ForumIAS

Mains Marathon

Compilation

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1. **Enumerate the salient features of the second-generation NavIC satellite. Also, highlight the significance of regional satellite-based navigation systems for a country.**
2. **According to research, investing in agricultural research, development, education, and extension (ARDE) yields much greater returns compared to other areas like fertilizer subsidy, power subsidy, education, or roads. Elaborate on this and suggest ways to increase the emphasis on ARDE in India.**

3. **In the light of the recent developments, critically analyze the Chief Justice of India's power as a master of the roster.**
4. **Workplace violence against doctors is a rising trend in developing countries like India. Discuss the contributing factors to this issue, and propose policy measures that could mitigate this problem.**

5. **Why is it crucial for India to become a leader in graphene technology? Describe the challenges that have been encountered in producing high-grade large-scale graphene.**
6. **What is the significance of Vande Bharat trains in the context of India's infrastructure development?**

7. **Analyze the reasons behind the slow growth of the manufacturing sector in India despite policy initiatives like 'Make in India' and Production-Linked Incentive schemes.**
8. **Discuss the potential impact of a global carbon market on India's domestic carbon market. How can a global carbon market level the playing field for developing countries?**

9. **What is the Carbon Border Adjustment Mechanism (CBAM) and why has it raised concerns in India regarding its impact on exports?**
10. **What is the purpose of India's strategic petroleum reserves (SPR) program? Discuss the difference between salt cavern-based reserves and rock cavern-based reserves for storing crude oil.**

Q.1) Enumerate the salient features of the second-generation NavIC satellite. Also, highlight the significance of regional satellite-based navigation systems for a country.

Introduction: Describe NaVIC briefly
Body: What are its features and its significance
Conclusion: Conclude with short statement

NavIC is an Indian 'GPS' - Global Positioning System which aims to provide accurate and real-time navigation in India and a region extending to **1,500 km around the mainland.** ISRO launched the first of the second generation satellite for its Indian Regional Navigation Satellite System (IRNSS) constellation, also named NavIC (Navigation with Indian Constellation). **NVS-01 is a 2232 kg satellite with a mission life of 12 years powered by two solar arrays capable of generating power up to 2.4kW and a lithium-ion battery during the eclipse**. The satellite was launched on board a GSLV rocket which deployed the satellite in geosynchronous transfer orbit (GTO).

What are its salient features?

- **Heavier than 1 generation**: The second-generation satellites are comparatively heavier than the previous 1 generation satellites. 1 generation of satellites used the lighter PSLV vehicle while 2 generations use GSLV.
- **Long Life**: The mission life of the second-generation satellites will be greater than 12 years. The mission life of the current satellites is ten years.
- **Atomic Clocks**: The Rubidium atomic clock, an important piece of Indian technology, will be installed on the satellite. It is indigenously developed by Space Application Centre, Ahmedabad. The working of these clocks ensures that satellites can provide accurate locations for longer hours.
- **Use of L1 signals:** To improve interoperability with other satellite-based navigation systems, the second-generation satellites will transmit signals in a third frequency, L1, in addition to the L5 and S frequency signals that are currently provided by the present satellites.

What is the significance of Navic for India?

- **Useful in daily life:** NavIC is useful for projects like public vehicle safety, power grid synchronization, real-time train information systems, and fishermen's safety.
- **Mapping services**: Government is in talks with chipset and mobile phone manufacturers to integrate their headsets with the Navic system.
- **Defense:** NaVIC provides a wide range of 1500km coverage useful for the country's security.
- Covers inaccessible areas: NaVIC signals can reach devices located in dense forests, congested areas, and mountains.
- **Self-reliant**: India is one of the countries having its satellite-based navigation system. India will not have to depend on other nations for its commercial and military use.

Conclusion

India is the only country having a regional satellite-based navigation system that can be used as a tool of diplomatic engagement with SAARC nations and help in disaster management.

Q.2) According to research, investing in agricultural research, development, education, and extension (ARDE) yields much greater returns compared to other areas like fertilizer subsidy, power subsidy, education, or roads. Elaborate on this and suggest ways to increase the emphasis on ARDE in India.

Introduction: Give a brief introduction about ARDE.
Body: Why is it useful and what are ways to increase ARDE empahasis in India
Conclusion: Conclude with ARDE being efficient in India.

