

4th July, 2024

1. Mumbai-Ahmedabad Bullet Train Project GS 3 (Infrastructure)

- **Why in News:** The Mumbai-Ahmedabad bullet train is expected to begin operations in Gujarat by 2027 end and will later be extended to Maharashtra, according to the National High Speed Rail Corporation Limited (NHSRCL).
- **About Mumbai-Ahmedabad Bullet Train Project:**

- The foundation stone for the Mumbai-Ahmedabad bullet train project was laid in 2017.
- **Speed and Distance:** The bullet train will zip along at 320 kmph, covering the 508.17 km distance between Mumbai and Ahmedabad in just about two hours.
- **Cost and Completion:** Estimated at Rs 1.65 lakh crore, the project is slated for completion by 2028.
- **National High-Speed Rail Corporation Limited:** Established under the Companies Act, 2013, NHSRCL aims to finance, construct, maintain, and manage high-speed rail corridors across India.
- **The Need for High-Speed Rail**

- ◆ **Challenges of Indian Railways:** With over 67,415 route km, Indian Railways forms the backbone of the nation's transport system. However, overcrowding on main routes, with some operating at 150% capacity, has slowed down travel speeds and shifted traffic to less efficient road transport.
- ◆ **Logistical Constraints:** Congestion on rail routes increases turnaround times for goods, impacting manufacturing efficiency and competitiveness.

■ Benefits of High-Speed Rail

- ◆ **Capacity Release and Safety:** High-speed rail will alleviate congestion on existing lines, enhancing passenger safety and comfort.
- ◆ **Environmental Impact:** Powered by indigenous electric power, high-speed rail reduces dependence on imported fuels, lowering greenhouse gas emissions.
- ◆ **Airport Congestion:** By reducing short-haul flights, high-speed rail frees up airport capacity for more economical long-haul flights.
- ◆ **Global Examples:** Successful implementations in Japan, Europe, and China demonstrate how high-speed rail enhances connectivity and boosts economic growth.
- ◆ A study found that towns connected by high-speed rail saw their GDP rise by at least 2.7 per cent compared to those not on the route.

Mumbai-Ahmedabad bullet train expected to begin operations in Gujarat by 2027 end

Ateeq Shaikh
MUMBAI

The Mumbai-Ahmedabad bullet train, Prime Minister Narendra Modi's pet project, is expected to begin operations in Gujarat by 2027 end and will later be extended to Maharashtra, according to the National High Speed Rail Corporation Limited (NHSRCL).

The first phase of operations is likely to begin ahead of the Gujarat Assembly election, which is due in 2027 with the term of the House expiring on December 19, 2027. "Trial runs are expected to start in 2026 between Surat and Bilimora (a 50-km stretch). Since the project is in a more advanced stage in Gujarat, it is prudent to start commercial operations here first and then expand services to Maharashtra as construction work gets completed there," an NHSRCL spokesman told *The Hindu*.

Out of the 508-km-long



Since the project is in a more advanced stage in Gujarat, it is prudent to start commercial operations here first and then expand services to Maharashtra NHSRCL SPOKESPERSON

rail corridor, 90% is elevated. Twelve stations will dot the corridor – eight in Gujarat (Sabarmati, Ahmedabad, Anand, Vadodara, Bharuch, Surat, Bilimora, and Vapi) and four in Maharashtra (Boisar, Virar, Thane, and Mumbai). Plans are afoot to begin operations between Vadodara and Vapi by 2027.

The NHSRCL aims to complete the project by the second half of 2028. The service is expected to reduce travel time between the two cities to three hours. Currently, the Mumbai-Ahmedabad

Vande Bharat is the fastest train on the route, with a travel time of five and a half hours. Travel by air takes about 95 minutes.

44% progress
As of May 2024, overall progress of 44% has been made, with 53% of the work completed in Gujarat, and 25.6% in Maharashtra. As of June, of the 508-km route, 183 km of viaduct and 313 km of pier work have been completed. Of the 1,390 hectares earmarked for the project, 960 are in Gujarat and Dadra and Nagar Haveli, and 430 in Maharashtra. Land acquisition has been completed for the rail corridor.

Laying of tracks has begun in Gujarat, with over 35,000 metric tonnes of rails and three sets of track construction machinery at Surat and Vadodara. The assembly, testing, and commissioning of the machinery is in progress.

