is the One Health Approach?

One Health is a collaborative, multisectoral, and transdisciplinary approach that aims to achieve optimal health outcomes by recognizing the interdependence of human, animal, and environmental health. It promotes cooperation among healthcare professionals, veterinarians, environmental scientists, policymakers, and communities.

Importance for India

India is one of the world's biodiversity-rich countries and has a large livestock population. Rapid urbanization, deforestation, climate change, and increased human-animal interaction have raised the risk of zoonotic diseases. The One Health approach helps strengthen disease surveillance, improve food safety, enhance pandemic preparedness, and promote sustainable development.

Challenges

Implementing the One Health approach faces several challenges, including inadequate coordination among different sectors, limited surveillance infrastructure, shortage of trained professionals, insufficient data sharing, and weak public awareness. Climate change and antimicrobial resistance further complicate disease management.

Government Initiatives

The Government of India has strengthened integrated disease surveillance, promoted collaboration between health and veterinary institutions, enhanced laboratory networks, and supported research on zoonotic diseases and antimicrobial resistance. These efforts align with the broader objective of improving public health security.

Way Forward

India should strengthen inter-sectoral coordination, invest in integrated surveillance systems, improve laboratory capacity, promote responsible use of antibiotics, enhance public awareness, and encourage scientific research. Adopting the One Health approach will improve India's ability to prevent future pandemics while ensuring sustainable health outcomes.

UPSC Prelims Practice Question

Q. With reference to the One Health Approach, consider the following statements:

1. It recognizes the interconnection between human, animal, and environmental health.
2. It primarily focuses only on the treatment of human diseases.
3. It promotes collaboration among multiple sectors for disease prevention and control.

Which of the statements given above is/are correct?

- A. 1 only
B. 1 and 3 only
C. 2 and 3 only
D. 1, 2 and 3

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Answer: B

Explanation

- Statement 1 is correct because the One Health approach integrates human, animal, and environmental health.
- Statement 2 is incorrect because it is not limited to human healthcare; it adopts a multidisciplinary approach.
- Statement 3 is correct because One Health encourages collaboration among health, veterinary, environmental, and other sectors.

BIMSTEC and Northeast India: The Missing Link in India's Act East Policy

India's Act East Policy (AEP) aims to strengthen economic, strategic, and cultural ties with Southeast Asia and the wider Indo-Pacific. While India has made significant progress in building partnerships with ASEAN and other regional countries, one important objective remains incomplete—making Northeast India the gateway to Southeast Asia. The future success of the Act East Policy depends not only on India's diplomacy abroad but also on the development and connectivity of its northeastern states.

Northeast India occupies a unique geographical position. It shares borders with Bangladesh, Bhutan, Myanmar, China, and Nepal, making it India's natural bridge to Southeast Asia. Four BIMSTEC countries—Bangladesh, Bhutan, Myanmar, and Nepal—are directly connected to the Northeast. This gives the region immense strategic and economic importance. However, due to inadequate infrastructure, difficult terrain, security challenges, and decades of underdevelopment, the Northeast has not been able to realise its full potential.

This is where BIMSTEC (Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation) becomes important. BIMSTEC connects five South Asian and two Southeast Asian countries through the Bay of Bengal, creating a platform for cooperation in trade, transport, energy, disaster management, tourism, and technology. Unlike SAARC, which has often been affected by India-Pakistan tensions, BIMSTEC has emerged as a more active regional organisation and fits well with India's Neighbourhood First Policy, Act East Policy, and SAGAR (Security and Growth for All in the Region) vision.

Improving connectivity is the key to unlocking the Northeast's potential. Projects such as the India–Myanmar–Thailand Trilateral Highway and the Kaladan Multi-Modal Transit Transport Project can connect the Northeast with markets in Myanmar, Thailand, and beyond. Better roads, railways, inland waterways, border trade centres, and digital infrastructure can reduce transportation costs, promote tourism, encourage investment, and create employment opportunities. However, many of these projects have faced delays because of political instability in Myanmar, security concerns, funding issues, and slow implementation.

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Bangladesh plays a particularly important role in this strategy. Better connectivity through Bangladeshi ports, railways, and inland waterways can provide the Northeast with shorter and cheaper access to global markets. This would reduce the region's dependence on the narrow Siliguri Corridor and improve trade and logistics. Strengthening cooperation through both BBIN (Bangladesh-Bhutan-India-Nepal) and BIMSTEC can therefore significantly boost regional integration.

The Northeast is not only strategically important but also rich in economic opportunities. It has abundant natural resources, hydropower potential, biodiversity, bamboo, organic farming, handicrafts, and tourism potential. Better regional connectivity can help local farmers, entrepreneurs, and small businesses access larger markets across South and Southeast Asia. This would generate employment, reduce regional disparities, and contribute to inclusive economic development.

At the same time, connectivity projects should not be viewed only from a strategic or geopolitical perspective. They must improve the lives of local people. Better schools, healthcare, digital connectivity, skill development, tourism, and employment opportunities should accompany infrastructure development. Unless local communities benefit directly, regional connectivity projects may fail to achieve their long-term objectives.

From India's foreign policy perspective, BIMSTEC has become increasingly important because it strengthens regional cooperation without the political difficulties faced by SAARC. It also supports India's broader Indo-Pacific strategy by promoting a free, open, and rules-based regional order through development, connectivity, and economic cooperation rather than military alliances.

Despite its potential, several challenges remain. Political instability in Myanmar continues to affect cross-border projects. Difficult terrain, insurgency in some areas, delays in project execution, and limited institutional capacity have slowed progress. Addressing these issues requires stronger coordination between the Central Government, northeastern states, neighbouring countries, and the BIMSTEC Secretariat.

The way forward is clear. India should accelerate connectivity projects, improve trade infrastructure, expand digital and energy cooperation, strengthen border trade, and encourage private investment in the Northeast. Equally important is ensuring that development reaches local communities through better education, healthcare, entrepreneurship, and employment opportunities.

In conclusion, the success of India's Act East Policy will not be measured only by diplomatic engagements with Southeast Asia but also by how effectively it transforms Northeast India into a vibrant economic and connectivity hub. BIMSTEC provides the ideal platform to achieve this objective. By placing the Northeast at the centre of regional integration, India can convert a historically neglected frontier into a bridge connecting South Asia with Southeast Asia, thereby strengthening both national development and regional cooperation.



Nutshell

- **Core Idea:** The success of India's Act East Policy depends on transforming Northeast India into India's gateway to Southeast Asia.
 - **Why the Northeast Matters:** The Northeast shares borders with Bangladesh, Bhutan, Myanmar, China, and Nepal.
 - **Role of BIMSTEC:** BIMSTEC connects South Asia and Southeast Asia through the Bay of Bengal. It promotes trade and economic cooperation, serving as a key pillar of India's Act East Policy and Neighbourhood First Policy.
 - **Need for Better Connectivity:** Projects like the India–Myanmar–Thailand Trilateral Highway and the Kaladan Multimodal Transit Project aim to improve access to Southeast Asian markets.
 - **Economic Benefits:** Better connectivity can boost trade, tourism, manufacturing, border commerce, agriculture, and employment.
 - **Strategic Significance:** A developed Northeast strengthens India's presence in the Bay of Bengal and the Indian Ocean Region.
 - **Challenges:** Political instability in Myanmar, insurgency, difficult terrain, infrastructure delays, funding constraints, and security concerns.
 - **Way Forward:** Accelerate connectivity projects, strengthen cooperation with BIMSTEC and BBIN, improve border management, and invest in infrastructure and human resources in the Northeast.
-

Census 2027 and Caste Enumeration: Why Methodology Matters More Than Politics?

As part of the **Census 2027** preparations, the government has begun field testing the methodology for caste enumeration. An important feature under examination is the "open column" approach, where respondents declare their caste in their own words rather than selecting from a pre-defined list. The exercise has revived debates on balancing accurate data collection, administrative feasibility, social justice, and national integration.

The upcoming Census will be the first nationwide caste enumeration since the 1931 Census. While independent India has continued to enumerate Scheduled Castes (SCs) and Scheduled Tribes (STs), data on other caste groups have not been collected through the regular decennial Census. The decision to include caste data reflects growing demands for evidence-based policymaking and improved targeting of welfare measures.

Why is Caste Enumeration Important?

1. Evidence-based Social Justice

Reliable caste data enables governments to assess whether affirmative action policies are reaching intended beneficiaries. It provides a factual basis for designing welfare schemes instead of relying on outdated demographic estimates.

2. Better Policy Formulation

Data on caste combined with education, occupation, income, housing and health indicators helps identify multidimensional deprivation, allowing more targeted interventions.

3. Rational Resource Allocation

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Governments can distribute resources more efficiently when backed by updated demographic information, reducing exclusion as well as duplication.

4. Constitutional Commitment

The Constitution permits affirmative action for socially and educationally backward classes. Accurate empirical data strengthens the implementation of Articles 15(4), 15(5), 16(4), 46 and related social justice measures.

The Challenge of the "Open Column" Method

Under the proposed methodology, respondents state their caste without choosing from a standardized list.

Potential Advantages

- Respects individual self-identification.
- Avoids forcing communities into predetermined classifications.
- Captures local caste variations and sub-castes.
- Enhances inclusiveness in data collection.

Major Concerns

- India has thousands of caste names, regional spellings and synonyms.
- Similar communities may report different names across states.
- Enumerators may record spellings inconsistently.
- Data cleaning and classification become extremely complex.
- Possibility of duplicate or fragmented caste categories.

The experience of earlier caste-related exercises demonstrated that open-ended responses can generate an enormous number of unique caste names, requiring extensive standardization before meaningful analysis becomes possible.

Key Administrative Challenges

Standardisation

Different spellings, dialects and local identities need harmonisation without altering respondents' declarations.

Training Enumerators

Enumerators require intensive training to ensure accurate recording and minimise recording errors.

Digital Validation

Since Census 2027 is being conducted digitally, technological tools such as automated coding, linguistic mapping and AI-assisted standardisation may improve consistency.