According **to ICRIER research**, investing in agri-R&D generates substantially higher returns than, for example, spending on education, roads, fertilizer subsidies, or power subsidies. So, even in the face of climate change, **ARDE (agricultural research, development, education, and extension)** can assist achieve higher agricultural production.

Why ARDE is essential for India?

- **Efficient use of resources:** ARDE can help use scarce resources to best use especially natural resources like water, air, and soil.
- **New irrigation practices:** Large amounts of water can be saved with precision agriculture techniques like drip irrigation. For instance, implementing sensor-based irrigation systems provides automated control, increasing the effectiveness of resource use.
- **Innovation & Technology:** The use of nanotechnology and fertigation can help reduce fertilizer subsidies and carbon footprint.
- **New agriculture practices:** Research has shown that mulching contributes towards higher soil organic carbon (SOC), reducing GHG emissions and water consumption.

What are the ways to increase the emphasis on ARDE in India?

- **Fund allocation**: There is a crucial need to scale up the allocation of funds for ARDE. Research from ICRIER shows an increase in spending in absolute terms from 2005-06 to 2019-20. There is a need for more investment from the corporate sector in ARDE as the government is the largest spender. Various reports suggest that government needs to
- **Priority Areas:** Need to give priority to sectors like animal husbandry, dairy development, and fisheries sectors which have more growth potential and are carbon emissions generating sectors.
- **Political Will**: Rationalising the subsidies offered by both Centre and States for fertilizer and power can help channelise the savings to the ARDE sector. This requires immense political will, and dialogue with farmers and their organisations. The reduction of subsidies will help India to achieve its Panchamrit goals and SDG.

Conclusion:

ARDE is crucial for the efficient management of resources, improving water use efficiency, and innovative farming practices. Investment in ARDE can help India deal with food and nutritional security which can result in less GHG emissions.

Q.3) In the light of the recent developments, critically analyze the Chief Justice of India's power as a master of the roster.

Introduction: Give a brief about CJI.
Body: Why this power of CJI is under criticism
Conclusion: What can be done to address this concern

The Chief Justice of India is the highest-ranking officer of the judiciary in India. He is in charge of administrative as well as judicial functions of the Supreme Court of India. The Chief Justice of India and other judges of the Supreme Court are appointed by the President of India under **Article 124** of the Indian Constitution. All judges of the Supreme Court are equal when adjudicating and hearing cases. However, concerning the administration of the court, it is CJI who is first among the equals as he decides when a case must be listed for hearing and which judge should hear it.

Why has this power of CJI come under criticism:

- **Irregularities in assigning cases:** Judges in the past have raised concerns regarding the administration and assigning of cases for hearing to benches in the court.
- **Divided Verdict:** Unlike in the USA where all judges exercise collective power and sit en bloc, judges in India sit in benches giving a divided verdict where sometimes CJI is part of the minority opinion. Eg, in the case of EWS reservation.

- **Sitting in Benches**: Judges of the Supreme Court sit in bench of two giving CJI more discretion in deciding who will hear the case.
- **Random selection of cases**: It is being observed that the allocation of cases is based on the preference of the "Judge" or "based on the will of CJI" ignoring the experience and seniority which are considered as legal precedents while hearing the cases.
- **Rise of PIL cases**: The rise of PIL cases has given more discretion to CJI in the allocation of cases forming multiple benches to hear maximum cases while ignoring legal precedents and giving way to more judgments based on personal beliefs.
- **CJI acting as an intra-court appeal**: In many cases, it is found that if the order goes against the Government it applies to CJI who takes the matter suo motu and disposes of it without any review petition. This mechanism is against any legislative or constitutional precedent.

Way Forward:

The powers given to CJI are necessary for the smooth administrative functioning of the court. Hence, CJI should take caution in using his wide discretionary powers. Further, the practice of constituting benches and allocation of cases should be computerized to ensure transparency and accountability

Q.4) Workplace violence against doctors is a rising trend in developing countries like India. Discuss the contributing factors to this issue, and propose policy measures that could mitigate this problem.

Introduction: Provide a brief introduction on the 'Workplace violence against doctors in India and the rising trend'
Body: Write 4-5 points on the Contributing Factors to this Issue. Write 4-5 points on the Policy Measures that Could Mitigate this Problem. Write 2-3 points on the ways this problem can be solved.
Conclusion: Provide a conclusion on Workplace violence against doctors, contributing factors, policy measures.