In Maharashtra, construction of India's first un-

dersea rail tunnel, a 7-km stretch part of the project's 21-km tunnel between Bandra Kurla Complex and Shilphata, is under way. The undersea tunnel is expected to be completed by mid-2028. Excavation to build five mountain tunnels in Palghar is on.

When the bullet train project was launched in 2017, the initial deadline was December 2023. The timeline had to be revised owing to land acquisition challenges in Maharashtra and restrictions owing to the COVID-19 pandemic.

Funded by the Japan International Cooperation Agency (JICA) through an Official Development Assistance (ODA), the project's total cost is estimated at ₹1.08 lakh crore. It is yet to be revised owing to delay in completion. The last tranche was signed between JICA and the Union government in December 2023, with an ODA of 400 billion Japanese yen or approximately ₹22,627 crore.



2. Trials, Medical Ethics, and the Orbit of Power GS 2 (Health)

- **Why in News:** Recent controversies in Indian medical research particularly the Covaxin trial in Bhopal, have highlighted ethical challenges in clinical trials and drug development. These events underscore issues of informed consent, regulatory oversight, and protection of vulnerable populations emphasizing the need for stronger ethical frameworks and accountability in India's healthcare and pharmaceutical sectors
- **Ethical Violations in Clinical Trials**

■ **Introduction to the Issue:** The controversy centers around alleged ethical violations during the clinical trials of Bharat Biotech's Covaxin at the People's Hospital in Bhopal. Allegations include the lack of informed consent, enrollment of vulnerable populations, and inadequate reporting of adverse events.

■ **Regulatory Oversight and Ethical Lapses:** The approval process by the Central Drugs Standard Control Organisation (CDSCO) is scrutinized, especially the introduction of terms like "Restricted Use under Clinical Trial Mode," which lack a clear legal framework.

■ **Role of Ethics Committees:** The functioning of ethics committees at trial sites is questioned, with concerns about their effectiveness and transparency. The Supreme Court's intervention underscores the need for public disclosure of clinical trial data.

- **Challenges Faced by Whistleblowers**

■ **Whistleblower Risks:** The editorial highlights the experiences of whistleblowers who expose ethical violations in medical trials, drawing parallels with global cases documented by bioethicist Carl Elliott.

■ **Inadequate Legal Protection:** India's weak whistleblower protection laws, further diluted in 2015, fail to safeguard those exposing wrongdoing. The societal and institutional pressures against whistleblowers are emphasized.

■ **Cultural and Social Barriers:** Deep-rooted issues like groupthink, fear of retribution, and social conformity hinder the emergence of whistleblowers. The need for a cultural shift towards valuing integrity and dissent is highlighted.

- **Systemic Issues in Medical Research**

■ **Lack of Expertise in Drug Development:** The editorial points out that India's medical community lacks the necessary expertise in clinical development, often leading to ethical compromises in trials.

■ **Informed Consent and Vulnerable Populations:** There is a historical pattern of enrolling poor and uneducated individuals in trials without proper informed consent. This is exacerbated by the inadequate functioning of institutional ethics committees.

■ **Regulatory Failures:** A 2022 study in PLOS Global Public Health identified numerous problems with the ethics committees' operations in India, including the approval of clinical trials without proper oversight.

3. Factory Accidents, a Pointer to Rusty Inspection Reform GS 2 (Social Issues)

- **Why in News:** The recent factory explosion in the Dombivli Maharashtra Industrial Development Corporation (MIDC) area highlights systemic issues in industrial safety and the effectiveness of the labour inspection system in India. This incident, along with previous accidents, underscores the need for comprehensive reform in the inspection and regulatory mechanisms to ensure worker safety and compliance with industrial regulations.

- **Issues with Industrial Safety and Inspections**

■ **Frequency of Accidents:** Industrial accidents in Maharashtra have been frequent, with significant incidents reported in 2016, 2018, 2020, and 2023. The recent explosion in 2024 further exemplifies ongoing safety issues.

Trials, medical ethics and the orbit of power



Dr. Harish Varshney, a public health activist and was the whistleblower in the case against Bharat Biotech.