Confidentiality

Maintaining public trust requires strong safeguards for personal information and strict adherence to the confidentiality provisions of the Census framework.

Arguments in Favour of Caste Enumeration

- Provides updated demographic evidence after several decades.

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- Improves targeting of welfare schemes.
- Enables informed public debate on reservation and inclusion.
- Supports evidence-based policymaking rather than political speculation.
- Strengthens governance through better statistical databases.

Concerns Raised

- Excessive emphasis on caste identities may reinforce social divisions.
- Political mobilisation around caste numbers could intensify.
- Administrative complexity may delay publication of results.
- Incorrect classification may reduce data reliability.
- Public misunderstanding of preliminary figures could fuel social tensions.

The Way Forward

A balanced approach should combine accuracy, transparency and institutional credibility.

The following measures can improve the exercise:

- Develop a scientifically validated national coding framework after data collection.
- Use digital tools for linguistic standardisation while preserving original responses.
- Conduct extensive enumerator training and pilot testing.
- Involve statisticians, sociologists, anthropologists and state governments in classification.
- Maintain complete transparency regarding methodology.
- Ensure strict confidentiality of individual-level information.
- Release aggregate analytical data accompanied by methodological notes.

Constitutional Perspective

The Constitution envisions both social justice and national unity.

Accurate caste data should therefore be viewed neither as an instrument of political mobilisation nor as an end in itself. Rather, it should serve as a tool for achieving substantive equality while upholding constitutional values of justice, equality and fraternity.

UPSC Prelims Pointers

- Census is conducted under the Census Act, 1948.
- Census is carried out by the Registrar General and Census Commissioner of India under the Ministry of Home Affairs.
- Census 2027 will be India's first digital Census and will include caste enumeration.

Which of the following constitutional provisions are closely associated with affirmative action based on social and educational backwardness?

1. Article 15(4)
2. Article 16(4)
3. Article 46
4. Article 330

Select the correct answer.

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- | | | | | | |
|-----|---------------|---|-----|---|------|
| (a) | 1, | 2 | and | 3 | only |
| (b) | 1 | | and | 4 | only |
| (c) | 2 | | and | 3 | only |
| (d) | 1, 2, 3 and 4 | | | | |

UPSC Mains Value Addition

"Good public policy depends on good public data."

The debate is not whether caste should be counted, but how it should be counted. A scientifically robust methodology can convert caste enumeration from a politically contested exercise into a valuable instrument of evidence-based governance. If conducted transparently and professionally, Census 2027 can strengthen both social justice and administrative efficiency, ensuring that policy decisions rest on reliable data rather than assumptions.

UPSC Mains Practice Questions

GS Paper II (Polity & Governance)

1. *Discuss the significance of caste enumeration in the Census for evidence-based policymaking. What are the administrative and constitutional challenges associated with it? (15 Marks)*
2. *"Reliable data are essential for achieving substantive equality." Examine this statement in the context of the proposed caste census in India. (10 Marks)*
3. *Critically examine whether caste enumeration strengthens social justice or reinforces identity politics. Suggest a balanced way forward. (15 Marks)*

GS Paper I (Indian Society)

4. *Caste continues to shape socio-economic outcomes in India. Discuss the relevance of caste-based demographic data in addressing contemporary developmental challenges. (15 Marks)*

Essay Practice

5. *"Data-driven governance is indispensable for social justice, but data without trust can divide society." Discuss.*
6. *"Equality before law requires equality in opportunity." Examine the role of caste-based data in achieving substantive equality.*

Interview (Personality Test) Questions

1. Should India conduct a caste census every ten years? Justify your answer.
2. Can caste data improve governance without deepening caste consciousness?
3. If caste data reveal significant disparities, how should the government respond?
4. Is caste still a relevant indicator of deprivation in urban India?
5. What safeguards would you recommend to ensure that caste census data are used for public welfare rather than political mobilization?



Sustainable Power through Hydrogen

India's Green Hydrogen Mission: Fuel for a Sustainable Future

Why is it in News?

Green hydrogen has emerged as a key component of the global clean energy transition. India is actively promoting green hydrogen to reduce dependence on fossil fuels, achieve energy security, lower carbon emissions, and meet its climate commitments under the Paris Agreement.

What is Green Hydrogen?

Green hydrogen is hydrogen produced by splitting water into hydrogen and oxygen through electrolysis using electricity generated from renewable energy sources such as solar and wind power. Since the process does not involve fossil fuels, it produces little to no carbon emissions.

Importance for India

Green hydrogen can play a crucial role in decarbonizing sectors that are difficult to electrify, including steel, cement, fertilizers, shipping, and heavy transport. It can reduce India's dependence on imported fossil fuels, promote energy independence, create employment opportunities, and position the country as a global hub for clean energy production.

Challenges

The production of green hydrogen remains expensive due to the high cost of electrolyzers and renewable energy infrastructure. Other challenges include the need for storage and transportation facilities, limited technological capacity, and the requirement for large quantities of renewable electricity and water.

Government Initiatives

The Government of India launched the National Green Hydrogen Mission to make India a global hub for the production, utilization, and export of green hydrogen. The mission aims to promote domestic manufacturing, encourage research and innovation, reduce greenhouse gas emissions, and strengthen India's clean energy ecosystem.

Way Forward

India should continue investing in renewable energy, improve electrolyzer manufacturing, strengthen research and development, develop hydrogen infrastructure, and promote public-private partnerships. International collaboration and supportive policy measures will be essential for making green hydrogen commercially viable and accelerating the country's transition to a low-carbon economy.

UPSC Prelims Practice Question

Q. With reference to Green Hydrogen, consider the following statements:

1. Green hydrogen is produced using renewable sources of energy.
2. Electrolysis is one of the methods used to produce green hydrogen.
3. Green hydrogen production releases large quantities of carbon dioxide into the atmosphere.

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Which of the statements given above is/are correct?

- A. 1 only
- B. 1 and 2 only
- C. 2 and 3 only
- D. 1, 2 and 3

Answer: B

Explanation

- Statement 1 is correct because green hydrogen is produced using renewable energy sources.
- Statement 2 is correct because electrolysis splits water into hydrogen and oxygen using electricity.
- Statement 3 is incorrect because green hydrogen production using renewable energy generates little or no carbon emissions.

Harnessing Space for Economic Growth

India's Space Economy: Expanding Opportunities Beyond Earth

Why is it in News?

India's space sector is undergoing a major transformation with increased participation of private companies, policy reforms, and technological advancements. The country aims to significantly expand its share in the global space economy while strengthening innovation, scientific research, and commercial space activities.

What is the Space Economy?

The space economy comprises all economic activities related to the exploration, utilization, and commercialization of outer space. It includes satellite manufacturing, launch services, satellite communication, Earth observation, navigation systems, space-based applications, and emerging fields such as space tourism and in-orbit services.

Importance for India

A robust space economy can accelerate economic growth, improve communication networks, strengthen disaster management, enhance agricultural planning, support weather forecasting, improve navigation services, and boost national security. It also creates high-skilled employment and promotes technological innovation across multiple sectors.

Challenges

India faces several challenges, including limited private investment, high technology costs, increasing global competition, space debris, cybersecurity risks, and the need for advanced manufacturing capabilities. Strengthening research and ensuring sustainable use of outer space remain important priorities.

General Studies, Political Science and International Relations, Sociology, CSAT



Government Initiatives

The Government of India has introduced reforms to encourage private sector participation in the space industry. Institutions such as IN-SPACe facilitate collaboration between ISRO and private enterprises, while NewSpace India Limited (NSIL) promotes the commercialization of space technologies and services developed by ISRO.

Way Forward

India should continue investing in research and innovation, strengthen public-private partnerships, promote indigenous technology development, enhance international cooperation, and establish a strong regulatory framework. These measures will help position India as a leading player in the global space economy.

UPSC Prelims Practice Question

Q. With reference to India's space sector, consider the following statements:

1. IN-SPACe has been established to facilitate private sector participation in space activities.
2. NewSpace India Limited (NSIL) is responsible for commercializing ISRO's space technologies and services.
3. The space economy includes only satellite launch services.

Which of the statements given above is/are correct?

- A. 1 only
B. 1 and 2 only
C. 2 and 3 only
D. 1, 2 and 3

Answer: B

Explanation

- Statement 1 is correct because IN-SPACe promotes and regulates private sector participation in India's space sector.
- Statement 2 is correct because NSIL is responsible for commercializing ISRO's technologies and space-based services.
- Statement 3 is incorrect because the space economy covers a wide range of activities, including satellite communication, navigation, Earth observation, manufacturing, and space-based services.

Digital Foundations for Inclusive India

Digital Public Infrastructure: Transforming Governance in India

Why is it in News?

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India's Digital Public Infrastructure (DPI) has emerged as a global model for delivering public services efficiently and inclusively. Platforms such as Aadhaar, UPI, DigiLocker, and CoWIN have demonstrated how digital technologies can improve governance, financial inclusion, and service delivery at scale.

What is Digital Public Infrastructure?

Digital Public Infrastructure refers to a set of interoperable digital platforms, standards, and public digital systems that enable governments, businesses, and citizens to access essential services securely and efficiently. It serves as the digital foundation for governance, innovation, and economic development.

Importance for India

Digital Public Infrastructure has strengthened financial inclusion, improved the delivery of welfare schemes, reduced leakages in government subsidies, promoted digital payments, enhanced transparency, and expanded access to public services. It also supports innovation by enabling startups and private enterprises to build digital solutions on public platforms.

Challenges

Despite significant progress, India continues to face challenges such as the digital divide, cybersecurity threats, concerns over data privacy, varying levels of digital literacy, and unequal internet access across regions. Ensuring secure, inclusive, and affordable digital access remains essential.

Government Initiatives

The Government has launched several Digital Public Infrastructure initiatives, including Aadhaar for digital identity, Unified Payments Interface (UPI) for digital payments, DigiLocker for secure document storage, CoWIN for vaccination management, and the Account Aggregator framework for secure financial data sharing.