Introduction:

Workplace violence against doctors is a growing issue in developing countries like India. Doctors, especially female medical professionals, face both physical and verbal violence from patients or their relatives. The problem persists due to inadequate addressing of the issue and lack of protective legislation.

What are the Contributing Factors to this Issue?

- **Prevalence of Violence:** Studies show that over 50% of doctors in developing countries have experienced patient-led verbal and physical abuse.
- **Prevalence of Violence:** Junior doctors and residents are more likely to face violence compared to senior healthcare workers.
- **High-Stake Settings:** High-stake settings like emergency wings and intensive care units are prone to violence.
- **Perpetrators of Violence:** Perpetrators of workplace violence are usually family members or relatives of the patient.
- **Triggers for Violence:** Violence may be triggered by concerns about the patient's condition, payment dues, or waiting times.
- **Gender Disparities:** Female medical professionals, especially those with lesser experience, are more at risk of facing violence.

What are the Policy Measures that Could Mitigate this Problem?

- **Strengthen the healthcare system:** Invest more resources to reduce waiting periods for treatment, improve availability of medicines, tests, and financial aid for those in need.
- **Enhance communication skills and documentation:** Healthcare professionals should focus on effective communication and meticulous documentation to avoid misunderstandings and conflicts.
- **Institutional measures:** Install CCTV cameras, metal detectors, and robust security systems in healthcare facilities to deter violence. Restrict the number of relatives by a patient's bedside.
- **Provide emotional support:** Employ counselors to assist patients and their relatives during times of high emotional distress. Ensure availability of translators for effective communication.
- **Enforce the law:** Strictly enforce laws to hold perpetrators accountable and ensure timely resolution of complaints. Consider the introduction of protective legislation for healthcare professionals.

Way Forward:

- **Learning from Successful Policies:** Learn from successful policies in other countries, such as China, to improve public trust in the healthcare system.
- **Addressing Contributing Factors:** Prioritize the implementation of policy measures that address the contributing factors to workplace violence against doctors.
- **Collaborative Approach:** Promote collaboration between healthcare professionals, policymakers, and the public to find effective solutions.
- **Continuous Evaluation and Updating:** Continuously evaluate and update policies based on feedback and evolving needs.

Conclusion:

Workplace violence against doctors in developing countries, including India, demands a comprehensive approach. Strengthening the healthcare system, improving communication, and providing institutional and legal support are necessary steps. Collaborative efforts and continuous policy evaluation are vital to effectively address this issue, fostering a safer and more trusting environment for healthcare professionals.

Q.5) Why is it crucial for India to become a leader in graphene technology? Describe the challenges that have been encountered in producing high-grade large-scale graphene.

Introduction: Give a brief introduction to graphene.
Body: What are its applications and challenges?
Conclusion: Conclude with the progress made by India in this field

Graphene is a two-dimensional material discovered in 2004 with many unique properties. Graphene Technology is an emerging technology which has the potential to be a game-changer in the coming decades. It is the world's thinnest, strongest and most conductive material of both heat and electricity. It has the properties of being perfectly transparent and is impermeable to gases.

Why Graphene is so crucial for India?

- **Wide range of applications:** Graphene has a wide range of applications in fields like electricity, energy generation and sensors. it can be used in high-performance batteries, supercapacitors and touch screens.
- **Health:** Sensors based on graphene technology are used for health monitoring, environmental monitoring, and making wearable devices. Graphene also finds application in water purification and distillation.

- **Electronics:** Graphene-based transistors can enable communication in a terahertz frequency range which is useful in wireless communication and much faster than 4G, and 5G.
- **Environment:** Since it is extremely sensitive to the environment it is useful in detecting chemical, and biological pollutants, radiation, explosives and other hazardous substances.
- **Defence & Aerospace:** Graphene is used in the making of armour and ballistic protection vests due to its sheer strength. Due to its capacity to both absorb and dissipate electromagnetic waves, graphene is useful for creating stealth materials and coatings that lessen electromagnetic interference and radar signatures.

What are the challenges in producing high-grade large-scale graphene?