On January 30, 2021, Rashida Bee representing the Bhopal Gas Peedhi Mahila Samiti, Karmachari Sangh, Anand Khan representing Bhopal Gas Peedhi Mahila Purnab Sangharsh Morcha, Rachna Chandra representing the Bhopal Group for Information and Action and Naveen Khan representing Children Against Dow Chemicals wrote a letter to Prime Minister Narendra Modi and the then Minister of Health and Family Welfare, Dr. Harish Varshney. In the letter, they alleged irregularities and ethical violations in the conduct of the clinical trial for Bharat Biotech's Covaxin (a COVID-19 vaccine) by the People's Hospital in Bhopal. Madhya Pradesh and the resultant exploitation of trial participants belonging to vulnerable groups demanding: reparation, punishment and compensation.

The letter further alleged gross violations of ethics guidelines including violations of informed consent procedures, enrolment of vulnerable population among study participants, non-reporting of adverse events and a lack of monitoring and follow-up of study participants among others.

The writers sought urgent intervention to stop the study at the trial site and for investigation by an independent body. What became of the letter and any consequential actions are unknown. The Indian drug regulator, Central Drugs Standard Control Organisation had approved the vaccine candidate prior to the completion of the recruitment for the vaccine candidate's Phase III study for "Restricted Use of Covaxin under Clinical Trial Mode" – a term and process that finds no mention in India's Drug Regulatory Framework, the Drugs and Cosmetics Act and its accompanying Drugs and Cosmetics Rules, 2003.

Ethics committees and whistleblowers
One of the issues that stands out in this case is the functioning of the trial sites and their respective ethics committees. Dr. Jacob Pulayil, a member of the National Technical Advisory Group on Immunization (NTAGI) filed a writ petition in the Supreme Court of India where the Court said "subject to the protection of privacy of individual subjects and to the extent permissible by the 2019 Rules, the relevant data which is required to be published under the statutory regime and the WHO (World Health Organization) Statement on Clinical Trials shall be made available to the public without undue delay".

The development of potential therapeutic agents is often complicated by subjective and sometimes objective violations of ethical guidelines. The role of conscientious insiders, and sometimes outsiders, who have unique knowledge of such violations is the subject of a recent book, *The Occasional Human Sacrifice: Medical Experimentation and the Prior of Sowing*, by bioethicist, philosopher and whistleblower at the University of Minnesota, Carl Elliott. The book details several such

incidents in the western world, starting with the Tuskegee Syphilis Study to the Willowbrook Hepatitis Study.

It also looks at what happened with Protocol D26 for cancer study of bone marrow transplantation at the Fred Hutchinson Cancer Center and at the Eugene Sanger Radioisotope Laboratory, Cincinnati Medical Centre, to study the effect of radiation on humans among others. Driven by his own experience to understand the suicide of the Markington at the university, Elliott traverses some very difficult and human questions such as what makes someone speak out, the ethics of dissent, honour, respect, guilt and shame, and the concepts of dignity and integrity told through the journey of whistleblowers. As Nancy Olivieri, a

whistle-blower, recounts in her review, threats of legal action and, worse, often resulting in destroying the whistle-blower's life are far too common in such cases.

While one often wonders why such instances of moral courage are few and far between in our society, Satyendra Dubey, Shanmugam Manjath, Sanjay Chaturvedi and a few other named exceptions notwithstanding, lack of strong whistle-blower protection statutes is only a part of the problem. Unlike the United States, India does not have a law that protects those who take great personal risks to bring wrongdoing to public notice. The existing law, whose scope is limited to public servants to begin with, was further diluted in 2015, making it a dead letter law.

The deeper issues which we should, but do not wrestle with are: understanding groupthink and organisational wrongdoing, loyalty to the ivory tower, fear of retribution, social conformity, status hierarchies and exercise of power that are so ingrained in us as a society. Unless we study these traits among us as a society, we will never understand why someone chooses to be an

Arund Rai, the whistle-blower who exposed the Vyaspain scam.