Way Forward

India should continue strengthening cybersecurity, improving digital literacy, expanding internet connectivity, protecting personal data, and encouraging innovation through open digital platforms. A resilient and inclusive Digital Public Infrastructure will support economic growth and improve the quality of public service delivery.

UPSC Prelims Practice Question

Q. With reference to Digital Public Infrastructure (DPI), consider the following statements:

1. Unified Payments Interface (UPI) is a component of India's Digital Public Infrastructure.
2. DigiLocker enables citizens to store and access digital documents securely.
3. Digital Public Infrastructure is limited only to digital payment systems.

Which of the statements given above is/are correct?

- A. 1 only
B. 1 and 2 only
C. 2 and 3 only
D. 1, 2 and 3

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Answer: B

Explanation

- Statement 1 is correct because UPI is one of India's major Digital Public Infrastructure platforms.
- Statement 2 is correct because DigiLocker provides secure storage and access to digital documents.
- Statement 3 is incorrect because Digital Public Infrastructure includes digital identity, document management, healthcare, financial services, and many other public digital platforms.

National Commission for Men Bill, 2025

Rajya Sabha MP Ashok Kumar Mittal introduced the National Commission for Men Bill, 2025 as a Private Member's Bill in Parliament. The proposal gained attention following the widely discussed **Pune Ketan Agarwal case**, which reignited debate on whether India requires a statutory body to address grievances faced by men.

India has several statutory commissions for protecting vulnerable groups, such as:

- National Commission for Women (NCW)
- National Commission for Protection of Child Rights (NCPCR)
- National Human Rights Commission (NHRC)
- National Commission for Scheduled Castes (NCSC)
- National Commission for Scheduled Tribes (NCST)

However, there is currently no dedicated statutory institution addressing issues specifically affecting men, including allegations of false criminal cases, domestic violence against men, workplace harassment, mental health challenges, parental rights, and legal aid in matrimonial disputes. The proposed Bill seeks to fill this institutional gap.

What is a Private Member's Bill?

A Private Member's Bill is introduced by any Member of Parliament who is not a Minister.

Features

- Can propose new laws or amendments.
- Intended to stimulate debate and highlight policy issues.
- Very few become law because Government Bills receive priority.

Only 14 Private Members' Bills have been passed by Parliament since Independence, making them extremely rare legislative successes.

Objectives of the Bill

The Bill seeks to establish a National Commission for Men (NCM) as an independent statutory body to:

General Studies, Political Science and International Relations, Sociology, CSAT



- Protect the rights and welfare of men.
- Address grievances related to discrimination and abuse.
- Ensure access to legal aid and counselling.
- Recommend reforms in family and criminal laws.
- Promote gender-neutral justice.
- Improve awareness of men's mental health and well-being.

Major Provisions of the Bill

1. Establishment of National Commission for Men

A statutory commission with powers to:

- Receive complaints.
- Conduct investigations.
- Recommend action to governments.
- Undertake research.
- Advise Parliament on policy reforms.

2. Complaint Redressal

The Commission may inquire into:

- Domestic violence against men.
- Workplace harassment.
- Matrimonial disputes.
- Child custody issues.
- Alleged misuse of gender-specific laws.
- Mental harassment.

3. Legal Assistance

The Commission may provide:

- Legal aid.
- Counselling services.
- Mediation.
- Family dispute resolution.

4. Policy Review

The Commission would periodically examine:

- Family laws.
- Criminal laws.
- Labour laws.
- Welfare schemes.

It may recommend reforms wherever it finds discrimination or unequal treatment.

5. Mental Health Initiatives

Recognising rising concerns over:



- Male depression
- Suicide
- Family stress
- Social isolation

the Commission would promote counselling and awareness programmes.

Why has the Bill been proposed?

The proponents argue that:

1. Rising Male Suicide

NCRB data consistently show that men account for nearly 70–75% of suicides in India, with family problems and marital issues being major causes.

1. Domestic Violence Against Men

Existing domestic violence legislation primarily protects women.

Men facing abuse often rely only on general criminal law.

1. Alleged Misuse of Certain Laws

Supporters argue that provisions such as:

- Section 498A IPC (now corresponding provisions under the Bhartiya Nyaya Sanhita framework)
- Dowry laws
- Maintenance provisions

have occasionally been misused through false complaints.

1. Lack of Institutional Support

Unlike women, men have:

- No national commission
 - No dedicated helpline
 - Limited counselling mechanisms
 - Few governments welfare schemes
- ##### 1. Need for Gender-Neutral Justice

Supporters contend that constitutional equality requires protection for every individual, irrespective of gender.

Arguments in Favour

Constitutional Equality

Article 14 guarantees equality before law.

A commission for men could strengthen equal access to justice.

Mental Health

Men often hesitate to seek psychological help due to social expectations.

A dedicated commission may reduce stigma.

Better Data Collection

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The Commission could generate reliable national data regarding:

- Male victimisation
- Suicide
- Custodial issues
- Domestic violence
- Workplace discrimination

Policy Research

Evidence-based policymaking becomes easier when specialised institutions exist.

Gender-Neutral Justice

Many experts advocate that laws should protect victims rather than focusing solely on gender.

Arguments Against

Existing Institutions Already Exist

Critics argue that:

- NHRC
- Judiciary
- Police
- State Legal Services Authorities

already provide remedies for all citizens.

Women's Vulnerability Remains Higher

Women continue to face:

- Domestic violence
- Sexual violence
- Wage inequality
- Low workforce participation
- Patriarchal discrimination

Hence, creating an equivalent commission may create a false equivalence.

Risk of Weakening Women's Protections

Women's organisations fear that demands for gender neutrality may dilute safeguards designed to address historical disadvantages.

Resource Constraints

Another statutory body would require:

- Budget
- Personnel
- Infrastructure

Its effectiveness would depend on implementation.

Constitutional Perspective

Relevant Articles include:

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- Article 14 – Equality before law
- Article 15(1) – Prohibits discrimination on grounds of sex
- Article 15(3) – Permits special provisions for women and children
- Article 21 – Right to life and dignity
- Directive Principles – Social justice and welfare

The debate centres on balancing formal equality (equal treatment) with substantive equality (special protection for disadvantaged groups).

Safeguarding Cities in a Changing Climate

Urban Flooding: Building Climate-Resilient Indian Cities

Why is it in News?

Urban flooding has become an increasingly frequent phenomenon in Indian cities due to rapid urbanization, extreme rainfall events, inadequate drainage infrastructure, and climate change. Recent flooding incidents have highlighted the urgent need for sustainable urban planning and resilient infrastructure.

What is Urban Flooding?

Urban flooding refers to the inundation of land or property in urban areas caused by intense rainfall overwhelming drainage systems, encroachment of natural water bodies, poor land-use planning, and unplanned urban expansion. Unlike riverine floods, urban floods develop rapidly and can severely disrupt city life.

Importance for India

India is witnessing rapid urbanization, with cities serving as major centers of economic growth. Effective management of urban flooding is essential to protect lives, infrastructure, public health, economic activities, and critical services. Climate-resilient cities are also crucial for achieving sustainable urban development.

Challenges

Many Indian cities face inadequate stormwater drainage systems, encroachment of wetlands and lakes, increasing concretization, poor solid waste management, and weak urban planning. Climate change has further intensified the frequency and severity of extreme rainfall events, increasing flood risks.

Government Initiatives

The Government of India has undertaken several initiatives to improve urban resilience, including the Smart Cities Mission, Atal Mission for Rejuvenation and Urban Transformation (AMRUT), National Disaster Management Plan, and programmes promoting sustainable urban planning, drainage improvement, and water body restoration.

General Studies, Political Science and International Relations, Sociology, CSAT

Way Forward

India should strengthen urban planning, restore natural drainage systems, conserve wetlands, improve stormwater infrastructure, adopt nature-based solutions, strengthen early warning systems, and promote climate-resilient urban development. Community participation and effective governance will be essential for reducing urban flood risks.

UPSC Prelims Practice Question

Q. With reference to urban flooding in India, consider the following statements:

1. Encroachment of wetlands and natural drainage channels increases the risk of urban flooding.
2. Climate change has contributed to an increase in the frequency of extreme rainfall events.
3. Urban flooding occurs only due to the overflow of major rivers.

Which of the statements given above is/are correct?

- A. 1 only
B. 1 and 2 only
C. 2 and 3 only
D. 1, 2 and 3

Answer: B

Explanation

- Statement 1 is correct because wetlands and natural drainage channels help absorb and drain excess rainwater.
 - Statement 2 is correct because climate change has increased the occurrence of intense rainfall events in many regions.
 - Statement 3 is incorrect because urban flooding is primarily caused by inadequate drainage, rapid urbanization, and extreme rainfall, not only by overflowing rivers.
-

National Cybersecurity & Trust Framework

India's Cybersecurity Framework: Securing the Digital Economy

Why is it in News?

With the rapid expansion of digital services, online transactions, artificial intelligence, and cloud computing, cybersecurity has become a national priority. The increasing frequency of cyberattacks on government institutions, financial systems, critical infrastructure, and private organizations highlights the need for a robust cybersecurity framework.

What is Cybersecurity?

Cybersecurity refers to the protection of computers, networks, digital infrastructure, and data from cyber threats such as hacking, malware, ransomware, phishing, and data breaches. It aims to ensure the confidentiality, integrity, and availability of information in the digital ecosystem.

General Studies, Political Science and International Relations, Sociology, CSAT

Importance for India

As one of the world's fastest-growing digital economies, India relies heavily on secure digital infrastructure for governance, banking, healthcare, education, defence, and e-commerce. A strong cybersecurity ecosystem safeguards critical infrastructure, protects citizens' data, strengthens national security, and promotes trust in digital services.

Challenges

India faces several cybersecurity challenges, including increasing cybercrime, ransomware attacks, phishing scams, shortage of skilled cybersecurity professionals, vulnerabilities in critical infrastructure, and the growing sophistication of cyber threats. Rapid technological advancements also demand continuous updates to cybersecurity measures.