- **International Competition**: China, the USA, the UK, Korea, and Japan are leaders in research based on graphene technology. Brazil and China are global leaders in the production of graphene.
- **Structure**: The two-dimensional structure of graphene leads to contamination of graphene when it comes in contact with other materials which reduces the properties of graphene.
- **Limited production:** The scale of production of graphene-related products is very low in India. India produces about one-twentieth compared to China and one-third compared to Brazil. High-grade graphene has a high cost-to-volume ratio, therefore production may become centralised in a few places throughout the world.
- **No flagship programs:** India lacks the coherent structure and schemes which could aid in the production of graphene. India needs flagship missions related to graphene along the lines done in China and Europe.

Conclusion

India is a latecomer in graphene technology but it is still doing better than many nations with active support from pioneering institutes like Centre for Nano Science and Engineering at IISc. Institutes like IIT-Roorkee and IIT-Kanpur have done scientific research based on graphene-based ultracapacitors, and graphene-based nanotubes. Centre has been focussing on spurring large-scale innovation by setting up India Innovation Centre for Graphene in Kerala.

Q.6) What is the significance of Vande Bharat trains in the context of India's infrastructure development?

Introduction: What are Vande Bharat trains
Body: Significance of Vande Bharat trains
Conclusion: Conclude with a short note

Vande Bharat Trains also referred to as Train 18 is a semi-high-speed, self-propelled train conceptualised, designed and manufactured by Integral Coach Factory. The first train of Vande Bharat was flagged off by PM Modi in 2019 between Delhi and Varanasi. During the Union Budget 2022, the government set the target of manufacturing 400 trains over the next three years. As of May 2023, 18 Vande Bharat trains are running in India.

What is the significance of Vande Bharat in India's infrastructure:

- **Enhanced Connectivity:** Vande Bharat Trains aim at improving connectivity and reducing travel time between major cities and regions. Such enhanced connectivity leads to growth in tourism, increase in economic growth and connecting people from different parts of the country.
- **Faster speed**: These trains are designed to run at 160km/hr which reduces travel time considerably and leads to faster movement of goods and people across the country. The railway is looking to increase the speed to 250km/hr.

- **Continuous upgradation**: The trains will be having better seating arrangements, an anti-bacterial system in AC, and less noise which will make the ride user-friendly and comfortable. There is a further plan to upgrade sitting coaches to sleeper coaches.
- **Make in India**: The trains are manufactured in India with indigenous technology, reducing import dependence. It highlights the country's vision to make India's railway infrastructure globally competitive with the best state of the art.
- **Professionalism**: The completion of the project in record time highlights the professionalism and teamwork of Integral Coach Factory. This will help in building a more professional attitude of the bureaucrats to execute the project in the stipulated time.
- **Energy and Cost efficient**: Specific energy consumption of Vande Bharat trains is comparatively less than those of other conventional trains. The cost of Vande Bharat is also less as compared to its counterparts in other developed countries.
- **Employment**: it is widely estimated that manufacturing 400 trains would create additional employment of around 10,500- 50000 jobs.

Conclusion:

The project of modernization should be replicated in conventional trains also at par with Vande Bharat trains which would lead to enhanced connectivity, employment generation and indigenous manufacturing capabilities.

Q.7) Analyze the reasons behind the slow growth of the manufacturing sector in India despite policy initiatives like 'Make in India' and Production-Linked Incentive schemes.

Introduction: What is make in India and PLI scheme.
Body: Describe reasons for slow growth of manufacturing.
Conclusion: Conclude on positive effect of manufacturing.

Make in India is an initiative of the government of India launched in 2014 to encourage companies to invest, develop, manufacture, and assemble products made in India. Production-Linked Incentive scheme on the other hand aims to subsidise companies making products manufactured in India. While the focus of Make in India is centred around foreign companies investing in India, the PLI scheme focuses on the expansion of manufactured units by domestic companies.

What are the reasons for the slow growth of manufacturing

- **Demonetization**: Demonetisation impacted the manufacturing industry by reducing the cash supply from the economy, impacting small manufacturers, and reducing disposable income in the hands of people.
- **Necessities:** India is currently reeling under demand and supply side imbalance where the government has focussed on the supply side while ignoring the demand side. The necessities of life food, housing, health, and education take precedence against the demand for goods.
- **Infrastructure**: Poor infrastructure in terms of roads and long distances to reach ports constrict the movement of goods and raise production and logistics costs.
- **Lack of skilled workforce**: it is estimated that only 4.7% of the total workforce in India has undergone formal skill training as compared to 52% in the US, 80% in Japan, and 96% in South Korea. Skill training impacts the type of product which a country produces which impacts per capita income and foreign exchange of the country.
- **Poor educational outcomes**: Various reports of Pratham Ngo and the ranking of India in the PISA test highlights poor reading ability and numeracy of Indian children making them globally uncompetitive.