Innovative therapies and ethics
Back to the topic at hand, i.e., the development of life-saving medicines is a mosaic in our country. While we have a vibrant industry that manufactures generic (copy-cat) drugs, developing innovative therapies has not been our cup of tea. Development of life-saving medicines often entails balancing the risk to the patient with the projected benefit from using the therapeutic candidate. In most cases, there is not enough data to make an informed decision, which is not straightforward and requires specialised knowledge and experience. Using an approved drug that is on the market does not qualify a medical doctor to make such decisions. Drug development is a separate area of expertise. While we are green shoots of late, we do not have deep expertise in managing clinical development. Therefore, we make do with appointing medical

doctors to oversee the development of therapeutics. This requires better guardrails than we have in order to ensure that the basic tenets of ethics are not violated in the process. For example, when medical doctors who specialise in treating individual patients with specific diseases such as cardiology and paediatrics are appointed as subject expert committees make up things such as "emergency use authorization in clinical trial mode" and work hard to justify it with a straight face. These are glaring examples of gross violations of medical ethics in our recent past.

Indian patients and clinical studies
The bigger issue in our country is the historic and repeated violation of informed consent when patients are enrolled in clinical studies. More than anecdotal evidence exists that poor and uneducated people are enrolled in such studies without fully informing them of potential harms from the therapeutic candidate being evaluated in a clinical study. The job of ensuring such atrocities do not occur falls to what is called an institutional ethics committee. While such committees exist on paper and in our regulations, their function and effectiveness are at best patchy.

A publication (2022) by Gayatri Subbarwal et al. in the journal *PLOS Global Public Health* that evaluated 1,359 Phase II or III interventional studies registered in the Clinical Trials Registry India (CTRI) identified as many as 30 problems with the way in which our ethics committees function. These include clinical trials without any ethics committees, and trials with more sites than functional ethics committees – for example, three ethics committees approving one study site. The simple takeaway from this analysis is that the primary guardrails that are supposed to be a check on abuse of medical analysis says nothing about the competence of the members of the ethics committees, which was plainly obvious during the development of Covid during the pandemic. The biggest abuser of these regulations is a section of the industry that is actively promoted by the Ministry of AYUSH. These poorly designed, ill-succinct "clinical studies" with zero oversight are often used to provide a veneer of scientific validity to their concoctions and nothing more.

If there is one message that comes out clearly in Elliott's book, it is how even well-designed and well-run systems of checks and balances on accountability are often run roughshod over by those who have the means and power. We are nowhere even close to how such systems function in the West. If we truly wish to hold wrongdoing to account, we have a very long way to go before we even get the basics right. That is, if we truly want to.

- **Inspection Rates and Personnel Shortages:** In Maharashtra, only 23.89% of hazardous factories and 8.04% of registered factories were inspected in 2021. Personnel shortages contribute to this low inspection rate, with only 39.34% of sanctioned officers appointed.
- **Prosecution Rates:** The low prosecution rates in states like Gujarat (6.95%), Maharashtra (13.84%), and Tamil Nadu (14.45%) diminish the deterrent effect of inspections, leading to persistent safety violations.

Factory accidents, a pointer to rusty inspection reform

An explosion of a reactor in a chemical factory in the Dombivli Maharashtra region, which of the 953 sanctioned inspectors would have had to inspect 137 registered factories in a year. In 2021, the inspection rates are poor because of the heavy workload of the inspectors. An inspection in Maharashtra must inspect 100 factories in a year; 580 in Gujarat; 532 in Tamil Nadu, and 490 at the all India level.



Dr. B. Shyam
Deputy Professor,
Management
Consultant
Institute, Gurgaon

been inadequate to ensure that every factory is inspected in a year. For example, for an all-India level, each of the 953 sanctioned inspectors would have had to inspect 137 registered factories in a year. In 2021, the inspection rates are poor because of the heavy workload of the inspectors. An inspection in Maharashtra must inspect 100 factories in a year; 580 in Gujarat; 532 in Tamil Nadu, and 490 at the all India level.

The prosecution rate, i.e., the number of prosecutions decided as a percentage of total prosecutions (including pending cases) was 6.95% in Gujarat; 13.84% in Maharashtra, and 14.45% in Tamil Nadu. As a result, inspections lose their "deterrent effect".

From the data, it is clear that labour market governance through the labour inspection system is weak and does not perform efficiently. However, employers call it pejoratively as "Inspector raj", implying harassment and prevalence of compromising practices such as bribes.

Need for the right reforms in inspection
The criticism is not without merit. Given the vast universe of inspection, the inspectors may "target" and "harass" several factories/unestablishments, establishing state power and also attempting to secure bribes. But this cannot be universal as the statistics are telling. The President of the Maharashtra Industry Development Association has admitted, in a media report in May 2024, that in many cases, safety inspection and certification are done "on an understanding" between the auditors and factory owners or managers. Employers are as guilty as the labour inspectors, and tracking the "supply side" of "rent seeking" is as important as reforming the "demand" side.