Government Initiatives

The Government of India has established the Indian Computer Emergency Response Team (CERT-In) to respond to cybersecurity incidents and strengthen cyber resilience. The National Cyber Security Policy, Cyber Swachhta Kendra, and initiatives to secure critical information infrastructure further enhance the country's cybersecurity preparedness.

Way Forward

India should strengthen cyber resilience through advanced technologies, regular security audits, improved cyber awareness, capacity building, international cooperation, and continuous investment in cybersecurity research and innovation. Public-private partnerships and a skilled workforce will play a crucial role in protecting India's digital future.

UPSC Prelims Practice Question

Q. With reference to cybersecurity in India, consider the following statements:

1. CERT-In is the national agency responsible for responding to cybersecurity incidents.
2. Cybersecurity aims to protect the confidentiality, integrity, and availability of digital information.
3. Cybersecurity is relevant only to the banking sector.

Which of the statements given above is/are correct?

- A. 1 only
B. 1 and 2 only
C. 2 and 3 only
D. 1, 2 and 3

Answer: B

Explanation

- Statement 1 is correct because CERT-In is India's national nodal agency for responding to cybersecurity incidents.
- Statement 2 is correct because the primary objectives of cybersecurity are confidentiality, integrity, and availability of information.

General Studies, Political Science and International Relations, Sociology, CSAT



- Statement 3 is incorrect because cybersecurity is essential across all sectors, including governance, healthcare, defence, education, energy, and telecommunications.

Strategic Minerals for Global Competitiveness

Rare Earth Elements: Strategic Resources for the Future

Why is it in News?

Rare Earth Elements (REEs) have gained global attention due to their growing importance in clean energy technologies, electric vehicles, electronics, defence equipment, and advanced manufacturing. As countries seek to diversify supply chains, securing access to these strategic minerals has become a major economic and geopolitical priority.

What are Rare Earth Elements?

Rare Earth Elements are a group of 17 metallic elements comprising the 15 lanthanides along with scandium and yttrium. Although they are relatively abundant in the Earth's crust, they are rarely found in economically viable concentrations, making their extraction and processing challenging.

Importance for India

Rare Earth Elements are essential for manufacturing permanent magnets, electric vehicles, wind turbines, smartphones, semiconductors, aerospace equipment, defence technologies, and medical devices. Developing domestic capabilities in mining and processing these minerals will strengthen India's technological self-reliance, energy security, and industrial competitiveness.

Challenges

India possesses reserves of rare earth minerals but faces challenges such as limited processing capacity, dependence on imports for refined rare earth products, environmental concerns associated with mining, and intense global competition. Supply chain concentration in a few countries also poses strategic risks.

Government Initiatives

The Government of India is promoting the exploration and sustainable development of critical minerals, including Rare Earth Elements. Efforts are being made to strengthen domestic mining, improve processing technologies, encourage research and development, and enhance international cooperation for securing critical mineral supply chains.

Way Forward

India should invest in advanced extraction and processing technologies, promote recycling of rare earth materials, strengthen public-private partnerships, expand geological exploration, and diversify international supply sources. A resilient rare earth ecosystem will support India's transition towards clean energy and advanced manufacturing.

UPSC Prelims Practice Question

General Studies, Political Science and International Relations, Sociology, CSAT



Q. With reference to Rare Earth Elements (REEs), consider the following statements:

1. Rare Earth Elements are essential for manufacturing electric vehicles and wind turbines.
2. Rare Earth Elements consist of 17 metallic elements, including scandium and yttrium.
3. Rare Earth Elements are found only in India.

Which of the statements given above is/are correct?

- A. 1 only
B. 1 and 2 only
C. 2 and 3 only
D. 1, 2 and 3

Answer: B

Explanation

- Statement 1 is correct because Rare Earth Elements are widely used in permanent magnets required for electric vehicles and wind turbines.
 - Statement 2 is correct because the Rare Earth group includes 17 elements—the 15 lanthanides along with scandium and yttrium.
 - Statement 3 is incorrect because Rare Earth Elements are found in several countries, though economically viable deposits and processing facilities are concentrated in a few regions.
-

Market Mechanisms for a Greener Future

Carbon Markets: A Market-Based Approach to Climate Action

Why is it in News?

As countries intensify efforts to combat climate change and achieve net-zero emissions, carbon markets have emerged as an important mechanism for reducing greenhouse gas emissions. India is also taking steps to develop a domestic carbon market to support sustainable economic growth while meeting its climate commitments.

What is a Carbon Market?

A carbon market is a trading system where carbon credits or emission allowances can be bought and sold. It provides financial incentives to industries and organizations that reduce greenhouse gas emissions, encouraging cleaner technologies and sustainable production practices.

Importance for India

Carbon markets can help India achieve its climate goals by promoting energy efficiency, renewable energy, low-carbon technologies, and sustainable industrial practices. They also create new economic opportunities, attract green investments, and encourage innovation in climate-friendly sectors.

Challenges

General Studies, Political Science and International Relations, Sociology, CSAT



Developing an effective carbon market requires accurate emission monitoring, transparent verification mechanisms, reliable carbon accounting, regulatory clarity, and active participation from industries. Concerns such as carbon leakage, market volatility, and maintaining environmental integrity also need to be addressed.

Government Initiatives

India has introduced the Carbon Credit Trading Scheme (CCTS) to establish a national framework for carbon trading. The scheme aims to reduce greenhouse gas emissions, improve industrial energy efficiency, and support the country's commitment towards sustainable development and climate action.

Way Forward

India should strengthen emission monitoring systems, establish transparent regulatory mechanisms, build institutional capacity, encourage participation from industries, and promote technological innovation. A well-functioning carbon market can contribute significantly to achieving sustainable development while supporting economic growth.

UPSC Prelims Practice Question

Q. With reference to Carbon Markets, consider the following statements:

1. Carbon markets encourage the reduction of greenhouse gas emissions through the trading of carbon credits.
2. Carbon credits can be earned by reducing or avoiding greenhouse gas emissions.
3. Carbon markets are meant only for developed countries and cannot be implemented in developing countries.

Which of the statements given above is/are correct?

- A. 1 only
B. 1 and 2 only
C. 2 and 3 only
D. 1, 2 and 3

Answer: B

Explanation

- Statement 1 is correct because carbon markets create economic incentives for reducing greenhouse gas emissions.
 - Statement 2 is correct because carbon credits are generated through verified emission reductions or avoidance.
 - Statement 3 is incorrect because both developed and developing countries can establish and participate in carbon market mechanisms.
-



Unlocking the Depths: India's Ocean Mission

India's Deep Ocean Mission: Exploring the Blue Frontier

Why is it in News?

The Deep Ocean Mission has become a key initiative in India's efforts to explore and sustainably utilize marine resources. The mission aims to strengthen scientific research, develop indigenous technologies for deep-sea exploration, and enhance India's strategic presence in the Indian Ocean Region.

What is the Deep Ocean Mission?

The Deep Ocean Mission is a flagship initiative of the Government of India launched to explore the deep ocean for living and non-living resources, develop technologies for deep-sea mining, strengthen ocean observation systems, and promote marine biodiversity conservation. The mission also seeks to improve India's capabilities in ocean science and technology.

Importance for India

India has a vast Exclusive Economic Zone (EEZ) rich in marine resources. The Deep Ocean Mission will support the exploration of critical minerals, improve marine resource management, strengthen the blue economy, enhance climate research, and contribute to disaster forecasting. It also has strategic importance in ensuring maritime security and technological self-reliance.

Challenges

Deep-sea exploration requires advanced technology, high investment, and specialized scientific expertise. Environmental concerns related to deep-sea mining, limited knowledge of marine ecosystems, and the need for international cooperation under global maritime regulations remain significant challenges.

Government Initiatives

The Government has launched the Deep Ocean Mission with multiple components, including the development of a manned submersible vehicle, exploration of polymetallic nodules, deep-sea biodiversity studies, ocean climate research, and advancement of marine technologies. The mission complements India's broader Blue Economy strategy.

Way Forward

India should continue investing in ocean science, promote sustainable utilization of marine resources, strengthen international scientific collaboration, develop indigenous deep-sea technologies, and ensure that marine exploration is carried out without harming fragile ocean ecosystems.

UPSC Prelims Practice Question

Q. With reference to the Deep Ocean Mission, consider the following statements:

1. It aims to develop indigenous technologies for deep-sea exploration.
2. One of its objectives is the exploration of polymetallic nodules.
3. The mission is concerned only with marine tourism.

Which of the statements given above is/are correct?

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- A. 1 only
- B. 1 and 2 only
- C. 2 and 3 only
- D. 1, 2 and 3

Answer: B

Explanation

- Statement 1 is correct because the Deep Ocean Mission focuses on developing indigenous deep-sea exploration technologies.
- Statement 2 is correct because exploration of polymetallic nodules is one of the major objectives of the mission.
- Statement 3 is incorrect because the mission covers scientific research, resource exploration, marine biodiversity, and ocean technology, not just tourism.

Kudankulam Cyber Breach: A Wake-Up Call for India's Critical Infrastructure GS Paper III – Cyber Security | Internal Security | Science & Technology

The Kudankulam Nuclear Power Plant (KKNPP) is in the news following reports of a cyber-related data breach involving project-related files. While the Nuclear Power Corporation of India Ltd. (NPCIL) clarified that the reactor control and safety systems remained unaffected, the incident has once again highlighted the growing cyber risks facing India's critical infrastructure.

Introduction

Critical infrastructure—including nuclear power plants, power grids, defence establishments, ports, and financial networks—is increasingly vulnerable to cyberattacks. The Kudankulam incident underscores the importance of securing not just operational systems but also administrative and supply-chain networks against sophisticated cyber threats.

Kudankulam Nuclear Power Plant

- Located in Tirunelveli, Tamil Nadu
- India's largest nuclear power station
- Operated by NPCIL
- Built with Russian collaboration (Rosatom)
- Uses VVER-1000 Pressurised Water Reactors

2019 Cyber Incident

In 2019, malware known as DTrack, allegedly linked to North Korea's Lazarus Group, was detected in the plant's administrative network.