- **Complex labour laws**: The complicated labour laws makes it harder for investor to invest in India as it leads to red tape.
- **Chinese imports**: The surge and scale of Chinese imports have led to the flooding of the Indian market with Chinese goods and negatively impacting Indian manufacturers, particularly MSMEs.
- **Global Issues**: certain geopolitical issues like the USA-Iran tension, and Ukraine-Russia conflict have negatively affected the supply chain, increase in oil prices thereby increasing the cost of manufacturing.

Conclusion:

India's manufacturing sector is in constant need of reforms to make the manufacturing sector globally competitive. The government needs to focus on the demand side of the economy by taking measures to raise the income of individuals which would lead to a cycle of production, consumption, and economic growth of the country. The government needs to address the concerns regarding the programs like Make in India and PLI schemes to enhance manufacturing share in India's GDP and achieve the target of 5 trillion by 2025.

Q.8) Discuss the potential impact of a global carbon market on India's domestic carbon market. How can a global carbon market level the playing field for developing countries?

Introduction: Define carbon markets and carbon credits.
Body: Impact of global carbon impact on India and how can level playing field be achieved
Conclusion: Conclude on India can take leadership role.

Carbon markets are essentially a tool for putting a price on carbon emissions. They establish trading systems where carbon credits or allowances can be bought and sold. Carbon credits and carbon market was first set out in Article 17 of the Kyoto Protocol which allows countries that have emission units to spare can sell this excess capacity to countries that are over their targets of curbing GHG emissions.

What is the impact of global carbon impact on India's domestic market?

- **Technology Transfer**: Indian carbon market can gain access to the latest technology to reduce emissions, and mitigate climate change.
- **Fulfilment of International Goals:** The positive impact can lead to a commitment to the NDC goals of India announced in the Paris Agreement. This would help India achieve carbon neutrality by 2070.
- **Address the imbalance between developed and developing nations:** Global carbon market is expected to cross $100 billion by 2030 which could impact India's carbon market in terms of increased completion and pricing mechanism. A rules-based system of the global carbon market according to the Paris Agreement would offset the advantage held by developed nations over developing nations due to their technical and financial capabilities.

How can a level playing field be achieved?

- **Cooperation in the International Market:** Indian companies and organizations can participate in the global marketplace to trade carbon credits. This could lead to the expansion of the market and new opportunities for buyers and sellers.
- **Access to international funding:** More interlinkages can lead to more funding from international organizations and investment. Proceeds from such investment can be used to mitigate climate change and sustainable development. A long-term commitment of developed nations to developing countries of $100 billion annually can be fulfilled.
- **Carbon credit market:** Ministry of New and renewable energy has announced to establish carbon credit market in India. Carbon credits so generated would be used

to achieve Nationally Determined Contributions (NDC) commitments with excess generated to be sold in the global market. The revenue generated would be used for the development of renewable energy infrastructure, afforestation, and reforestation projects.

- **Oversight by a neutral body:** Global carbon market would have an oversight mechanism headed by the UN entity which will be a centralized and regulatory body responsible for the efficient trading of carbon credits.

Conclusion:

India as chair of G20 in 2023 needs to take a leadership role in climate change and climate finance. India could position itself as a key leader in the global carbon market by focusing on the 5E's- enhancing carbon reduction efforts, establishing robust mechanisms, exploring technology and innovation, and empowering local stakeholders in pursuing goals of sustainable development.

Q.9) What is the Carbon Border Adjustment Mechanism (CBAM) and why has it raised concerns in India regarding its impact on exports?

Introduction: What is CBAM
Body: Why is it raised concern and how is India dealing with it
Conclusion: Conclude by giving balance view.

Carbon Border Adjustment Mechanism (CBAM) is a key policy of the EU related to climate change. The policy ensures that imports of carbon-intensive products like cement, iron and steel, electricity, fertilizers, aluminium, and hydrogen are subject to the same economic costs as products by EU producers. It requires importers to report the number of goods imported and their embedded GHG emissions on an annual basis. CBAM is part of the **"Fit for 55 in 2030 package**", the EU's plan to reduce greenhouse gas emissions by at least **55% by 2030 compared to 1990 levels**, in line with the European Climate Law.