Reforms of the inspection system are necessary but not of the kind initiated in most States in response to employer criticism.

Self-certification, randomised inspections, online inspections, and third-party certification have been introduced by ruling political parties at the all-India level and in many States. These changes violate several articles in the International Labour Organization's Labour Inspection Convention (ILO, 1947).

According to the Convention, there must be sufficient qualified and well-trained inspectors and they shall enter the establishments freely and without prior notice at any time to secure due compliance of the labour laws, among others. Instead of this during the inspection system, governments must ensure a strong labour market governance by implementing the provisions of the ILO Convention. Given the fast-paced changes taking place in technology, and the use of hazardous and chemical substances, the increased need for inspection is felt. Inspectors can both "inspect" and "facilitate" due compliance of laws by providing suitable advice to employers and workers. This is recognised by the ILO Convention.

Possibilities for the enforcer
If a firm or a trade union does not comply with laws, they are prosecuted by the state. If the state fails in its governance what is the penalty the state, viz. the government and the labour department officials pay? Simple! It is a huge compensation to the victims and their families. So, there cannot be a penal system for the enforcers also which will pave the way for complete legal compliance.

The recurrence of the same kind of industrial disasters shows a lack of learning by the government. In the name of reforms and a lean government, the state cannot shirk its fundamental duty - to ensure a safe working and living environment. It should carry out meaningful reforms to ensure an "efficient" and "ethical" labour inspection.

Challenges and Criticisms of the Inspection System

- **Inspector-Raj and Corruption:** Employers often criticize the inspection system as "inspector-raj," citing harassment and bribery. While there are instances of misuse of power by inspectors, employers are also complicit in avoiding compliance through corrupt practices.
- **Self-Certification and Randomized Inspections:** Reforms like self-certification, randomised inspections, and third-party certification have been introduced but fail to address the core issues. These measures violate the International Labour Organization's Labour Inspection Convention (O81), 1947, which mandates qualified inspectors and unannounced inspections.
- **Ineffective Reforms:** The current reforms have not strengthened labour market governance. Instead, they have weakened the inspection system, failing to ensure compliance with safety regulations and exposing workers to greater risks.

Recommendations for Effective Inspection Reforms

- **Strengthening Labour Market Governance:** Governments should implement the provisions of the ILO Convention, ensuring sufficient qualified inspectors and unannounced inspections to secure compliance with labour laws.
- **Penalties for Government Failures:** There should be a penal system for government officials who fail in their duty to enforce safety regulations, ensuring accountability and compliance.
- **Balancing Inspection and Facilitation:** Inspectors should not only enforce laws but also provide advice to employers and unions, helping them comply with regulations and improving overall industrial safety.

4. PM 2.5 Pollution GS 3 (Environment)

- **Why in News:** The Lancet study reveals a serious link between air pollution and deaths in Indian cities like Delhi. Pollution particles like **sulfur dioxide** and **nitrogen dioxide** can cause respiratory issues like coughing and chest tightness.

Key-highlights of the Study

- Between 2008 and 2019, 7.2% of all deaths (approximately 33,000 each year) in 10 cities in India every year can be attributed to air pollution levels that are below India's national clean air threshold.
- Delhi recorded the highest number of air pollution-related deaths in the study period - a staggering 11.5% i.e. 12,000 deaths each year.
- India's clean air norms are presently well above the World Health Organisation guideline of 15 micrograms in every cubic meter of air.

What is PM 2.5?

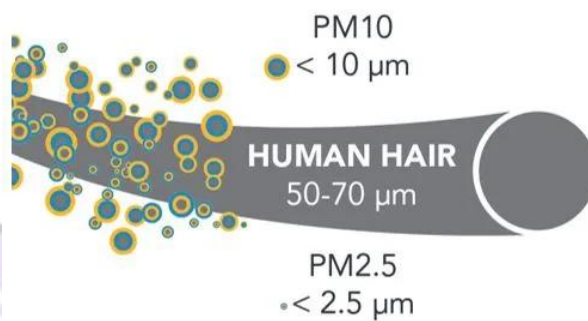
- PM 2.5 are tiny particles smaller than 2.5 microns, much smaller than a human hair. They're a mix of various chemicals and can be partly liquid, unlike solid dust particles. When these particles are mainly liquid, they're called aerosols.