NPCIL confirmed that:

- Reactor control systems were unaffected.

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- Operational Technology (OT) remained isolated from the infected IT network.
- Nuclear safety was never compromised.

Why is the Incident Significant?

1. Threat to Critical Infrastructure

Cyberattacks on nuclear facilities, power grids and defence systems can have serious national security implications.

2. Supply Chain Vulnerabilities

Attackers increasingly target contractors, vendors and third-party software instead of directly attacking highly secured facilities.

3. Cyber Espionage

Such attacks often aim to steal sensitive information, map infrastructure and gather intelligence for future operations.

4. Hybrid Warfare

Cyberattacks have become an important tool of modern geopolitical competition alongside conventional warfare.

Major Challenges

- Legacy Industrial Control Systems (ICS)
- Insider threats
- Supply-chain vulnerabilities
- Shortage of cybersecurity professionals
- Increasing use of AI-enabled and Advanced Persistent Threat (APT) attacks

India's Cyber Security Framework

- CERT-In – National cyber incident response agency
- NCIIIP – Protects Critical Information Infrastructure
- National Cyber Coordination Centre (NCCC) – Cyber threat monitoring
- Defence Cyber Agency – Military cyber operations

Way Forward

- Strengthen Zero Trust Security Architecture
- Conduct regular cyber audits and penetration testing
- Improve vendor and supply-chain security
- Adopt AI-based threat detection systems
- Enhance cyber workforce and capacity building
- Conduct regular cyber drills for critical infrastructure

Conclusion

The Kudankulam cyber incident demonstrates that while India's nuclear operational systems remain well protected, administrative and supply-chain networks continue to pose vulnerabilities. As India



expands its digital and critical infrastructure, strengthening cyber resilience through robust governance, advanced technology and skilled manpower is essential for safeguarding national security.

Logistics for Economic Growth

National Logistics Policy: Enhancing India's Competitiveness

Why is it in News?

Efficient logistics play a crucial role in economic growth, trade competitiveness, and industrial development. To reduce logistics costs, improve supply chain efficiency, and strengthen India's position in global trade, the Government is implementing reforms under the National Logistics Policy.

What is the National Logistics Policy?

The National Logistics Policy (NLP) is a comprehensive framework aimed at creating an integrated, efficient, and technology-driven logistics ecosystem. It seeks to improve the movement of goods, reduce transportation costs, enhance multimodal connectivity, and promote ease of doing business.

Importance for India

A well-developed logistics sector supports manufacturing, agriculture, exports, e-commerce, and industrial growth. Reducing logistics costs can improve the competitiveness of Indian products in global markets, attract investments, generate employment, and contribute to achieving the vision of a developed India.

Challenges

India's logistics sector faces several challenges, including fragmented transportation systems, inadequate warehousing infrastructure, high logistics costs, congestion at ports, and limited multimodal integration. Digitalization and better coordination among stakeholders are also required.

Government Initiatives

The Government has launched the National Logistics Policy to improve logistics efficiency through digital integration, process simplification, infrastructure development, and better coordination among different modes of transport. Initiatives such as PM Gati Shakti complement the policy by promoting integrated infrastructure planning.

Way Forward

India should strengthen multimodal transport networks, modernize logistics infrastructure, encourage private sector participation, adopt digital technologies, and improve last-mile connectivity. An efficient logistics ecosystem will reduce business costs, boost exports, and enhance India's global competitiveness.

UPSC Prelims Practice Question

Q. With reference to the National Logistics Policy (NLP), consider the following statements:

1. The National Logistics Policy aims to reduce logistics costs and improve supply chain efficiency.

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2. PM Gati Shakti complements the objectives of the National Logistics Policy.
3. The National Logistics Policy focuses only on road transport.

Which of the statements given above is/are correct?

- A. 1 only
B. 1 and 2 only
C. 2 and 3 only
D. 1, 2 and 3

Answer: B

Explanation

- Statement 1 is correct because the National Logistics Policy seeks to improve logistics efficiency and reduce costs.
 - Statement 2 is correct because PM Gati Shakti supports integrated infrastructure planning, complementing the objectives of the National Logistics Policy.
 - Statement 3 is incorrect because the policy promotes multimodal logistics involving road, rail, air, waterways, and ports.
-

The Rise of Quantum Technology in India

Quantum Technology: The Next Frontier of Scientific Innovation

Why is it in News?

Quantum technology is emerging as a transformative field with applications in computing, communication, sensing, and cybersecurity. Recognizing its strategic importance, India is investing in quantum research to strengthen technological self-reliance, national security, and economic competitiveness.

What is Quantum Technology?

Quantum technology utilizes the principles of quantum mechanics, such as superposition and entanglement, to develop advanced technologies. It includes quantum computing, quantum communication, quantum sensing, and quantum cryptography, offering capabilities beyond those of classical technologies.

Importance for India

Quantum technology has the potential to revolutionize sectors such as healthcare, finance, defence, telecommunications, space, and scientific research. It can improve computational capabilities, enhance secure communication, accelerate drug discovery, strengthen weather forecasting, and support advanced manufacturing. It is also considered a strategic technology for national security.

Challenges

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The development of quantum technology requires significant investment in research, highly skilled human resources, sophisticated infrastructure, and collaboration between academia, industry, and government. Technical complexity, high costs, and limited availability of quantum hardware remain major challenges.

Government Initiatives

The Government of India has launched the National Quantum Mission (NQM) to promote research and innovation in quantum technologies. The mission focuses on developing quantum computers, secure quantum communication networks, quantum sensors, and a strong ecosystem for scientific and industrial applications.

Way Forward

India should continue investing in research and development, strengthen collaboration between universities and industries, encourage private sector participation, develop skilled manpower, and promote international cooperation. Building a robust quantum ecosystem will help India emerge as a global leader in next-generation technologies.

UPSC Prelims Practice Question

Q. With reference to Quantum Technology, consider the following statements:

1. Quantum computing is based on the principles of quantum mechanics.
2. Quantum communication has the potential to provide highly secure data transmission.
3. The National Quantum Mission aims only to promote classical computing technologies.

Which of the statements given above is/are correct?

- A. 1 only
B. 1 and 2 only
C. 2 and 3 only
D. 1, 2 and 3

Answer: B

Explanation

- Statement 1 is correct because quantum computing operates using the principles of quantum mechanics.
 - Statement 2 is correct because quantum communication enables highly secure information transfer through quantum cryptographic techniques.
 - Statement 3 is incorrect because the National Quantum Mission focuses on advancing quantum technologies, not classical computing.
-

India's Role in Global Value Chains

Global Supply Chains: Strengthening India's Manufacturing Competitiveness

General Studies, Political Science and International Relations, Sociology, CSAT



Why is it in News?

The restructuring of global supply chains due to geopolitical developments, technological advancements, and the demand for resilient production networks has created new opportunities for India. By strengthening manufacturing and improving ease of doing business, India aims to become a preferred destination in global value chains.

What are Global Supply Chains?

Global supply chains are international networks through which goods and services are designed, manufactured, assembled, and distributed across multiple countries. Different stages of production take place in different locations based on comparative advantages such as cost, technology, infrastructure, and skilled workforce.

Importance for India

Greater integration into global supply chains can boost exports, attract foreign direct investment (FDI), create employment opportunities, enhance technological capabilities, and strengthen India's manufacturing sector. It also supports the vision of making India a global manufacturing hub.

Challenges

India faces challenges such as high logistics costs, infrastructure gaps, skill shortages, regulatory complexities, dependence on imported raw materials, and increasing global competition. Strengthening industrial clusters and improving trade facilitation remain important priorities.

Government Initiatives

The Government has introduced several measures to improve India's manufacturing ecosystem, including the Production Linked Incentive (PLI) Scheme, PM Gati Shakti, National Logistics Policy, Make in India, and initiatives to improve ease of doing business and industrial infrastructure.

Way Forward

India should continue improving infrastructure, reduce logistics costs, simplify regulations, strengthen skill development, promote innovation, and diversify export markets. A resilient and competitive manufacturing ecosystem will enable India to play a greater role in global supply chains and accelerate long-term economic growth.

UPSC Prelims Practice Question

Q. With reference to Global Supply Chains, consider the following statements:

1. Global supply chains involve different stages of production taking place in multiple countries.
2. The Production Linked Incentive (PLI) Scheme aims to strengthen domestic manufacturing.
3. Participation in global supply chains has no impact on exports or employment generation.

Which of the statements given above is/are correct?

- A. 1 only
B. 1 and 2 only
C. 2 and 3 only
D. 1, 2 and 3

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Answer: B

Explanation

- Statement 1 is correct because global supply chains distribute production activities across different countries.
- Statement 2 is correct because the PLI Scheme encourages domestic manufacturing and investment in key sectors.
- Statement 3 is incorrect because stronger participation in global supply chains can significantly boost exports, employment, and industrial growth.

Building an Atmanirbhar Philanthropy Ecosystem

Introduction

Philanthropy has emerged as a crucial pillar in addressing developmental challenges that governments alone cannot solve. In India, charitable organizations, foundations, and corporate donors contribute significantly to education, healthcare, livelihoods, climate action, and disaster relief. However, evolving regulations, especially concerning foreign funding, have altered the functioning of the philanthropic sector. The editorial argues that India must build a robust domestic philanthropy ecosystem that is transparent, accountable, and capable of supporting national development priorities while reducing excessive dependence on foreign funding.

Why Philanthropy Matters

A vibrant philanthropic sector complements government efforts by:

Improving access to quality education and healthcare.
Supporting innovation in social development.
Strengthening disaster preparedness and relief.
Funding research and policy initiatives.
Empowering marginalized communities.
Promoting sustainable development.

Philanthropic organizations often reach vulnerable populations faster than conventional government mechanisms.

Changing Landscape of Indian Philanthropy

India's philanthropic ecosystem has witnessed remarkable growth due to:

Rising personal wealth.
Expansion of Corporate Social Responsibility (CSR).
Growth of family foundations.
Increasing participation by high-net-worth individuals.
Greater public awareness of social responsibility.