Why has it raised concerns in India?

- **Effect on exports:** It will hurt India's exports to the EU namely cement, iron and steel, electricity, fertilizers, aluminium, and hydrogen. While these exports are only 1.8% of total exports to the EU it nevertheless raises concern about the free trade principle.
- **Violate WTO principles**: CBAM policy violates WTO principles of non-discrimination. It violates important principles of equal treatment to goods originating from another country to be treated at par with the same goods produced domestically.
- **Increased price for Indian goods:** Indian goods will be subjected to increased pricing owing to the carbon tax on iron, steel and aluminium which will lead to a decrease in the demand for these goods in the EU and affect Indian export potential.

What steps can India take to resolve this issue?

- **Negotiation with EU**: CBAM is an ongoing issue in the India-EU FTA discussions where India is trying to secure gains for its exporters while abiding by the principles of WTO.
- **Reaching out to WTO:** India could challenge CBAM in the WTO dispute settlement body on grounds of trade protectionism and violation of Most-favoured Nation treatment.
- **Lowering GHG emissions:** Investing more in renewable and green energy like wind, and solar and in developing carbon capture technology can lower emissions generated from manufacturing processes.
- **Carbon price market mechanism:** India needs to have a carbon pricing market mechanism to maintain competitiveness in the global world related to price volatility, while at the same time reducing the effects of CBAM.

- **Transfer of clean technologies:** Government of India should pursue consistent efforts to negotiate with developed countries to transfer clean technologies and fiance mechanisms as promised in various agreements to help make India's manufacturing sector more carbon efficient.

Conclusion:

CBAM once again raises debate about linkages between trade and the environment. Balancing both is extremely crucial and mutual negotiations should provide the answer rather than trade protectionism.

Q.10) What is the purpose of India's strategic petroleum reserves (SPR) program? Discuss the difference between salt cavern-based reserves and rock cavern-based reserves for storing crude oil.

Introduction: Describe the programme of building SPR.
Body: Explain difference between salt caverns and rock caverns
Conclusion: Conclude with why SPR is necessary.

Strategic Petroleum Reserves (SPR) programs are massive stores of crude oil which act as strategic crude oil reserves to mitigate major major supply disruptions in the global supply chain. Strategic petroleum reserves (SPR) could assist assure energy security and availability amid global supply shocks and other emergencies since India, the third-largest consumer of crude, depends on imports for more than 85% of its needs. The country has three strategic oil storage facilities *at Mangaluru and Padur in Karnataka and Visakhapatnam in Andhra Pradesh.* India's strategic oil reserves come under the Petroleum Ministry's special purpose vehicle Indian Strategic Petroleum Reserve (ISPRL).

What is the difference between salt cavern reserves and rock caverns?

- **Cost:** Salt-based caverns are considered cheaper and less labour intensive than cost intensive.
- **Development Process:** Salt caverns are created through the process of solution mining, which entails pumping water into geological formations containing significant salt deposits to dissolve the salt. This method differs from the excavation method used to create underground rock caverns. Compared to creating excavated rock caverns, the procedure is easier, quicker, and less expensive in the development of salt caverns.
- **Storage:** According to scientific reports, oil storage facilities built in salt caverns are also naturally well-sealed and designed for quick injection and extraction of oil. Because of this, they represent a more appealing alternative to rock caverns. The salt inside the caverns develops an impermeable barrier against liquid and gaseous hydrocarbons making them a better option than rock caverns.
- **Types of fuel:** Salt-based caverns are more widely used to store liquid fuels and natural gas. They are widely considered as the storage medium for storing compressed air and hydrogen.
- **Technical know-how:** The requisite knowledge to build salt-based caverns is inadequate in India as compared to rock-based caverns. However, this gap can be bridged by cooperating with developed nations like the USA, and Germany.
- **Location:** Rajasthan in India is seen as a potential site to develop salt cavern-based storage facilities.

Conclusion:

SPR is necessary to build buffer stock and ensure energy security during supply shocks. India needs to increase its SPR capacity and develop more strategic reserves through Public Private Partnerships to reduce government spending and exploit the commercial potential of the reserves.