Air pollution behind 7% of deaths in 10 cities: Lancet study

ANURADHA MASCARENHAS PUBLISHED: JULY 13	
ABOUT 11.5 PER CENT OF deaths in Delhi every year, roughly 12,000 deaths, can be attributed to air pollution, the highest for any city in the country, a first-of-its-kind multi-city study in India, published in The Lancet, has revealed.	
Across 10 cities — Ahmedabad, Bengaluru, Chennai, Delhi, Hyderabad, Kolkata, Mumbai, Pune, Shimla and Varanasi — more than 33,000 deaths could be attributed to air pollution every year on an average, the study said. Shimla has the lowest mortality burden among these cities, with only 50 deaths every year, about 3.7 per cent of its total, that could be attributed to pollution. Together, about 7.2 per cent of all deaths in these cities, amounting to about 33,000 deaths every year, could be said to be caused by air pollution every year, the study said.	
The study, carried out by researchers from India and abroad, found that PM2.5 concentrations in these 10 cities, exceeded the safe limits defined by the World Health Organisation (15 micrograms per cubic metre) on 95.6 per cent of the days.	
The researchers obtained daily death data from the civil registries in these ten cities between 2008 and 2019. For every city only three to seven years of daily death data during this period were made available. Together, more than 3.6 million deaths in these cities were examined. Given the sparse nature of air pollution data across many cities, researchers leveraged a previously-developed machine-learning based exposure model that combined data from regulatory monitors, satellites, meteorology and other data to generate PM2.5 exposure data with a high level of detail in terms of time and location.	
The study found 1.42 per cent increase in mortality for every increase of 10 micrograms per cubic metre in PM2.5 levels when all the ten cities were taken together. There was large variation among the cities, with Delhi showing a rise of 0.31 per cent in mortality while Bengaluru having an increase of 3.06 per cent. This suggested that people living in less polluted cities carried a higher risk of mortality than those in pollution than those in these cities," Dr Siddharth Mandal of the Centre for Chronic Disease Control, one of the co-authors of the study, said.	
Deputy director of the Sustainable Futures Initiative and a lead author on the study told The Indian Express, "The study broke new ground in the understanding of air pollution and health in India. It is the first multi-city study to assess the impact of air pollution on air pollution exposure and death with a high level of detail in terms of time and location. The study found a wide range of air pollution concentrations and associated in different agro-climatic zones," he said.	

DEATHS IN CITIES	
Average number of deaths attributable to air pollution every year	
Delhi	11,500
Mumbai	5,091
Kolkata	4,678
Chennai	2,870
Ahmedabad	2,495
Bengaluru	2,382
Hyderabad	1,597
Pune	1,367
Varanasi	831
Shimla	50

- ◆ **Natural kinds of aerosols** include dust, sea salt and volcanic ash
- ◆ **Man-made sources** include factory and auto emissions, coal combustion and biomass burning for clearing land or farming.



- PM 2.5 particles are especially harmful as they can bypass our body's defenses like nose hairs and mucus. They can penetrate deep into our lungs, reach the alveoli, and even enter the bloodstream, posing serious health risks.

5. National Quantum Mission

GS 3 (Science and Tech)

- **Why in the News:** Itihaasa, a non-profit organization, has recently published an assessment of India's National Quantum Mission.

- **About National Quantum Mission:**

- Union Cabinet approved the National Quantum Mission (NQM) in April 2023 at a total cost of **6000crores** from **2023-24 to 2030-31**.

- The mission aims to seed, nurture, and scale up scientific and industrial R&D, creating a vibrant and innovative ecosystem in **Quantum Technology (QT)**.

- This initiative will accelerate QT-led economic growth, foster the ecosystem in the country, and position India as one of the leading nations in the development of Quantum Technologies & Applications (QTA).

- **Mission Objectives:**

- Developing intermediate-scale quantum computers with 50-1000 physical qubits within 8 years using various platforms like superconducting and photonic technology.
- Satellite-based secure quantum communications between ground stations over a range of 2000 kilometres within India.
- Long-distance secure quantum communications with other countries.
- Inter-city quantum key distribution over 2000 km.
- Multi-node quantum networks with quantum memories.