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This shift indicates that domestic philanthropy has the potential to become a sustainable source of development finance.

Role of FCRA in Regulating Foreign Funding

The Foreign Contribution (Regulation) Act (FCRA) regulates foreign donations received by NGOs.

Objectives

Protect national sovereignty. Ensure transparency in foreign funding. Prevent misuse of funds. Improve financial accountability.

While regulation is necessary, excessive compliance burdens may discourage genuine developmental organizations and reduce their operational capacity. Challenges Facing the Philanthropy Sector

1. Declining Foreign Contributions

Several NGOs have experienced reduced access to foreign grants due to stricter regulations.

2. Limited Domestic Donor Base

India still relies heavily on a relatively small number of large donors.

3. Trust Deficit

Concerns regarding transparency and accountability affect donor confidence.

4. Uneven Distribution of Funds

Most donations concentrate on sectors like education and healthcare, while areas such as climate resilience, governance reforms, and research receive comparatively less attention.

5. Regulatory Complexity

Multiple reporting and compliance requirements increase administrative costs for NGOs.

Need for an Atmanirbhar Philanthropy Ecosystem

A self-reliant philanthropic ecosystem should aim to:

Encourage Indian donors to contribute consistently. Diversify funding sources. Promote transparency through better governance. Strengthen public trust. Support innovation in social development.

Align philanthropic initiatives with Sustainable Development Goals (SDGs).

Domestic philanthropy can become an important partner in India's developmental journey.

Government's Role

The government can facilitate philanthropic growth by:

Simplifying regulatory procedures. Ensuring predictable policy frameworks. Promoting digital transparency. Encouraging CSR participation.

Supporting collaborative partnerships among government, civil society, and private donors.

Balanced regulation can improve both accountability and sectoral growth.

Way Forward

Expand India's domestic donor base. Build stronger governance standards for NGOs. Promote impact based funding. Increase transparency through digital disclosures. Encourage long-term philanthropic investments rather than short-term charity. Foster partnerships among government, businesses, academia, and civil society.

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Conclusion

An Atmanirbhar philanthropy ecosystem is not merely about replacing foreign donations with domestic contributions. It is about creating a culture of responsible giving, institutional trust, and effective governance that enables civil society to contribute meaningfully to India's inclusive and sustainable development goals. Balanced regulation combined with greater domestic participation can strengthen both democracy and development.

UPSC Mains Practice Question (GS Paper II)

Q. Discuss the role of philanthropy in achieving inclusive development in India. Examine the challenges faced by the philanthropic sector and suggest measures to build a self-reliant and accountable philanthropy ecosystem. (15 Marks, 250 Words)

Indus Waters Treaty (IWT), 1960 — India Keeps Treaty in Abeyance

India has reiterated that the Indus Waters Treaty (IWT), 1960, will remain in abeyance and has indicated that it will not operate in its present form. The development comes amid continued India–Pakistan tensions and India's concerns over cross-border terrorism.

Background

The Indus Waters Treaty (1960) was brokered by the World Bank and signed by India and Pakistan to regulate the sharing of the waters of the Indus river system.

The six rivers are divided into:

Eastern Rivers

Ravi

Beas

Sutlej

- Eastern Rivers: Allocated primarily to India.
- Western Rivers: Allocated primarily to Pakistan, while India is permitted certain uses, including domestic use, non-consumptive use and limited agricultural and hydroelectric use, subject to treaty provisions.

Why has India placed the Treaty in abeyance?

1. Cross-border terrorism
 - India has linked the continuation of the treaty to Pakistan's support for cross-border terrorism.

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- In April 2025, India announced that the treaty would be held in abeyance until Pakistan credibly and irrevocably abjures its support for terrorism.
- 2. Changing water realities
 - India argues that the treaty needs to reflect contemporary realities such as:
 - Climate change
 - Changing precipitation patterns
 - Population growth
 - Increasing water requirements
 - Need for greater hydropower development
 - Studies have also highlighted declining rainfall in parts of the eastern Indus basin.
- 3. Developmental requirements
 - India seeks greater flexibility in utilising the western rivers, particularly for hydropower and water-storage infrastructure, within its sovereign and developmental requirements.
- 4. Dispute-resolution concerns
 - India has objected to what it considers an inappropriate parallelisation of the treaty's dispute-resolution mechanisms, particularly the simultaneous involvement of a Neutral Expert and a Court of Arbitration.

Key Institutional Mechanism

Permanent Indus Commission (PIC)

- Established under the IWT.
- Each country appoints an Indus Commissioner.
- It serves as the primary mechanism for information exchange and addressing treaty-related questions.

Important UPSC Point: Can India unilaterally terminate the IWT?

Termination ≠ abeyance

- Article XII(4) provides that the Treaty continues in force until terminated by a duly ratified treaty concluded for that purpose.
- Therefore, India's present position is better understood as placing the Treaty in abeyance, rather than formally terminating it.

Significance

For India

- Greater strategic leverage vis-à-vis Pakistan.
- Potentially greater utilisation of western river waters.
- Scope for accelerating hydropower projects such as Sawalkote and other projects on the Chenab.

For Pakistan

- Potential uncertainty over water availability.

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- Significant implications for irrigation and agriculture, given Pakistan's heavy dependence on the Indus river system.

For South Asia

- Raises concerns regarding transboundary water governance.
- Could affect the precedent for other international river-water agreements.
- Highlights the growing intersection of water security, climate change and geopolitics.

Artificial Intelligence and the Future of Governance

Artificial Intelligence in Governance: Transforming Public Service Delivery

Artificial Intelligence (AI) is increasingly being adopted by governments worldwide to improve public service delivery, enhance administrative efficiency, and support evidence-based policymaking. In India, AI is being integrated into sectors such as healthcare, agriculture, education, taxation, disaster management, and law enforcement, making it an important tool for digital governance.

What is Artificial Intelligence in Governance?

Artificial Intelligence in governance refers to the use of AI technologies to assist government institutions in decision-making, service delivery, policy implementation, and public administration. AI-powered systems analyse large volumes of data, automate routine processes, and provide predictive insights that improve the efficiency and quality of governance.

Importance for India

AI can significantly improve governance by reducing administrative delays, enhancing transparency, improving the targeting of welfare schemes, strengthening disaster preparedness, supporting smart cities, and delivering citizen-centric public services. It also contributes to better resource allocation and data-driven policymaking.

Challenges

Despite its potential, AI in governance raises concerns regarding data privacy, algorithmic bias, lack of transparency, cybersecurity risks, digital exclusion, and ethical accountability. Ensuring responsible use of AI while safeguarding citizens' rights remains a major challenge.

Government Initiatives

The Government of India is promoting the responsible adoption of Artificial Intelligence through initiatives under the IndiaAI Mission. Various ministries and state governments are using AI-based solutions in healthcare, agriculture, education, traffic management, language translation, and governance to improve public service delivery.

Way Forward

India should strengthen digital infrastructure, promote ethical AI principles, ensure transparency in AI systems, protect personal data, enhance digital literacy, and encourage research and innovation.

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Building a responsible and inclusive AI ecosystem will help improve governance while maintaining public trust and accountability.

UPSC Prelims Practice Question

Q. With reference to Artificial Intelligence (AI) in governance, consider the following statements:

1. Artificial Intelligence can assist governments in improving public service delivery through data-driven decision-making.
2. Algorithmic bias is one of the challenges associated with the use of AI in governance.
3. Artificial Intelligence completely eliminates the need for human oversight in public administration.

Which of the statements given above is/are correct?

- A. 1 only
B. 1 and 2 only
C. 2 and 3 only
D. 1, 2 and 3

Answer: B

Explanation

- Statement 1 is correct because AI supports evidence-based policymaking and improves administrative efficiency.
- Statement 2 is correct because algorithmic bias can lead to unfair or discriminatory outcomes if AI systems are not properly designed and monitored.
- Statement 3 is incorrect because AI is intended to assist decision-making, not replace human oversight and accountability in governance.

Strengthening India's Bioeconomy for Future Growth

India's Bioeconomy: Driving Sustainable Growth Through Biotechnology

India's bioeconomy has witnessed significant growth in recent years, driven by advancements in biotechnology, healthcare, agriculture, bio-manufacturing, and research. As biotechnology becomes a key pillar of innovation and economic development, strengthening the bioeconomy has emerged as a national priority.

What is the Bioeconomy?

The bioeconomy refers to economic activities that utilize biological resources, biotechnology, and life sciences to produce goods, services, and sustainable solutions. It encompasses sectors such as healthcare, pharmaceuticals, agriculture, industrial biotechnology, biofuels, and environmental sustainability.

Importance for India

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A strong bioeconomy can enhance healthcare outcomes, improve agricultural productivity, promote sustainable industrial development, generate high-skilled employment, and strengthen India's global competitiveness in biotechnology. It also supports food security, environmental conservation, and innovation-driven economic growth.

Challenges

The bioeconomy faces several challenges, including limited investment in research and development, regulatory complexities, shortage of skilled professionals, inadequate commercialization of research, intellectual property concerns, and the need for advanced biotechnology infrastructure.

Government Initiatives

The Government of India has launched the **BioE3 (Biotechnology for Economy, Environment and Employment) Policy** to promote high-performance biomanufacturing and build a sustainable biotechnology ecosystem. Initiatives such as the Biotechnology Industry Research Assistance Council (BIRAC), the National Biotechnology Development Strategy, and Startup India are also supporting innovation and entrepreneurship in the biotechnology sector.

Way Forward

India should strengthen research and innovation, encourage public-private partnerships, promote biotechnology startups, enhance skill development, simplify regulatory frameworks, and increase investment in bio-manufacturing. A vibrant bioeconomy will contribute to sustainable development, economic resilience, and technological leadership.

UPSC Prelims Practice Question

Q. With reference to India's Bioeconomy, consider the following statements:

1. The bioeconomy utilizes biological resources and biotechnology for economic development.
2. The BioE3 Policy aims to promote sustainable biomanufacturing in India.
3. The bioeconomy is limited only to the pharmaceutical sector.

Which of the statements given above is/are correct?

- A. 1 only
B. 1 and 2 only
C. 2 and 3 only
D. 1, 2 and 3

Answer: B

Explanation

- Statement 1 is correct because the bioeconomy includes the use of biological resources and biotechnology across multiple sectors.
- Statement 2 is correct because the BioE3 Policy focuses on promoting high-performance and sustainable biomanufacturing.
- Statement 3 is incorrect because the bioeconomy extends beyond pharmaceuticals to agriculture, healthcare, industrial biotechnology, biofuels, and environmental applications.

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Building an Innovation-Driven Startup Ecosystem

India's Startup Ecosystem: Driving Innovation and Economic Growth

India has emerged as one of the world's largest startup ecosystems, with startups playing a significant role in innovation, employment generation, digital transformation, and economic development. Government support, increasing investments, and technological advancements have strengthened the country's entrepreneurial landscape.

What is a Startup Ecosystem?

A startup ecosystem refers to the network of entrepreneurs, investors, incubators, accelerators, educational institutions, government agencies, and industries that work together to support the creation, growth, and sustainability of startups. A strong ecosystem encourages innovation, research, and commercialization of new ideas.

Importance for India

A vibrant startup ecosystem promotes job creation, technological innovation, economic diversification, and global competitiveness. Startups contribute to sectors such as fintech, healthtech, agritech, edtech, artificial intelligence, biotechnology, and clean energy. They also support the vision of an innovation-driven and self-reliant India.

Challenges

Despite rapid growth, startups face challenges such as limited access to early-stage funding, regulatory hurdles, talent shortages, high competition, intellectual property issues, and difficulties in scaling businesses. Strengthening research-commercialization and improving access to global markets remain important priorities.

Government Initiatives

The Government of India has launched several initiatives to strengthen the startup ecosystem, including Startup India, Fund of Funds for Startups (FFS), Atal Innovation Mission (AIM), and Startup India Seed Fund Scheme (SISFS). These initiatives provide financial support, mentorship, incubation, and policy assistance to entrepreneurs.

Way Forward

India should continue simplifying regulations, encourage research and innovation, strengthen industry-academia collaboration, improve access to finance, promote entrepreneurship in Tier-II and Tier-III cities, and enhance global market access. A strong startup ecosystem will accelerate economic growth and position India as a global innovation hub.

UPSC Prelims Practice Question

Q. With reference to India's startup ecosystem, consider the following statements:

1. Startup India is an initiative aimed at promoting entrepreneurship and innovation.
2. Atal Innovation Mission supports innovation through incubators and Atal Tinkering Labs.

3. The Startup India Seed Fund Scheme provides financial assistance only to large established companies.

Which of the statements given above is/are correct?

- A. 1 only
B. 1 and 2 only
C. 2 and 3 only
D. 1, 2 and 3

Answer: B

Explanation

- Statement 1 is correct because Startup India promotes entrepreneurship, innovation, and ease of doing business for startups.
 - Statement 2 is correct because Atal Innovation Mission supports innovation through incubation centres and Atal Tinkering Labs.
 - Statement 3 is incorrect because the Startup India Seed Fund Scheme is specifically designed to support eligible startups during their early stages.
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India's Transition Towards a Circular Economy

India's Circular Economy: Towards Sustainable Resource Management

With increasing resource consumption, rapid urbanization, and growing environmental concerns, India is placing greater emphasis on adopting a circular economy. The approach aims to reduce waste, improve resource efficiency, and promote sustainable economic growth while minimizing environmental degradation.

What is a Circular Economy?

A circular economy is an economic model that focuses on reducing, reusing, repairing, refurbishing, remanufacturing, and recycling materials to keep resources in use for as long as possible. Unlike the traditional linear economy of "take, make, and dispose," it seeks to minimize waste and maximize resource efficiency.

Importance for India

A circular economy can reduce dependence on raw material imports, improve resource productivity, generate green jobs, support sustainable industrialization, reduce pollution, and strengthen energy security. It also contributes to achieving the Sustainable Development Goals (SDGs) and India's climate commitments.

Challenges

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India faces challenges such as inadequate waste segregation, limited recycling infrastructure, low public awareness, informal waste management systems, technological constraints, and insufficient investment in resource recovery and recycling industries.

Government Initiatives

The Government of India has introduced several initiatives to promote resource efficiency and waste management, including the National Resource Efficiency Policy, Plastic Waste Management Rules, E-Waste Management Rules, Swachh Bharat Mission, and Extended Producer Responsibility (EPR) framework for various waste streams.

Way Forward

India should strengthen recycling infrastructure, encourage sustainable production and consumption, promote eco-design, support green technologies, enhance public awareness, and strengthen collaboration between government, industries, and local communities. A successful transition to a circular economy will improve economic resilience while protecting the environment.

UPSC Prelims Practice Question

Q. With reference to the Circular Economy, consider the following statements:

1. A circular economy promotes the reuse and recycling of resources to minimize waste.
2. Extended Producer Responsibility (EPR) places responsibility on producers for managing the end-of-life disposal of certain products.
3. The circular economy follows the traditional "take, make, and dispose" model of production.

Which of the statements given above is/are correct?

- A. 1 only
B. 1 and 2 only
C. 2 and 3 only
D. 1, 2 and 3

Answer: B

Explanation

- Statement 1 is correct because a circular economy emphasizes resource efficiency through reuse, repair, refurbishment, and recycling.
 - Statement 2 is correct because Extended Producer Responsibility (EPR) requires producers to take responsibility for the collection and environmentally sound management of specified products after their use.
 - Statement 3 is incorrect because the "take, make, and dispose" approach represents a linear economy, whereas the circular economy seeks to keep resources in productive use for as long as possible.
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Compassion Must Operate Within Constitutional Limits

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The Madurai Bench of the Madras High Court has struck down the Tamil Nadu government's decision to provide government employment on compassionate grounds to the family members of those who died in the Karur stampede of September 27, 2025. The tragedy occurred during a political rally of the Tamilaga Vettri Kazhagam (TVK), resulting in the death of 41 people and injuries to over 60 others. Following the formation of the TVK-led government, the State announced government jobs for the affected families as a rehabilitation measure. However, the decision was challenged before the Madras High Court. On July 27, 2026, a Division Bench comprising Justice C.V. Karthikeyan and Justice R. Sakthivel struck down the policy, holding that it violated the constitutional principles governing public employment.

The Case Before the Court

The principal case was Theeran Thirumurugan @ Thirumurugan v. The Chief Secretary (WP(MD) No. 19539 of 2026).

The petitioners contended that compassionate appointment cannot be converted into a general compensation mechanism for victims of accidents or public tragedies. Such appointments are traditionally intended to provide immediate financial relief to the dependants of government employees who die while in service. Creating a separate category of appointments for the Karur victims, they argued, would undermine equality and equal opportunity in public employment.

High Court's Verdict

The High Court set aside the Government Orders granting employment, holding that the State's executive power cannot be exercised in a manner inconsistent with Articles 14 and 16 of the Constitution.

Article 14: Equality Before Law

Article 14 guarantees equality before the law and equal protection of the laws. Any special benefit granted by the State must satisfy the test of reasonable classification and cannot be arbitrary.

Article 16: Equality of Opportunity in Public Employment

Article 16 guarantees equal opportunity for all citizens in matters of public employment. Government jobs are constitutional opportunities and public resources that must ordinarily be filled through established recruitment procedures.

The Court held that granting government jobs solely on humanitarian grounds to one category of victims violated these constitutional guarantees.

Public Employment Is Not a Form of Compensation

A significant principle emerging from the judgment is the distinction between compensation for a tragedy and appointment to public employment.



The State undoubtedly possesses the authority to provide financial assistance, rehabilitation, and welfare measures to disaster-affected families. However, a government job occupies a different constitutional position. Public employment cannot be distributed as a form of relief or compensation, as it is governed by constitutional principles of equality, fairness, and merit.

The Court observed that thousands of eligible candidates compete for limited government posts. Therefore, executive discretion cannot override the constitutional framework governing recruitment.

Understanding Compassionate Appointment

Compassionate appointment is an exception to the normal rule of recruitment through open competition. Its objective is not to compensate a family for the loss of a loved one but to provide immediate financial relief to the dependants of a government employee who dies while in service.

Thus, the framework is:

- General Rule: Recruitment through open competition.
- Exception: Compassionate appointment under clearly defined statutory or administrative rules.

The Court noted that many eligible dependants of deceased government employees are already awaiting compassionate appointments. Creating a new category outside this framework could unfairly bypass those who are already in the queue.

Limits on Executive Power Under Article 162

The Tamil Nadu government defended its decision by invoking its executive powers under **Article 162**, arguing that the appointments were an exceptional humanitarian policy response.

The High Court rejected this argument, emphasizing that executive power is not absolute. Even welfare-oriented policies must conform to constitutional limitations and fundamental rights.

The judgment reiterates an important constitutional principle:

Executive power under Article 162 must operate within the framework of Articles 14 and 16.

A policy decision, however well-intentioned, cannot create an arbitrary route into public employment.

The "Floodgates" Concern

The Court also expressed concern about the precedent such appointments could create.

If government employment were granted to families affected by one tragedy, similar demands could arise from victims of:

- Firecracker factory explosions
- Industrial accidents
- Major road accidents
- Building collapses
- Other crowd disasters



Accepting such a principle could open the floodgates for claims seeking government jobs after every major tragedy.

Traditionally, victims of disasters receive ex gratia compensation, rehabilitation assistance, healthcare, housing, and educational support rather than automatic government employment.

Comparison with Ex-Servicemen Rejected

The State relied on a 1999 Government Order granting compassionate appointments to the families of deceased ex-servicemen.

The Court rejected this comparison, holding that military personnel who sacrifice their lives in service to the nation constitute a constitutionally distinct category. Therefore, benefits extended to their families cannot be used as a precedent for victims of unrelated public tragedies.