- **Focus Areas:**

- Developing magnetometers with high sensitivity in atomic systems.
- Creating atomic clocks for precision timing, communications, and navigation.
- Supporting the design and synthesis of quantum materials such as superconductors, novel semiconductor structures, and topological materials for the fabrication of quantum devices.
- Developing single photon sources/detectors and entangled photon sources for quantum communications, sensing, and metrological applications.

- **Mission Implementation:**

- The mission implementation includes the establishment of four **Thematic Hubs (T-Hubs)** in top academic and National R&D institutes in the following domains:

- ◆ Quantum Computing
- ◆ Quantum Communication
- ◆ Quantum Sensing & Metrology
- ◆ Quantum Materials & Devices

- These hubs will focus on generating new knowledge through basic and applied research and promoting R&D in their respective areas.

Large gap to bridge in quantum capabilities: Report

AMITABH SINHA
NEW DELHI, JULY 3

INDIA MAY have done the right thing by launching a ₹6,000 crore National Quantum Mission to develop some of most sought-after technologies for the future, but it would have to overcome a significantly large gap that currently exists between its capabilities and those of other leading countries in these areas like the United States and China, a new assessment of India's potential in quantum technologies has revealed.

The assessment by Itihaasa, a non-profit that studies the evolution of technology and business domains in the country, shows that India was just one among 17 countries to have a dedicated government programme to back research in quantum technologies, and one of the 12 to have committed separate investments for the purpose. But several countries were much ahead of India, not just in terms of committed funding for research and development but also in their current capabilities.

India's ₹6,000 crore translates to about \$0.75 billion over five years. China, on the other hand, was estimated to be spending \$15 billion for developing quantum technologies. The United Kingdom was spending \$4.3 billion, the United States \$3.75 billion, Germany \$3.3 billion and South Korea \$2.35 billion.

India was far behind the United States and China in terms of patents obtained in quantum technologies till now, and in publications in top journals.

"It is commendable that

India is among the 17 countries with formal national quantum missions, and is among the top 12 countries in terms of committed investments," the assessment said.

Quantum technologies exploit the extremely weird and counter-intuitive — but very special nonetheless — properties of subatomic particles like an electron to develop processes and devices with capabilities and efficiencies that are impossible to achieve with classical, non-quantum, systems.

● Impact & Significance:

- NQM has the potential to elevate the country's technology development ecosystem to a level of global competitiveness.
- The mission will greatly benefit various sectors including communication, health, financial, and energy, with applications in drug design, space, banking, security, etc.
- The mission will also provide a significant boost to national priorities such as Digital India, Make in India, Skill India, Stand-up India, Start-up India, Self-reliant India, and Sustainable Development Goals (SDG).

● Assessment report of National Quantum Mission:

- Itihaasa, a non-profit organization, has recently published an assessment of India's National Quantum Mission.
- As per the assessment, India may have done the right thing by launching a Rs 6,000 crore-worth National Quantum Mission to develop some of the most sought-after technologies for the future.
- The assessment shows that **India was just one among 17 countries to have a dedicated government programme to back research in quantum technologies**, and one of the 12 to have committed separate investments for the purpose.
- However, the report cautions that **India would have to overcome a significantly large gap that currently exists between its capabilities and those of other leading countries in these areas like the United States and China.**
 - ◆ India's Spending = USD 0.75 billion
 - ◆ China's Spending = USD 15 billion
 - ◆ United States' Spending = USD 3.75 billion
- India was far behind of the United States and China in terms of patents obtained in quantum technologies till now, and in publications in top journals.
- The assessment report found **about 110-145 Indian researchers, at the principal investigator level, already working on quantum technologies at major laboratories and institutions.**
- About 75-100 Post-docs and 300-400 PhD students were working with them. In addition, there were about 50-100 MTech students in different areas related to quantum technologies.
- Also, **India was producing the highest number of graduates in areas related to quantum technologies**, the assessment found.

6. Developing Planetary Protection Systems Against Asteroids

GS 3 (Science and Tech)

● Why in News:

- Speaking to mark the Asteroid Day 2024 (June 30), ISRO Chairman emphasised the necessity of international collaboration in developing planetary protection systems against asteroids.
- He also highlighted India's ambition and qualifications to join global missions focused on asteroid research and defence prior to the Apophis asteroid and Earth having a close encounter on April 13, 2029.