Distinction from the Thoothukudi Police Firing

The Court also distinguished the Karur stampede from the Thoothukudi police firing.

In cases where deaths result directly from State action, different constitutional considerations may arise. Since the Karur incident was not caused by direct State action, the Court found no justification for departing from ordinary constitutional principles governing public recruitment.

Alternative Rehabilitation Measures Suggested

Importantly, the Court did not suggest that the affected families should be denied assistance altogether. Instead, it recommended rehabilitation measures that do not compromise constitutional equality.

Possible alternatives include:

- Technical education
- Vocational and professional training
- Skill development programmes
- Entrepreneurship assistance
- Government-funded livelihood support
- Measures promoting long-term economic self-sufficiency

Such interventions would provide sustainable rehabilitation without distorting the constitutional recruitment process.

Earlier Interim Order

On July 10, 2026, the High Court had permitted the government to distribute appointment orders, but only on a temporary basis and subject to the outcome of the case.



The Court specifically directed that the constitutional validity of the scheme be decided before the beneficiaries received their first salary. Following a detailed examination, the policy was ultimately struck down on July 27, 2026.

Compassion vs. Equality: The Constitutional Dilemma

The judgment highlights the delicate balance between two important constitutional objectives.

On one hand, the welfare state has a responsibility to rehabilitate families who suddenly lose their breadwinners in mass tragedies. On the other hand, millions of citizens compete for limited government jobs through examinations and established recruitment procedures.

The Court held that while compassion justifies generous rehabilitation measures, it does not justify granting special access to public employment outside the constitutional framework.

Constitutional Significance

The judgment reinforces several important constitutional principles:

1. **Government employment is a public resource** and cannot ordinarily be distributed through executive discretion.
2. **Compassionate appointment is an exception**, not an alternative mode of recruitment.
3. **Welfare policies remain subject to Fundamental Rights.** Benevolent intentions do not automatically make government action constitutional.
4. **Executive power under Article 162 has constitutional limits** and remains subject to judicial review.

Building Climate-Resilient Urban Transport Systems

Sustainable Urban Mobility: The Future of India's Cities

Rapid urbanization and increasing vehicle ownership have intensified challenges such as traffic congestion, air pollution, road accidents, and rising carbon emissions in Indian cities. Sustainable urban mobility has therefore become a key priority for ensuring efficient, safe, and environmentally friendly transportation systems.

What is Sustainable Urban Mobility?

Sustainable urban mobility refers to the development of transport systems that are accessible, affordable, safe, efficient, and environmentally sustainable. It encourages the use of public transport, non-motorized transport, electric mobility, and integrated transport planning while minimizing environmental impacts.

Importance for India



Efficient urban mobility is essential for economic productivity, improved quality of life, reduced travel time, lower fuel consumption, and better air quality. Sustainable transport systems also contribute to climate change mitigation, energy security, and inclusive urban development by providing accessible transportation for all sections of society.

Challenges

Indian cities face numerous challenges, including inadequate public transport infrastructure, traffic congestion, increasing private vehicle ownership, poor last-mile connectivity, limited pedestrian and cycling infrastructure, and high levels of air pollution. Financial constraints and fragmented urban planning further hinder sustainable mobility initiatives.

Government Initiatives

The Government of India has launched several initiatives to promote sustainable urban mobility, including the PM e-Bus Sewa Scheme, Faster Adoption and Manufacturing of Electric Vehicles (FAME India Scheme), Smart Cities Mission, Metro Rail Policy, and AMRUT. These initiatives aim to strengthen public transport, encourage electric mobility, and improve urban infrastructure.

Way Forward

India should expand integrated public transport networks, improve last-mile connectivity, promote walking and cycling infrastructure, accelerate electric vehicle adoption, strengthen urban planning, and encourage the use of intelligent transport systems. A sustainable mobility framework will reduce emissions, improve urban livability, and support long-term economic growth.

UPSC Prelims Practice Question

Q. With reference to Sustainable Urban Mobility, consider the following statements:

1. The FAME India Scheme promotes the adoption of electric vehicles in the country.
2. Sustainable urban mobility encourages greater dependence on private vehicles.
3. Improving public transport and last-mile connectivity are important components of sustainable urban mobility.

Which of the statements given above is/are correct?

- A. 1 only
B. 1 and 3 only
C. 2 and 3 only
D. 1, 2 and 3

Answer: B

Explanation

- Statement 1 is correct because the FAME India Scheme promotes the adoption and manufacturing of electric vehicles.
- Statement 2 is incorrect because sustainable urban mobility prioritizes public transport, non-motorized transport, and shared mobility rather than increasing dependence on private vehicles.

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- Statement 3 is correct because efficient public transport and seamless last-mile connectivity are essential for sustainable urban transport systems.

Advancing Financial Inclusion Through Digital Innovation

Digital Financial Inclusion: Empowering India's Economic Growth

India has made remarkable progress in expanding access to digital financial services through initiatives such as Jan Dhan Yojana, Unified Payments Interface (UPI), Aadhaar, and Direct Benefit Transfer (DBT). Digital financial inclusion has become a key driver of inclusive economic growth, poverty reduction, and financial empowerment.

What is Digital Financial Inclusion?

Digital financial inclusion refers to the provision of affordable, accessible, and secure financial services through digital platforms. It enables individuals and businesses to access banking, digital payments, savings, insurance, credit, and other financial services using technology.

Importance for India

Digital financial inclusion strengthens financial security, promotes savings, improves access to credit, supports entrepreneurship, reduces cash dependency, and enhances transparency in financial transactions. It also facilitates efficient delivery of government welfare schemes and contributes to economic development.

Challenges

Despite significant progress, challenges remain in the form of digital illiteracy, cybersecurity risks, internet connectivity gaps, financial fraud, low awareness in rural areas, and unequal access to digital infrastructure. Addressing these issues is essential for achieving universal financial inclusion.

Government Initiatives

The Government of India has implemented several initiatives to promote digital financial inclusion, including the Pradhan Mantri Jan Dhan Yojana (PMJDY), Unified Payments Interface (UPI), Aadhaar Enabled Payment System (AePS), Direct Benefit Transfer (DBT), and the Digital India Programme. These initiatives have improved access to formal financial services across the country.

Way Forward

India should strengthen digital infrastructure, improve financial and digital literacy, enhance cybersecurity, promote innovation in digital financial services, and expand access in rural and remote areas. A secure and inclusive digital financial ecosystem will contribute significantly to sustainable economic growth and social inclusion.

UPSC Prelims Practice Question

Q. With reference to Digital Financial Inclusion in India, consider the following statements:



The Pradhan Mantri Jan Dhan Yojana aims to provide universal access to banking services. Unified Payments Interface (UPI) enables instant digital fund transfers between bank accounts. Direct Benefit Transfer (DBT) increases dependence on cash-based welfare distribution.

Which of the statements given above is/are correct?

- A. 1 only
- B. 1 and 2 only
- C. 2 and 3 only
- D. 1, 2 and 3

Answer: B

Explanation

Statement 1 is correct because PMJDY promotes universal access to banking and financial services. Statement 2 is correct because UPI enables real-time digital payments between bank accounts. Statement 3 is incorrect because DBT transfers benefits directly to beneficiaries' bank accounts, thereby reducing leakages and dependence on cash-based distribution.

Towards a Disaster-Resilient India

Disaster Risk Reduction: Building a Resilient India

Why is it in News?

India is highly vulnerable to natural disasters such as floods, cyclones, earthquakes, droughts, landslides, heatwaves, and coastal erosion. The increasing frequency and intensity of extreme weather events due to climate change have highlighted the importance of disaster risk reduction (DRR) as a key component of sustainable development and national resilience.

What is Disaster Risk Reduction?

Disaster Risk Reduction (DRR) refers to the systematic approach of identifying, assessing, and reducing the risks associated with disasters. It focuses on minimizing vulnerabilities, strengthening preparedness, improving resilience, and reducing the impact of disasters on lives, livelihoods, infrastructure, and the environment.

Importance for India

Disaster risk reduction is essential for protecting human lives, safeguarding infrastructure, ensuring food and water security, reducing economic losses, and promoting sustainable development. A resilient disaster management system also supports climate adaptation, enhances community preparedness, and strengthens national security.

Challenges

India faces several challenges, including rapid urbanization, unplanned development, inadequate disaster-resilient infrastructure, limited public awareness, climate change-induced extreme weather

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events, and coordination issues among various stakeholders. Financial and technological constraints also hinder effective disaster preparedness.

Government Initiatives

The Government of India has implemented several measures to strengthen disaster resilience, including the Disaster Management Act, 2005, the National Disaster Management Authority (NDMA), the National Disaster Response Force (NDRF), and the National Disaster Management Plan (NDMP). India also supports the Coalition for Disaster Resilient Infrastructure (CDRI) to promote resilient infrastructure globally.

Way Forward

India should strengthen early warning systems, promote disaster-resilient infrastructure, improve community-based disaster management, integrate disaster risk reduction into development planning, leverage modern technologies such as GIS and remote sensing, and enhance coordination among government agencies. Investing in preparedness and resilience will significantly reduce disaster-related losses and support sustainable development.

UPSC Prelims Practice Question

Q. With reference to Disaster Risk Reduction (DRR), consider the following statements:

1. The National Disaster Management Authority (NDMA) is the apex body for disaster management in India.
2. Disaster Risk Reduction focuses only on post-disaster relief and rehabilitation.
3. Early warning systems play an important role in reducing disaster-related losses.

Which of the statements given above is/are correct?

- A. 1 only
B. 1 and 3 only
C. 2 and 3 only
D. 1, 2 and 3

Answer: B

Explanation

- Statement 1 is correct because the NDMA is the apex statutory body responsible for disaster management in India.
- Statement 2 is incorrect because Disaster Risk Reduction emphasizes prevention, mitigation, preparedness, and resilience in addition to response and recovery.
- Statement 3 is correct because effective early warning systems help reduce casualties and economic losses by enabling timely evacuation and preparedness.