● What is Asteroid Impact Avoidance?

- It encompasses the methods by which near-Earth objects (NEO) on a potential collision course with Earth could be diverted away, preventing destructive impact events.
- An impact by a sufficiently large asteroid or other NEOs **would cause massive tsunamis or multiple firestorms**, depending on its impact location.
- A collision 66 million years ago between the Earth and an object approximately 10 km/ 6 miles wide is thought to have
 - ◆ Produced the **Chicxulub crater** (buried underneath the Yucatán Peninsula in Mexico), and
 - ◆ Triggered the Cretaceous-Paleogene extinction event that is believed to have caused the **extinction of all non-avian dinosaurs.**

We want to be part of planetary defence mission, study asteroid: ISRO Chairman

EXPRESS NEWS SERVICE
BENGALURU, JULY 3

ISRO is keen on participating in a planetary defence mission in space and study the asteroid Apophis when it comes close to the Earth, ISRO Chairman S. Somanath said in Bengaluru on Wednesday.

"When Apophis comes in 2029, we should be able to go and meet this asteroid when it is very close to Earth. It is a one-time opportunity and India should be part of such efforts. It is yet to be decided in what way we should participate," Somanath said.

Discovered in 2004, Apophis was seen as a potential contender to have a collision with the Earth. But subsequent measurements have shown that there was no risk of Apophis impacting the Earth for at least a century, according to NASA. In 2029, however, it would make a fly-by of the Earth at a distance of about 32,000 km. NASA has redirected one of its operational spacecraft to study this asteroid, and this spacecraft would



ISRO chief S. Somanath speaks at Antariksh Bhavan in Bengaluru, Wednesday. /PTI

get as near to Apophis as 4,000 km on April 23, 2029. It will therefore, keep following the asteroid for 18 months to map its terrain and understand its chemical make-up. ISRO is looking at working in some capacity to study the asteroid Apophis when it is 32,000 km away from Earth in 2029 to prepare for planetary defence efforts, ISRO scientists said. "We must provide whatever support we can in the asteroid mission to participate and learn. We are eager to spread our knowledge," Somanath said. Referring to NASA's Double Asteroid Redirection Test (DART) mission in 2022, which facilitated the change of trajectory of an asteroid in deep space, he said, "When there is information that an asteroid will strike Earth in a couple of years, there will be a demand to act. It would be better if we act when there is no threat. This is why there are many missions to go near asteroids and understand them. One of them is DART."

Asteroid Redirection Test (DART) mission in 2022, which facilitated the change of trajectory of an asteroid in deep space, he said, "When there is information that an asteroid will strike Earth in a couple of years, there will be a demand to act. It would be better if we act when there is no threat. This is why there are many missions to go near asteroids and understand them. One of them is DART."

"It is a mission to show it is possible to change the asteroid trajectory a little and cause it to depart from its course. If we can change the trajectory, it will miss Earth by a whisker. That will be good enough to save Earth," he said. DART showed that a spacecraft's kinetic impact with its target asteroid, Dimorphos, had successfully altered its orbit. "This marks humanity's first time purposely changing the motion of a celestial object and the first full-scale demonstration of asteroid deflection technology," NASA had stated in 2022. As a major space-faring nation with the capability "to carry out complex missions of taking a spacecraft from one place to another," Somanath said India "will one day be in a position to handle an asteroid mission, land on an asteroid and possibly carry out a planetary defence action to protect Earth". "We should start by collaborating with other nations that have already started work in this area. For example, there is Japan Aerospace Exploration Agency (JAXA) which has gone to an asteroid and collected samples. There are also many other agencies," he said. Associate director of ISRO's Telemetry, Tracking and Command Centre (ISTRAC), Anil Kumar A K said, "In 2004, our observatories were able to see an object 340 meters in size was coming close. Our people calculated with the available data that the threat of this object coming and impacting Earth is more than one in 100 probability which is a high risk." "The object is known as Apophis and its sphere is 360 days, which is almost one Earth year and as a result it can be seen often in the vicinity of Earth," he said.

- While the chances of a major collision are low in the near term, **it is a near-certainty that one will happen eventually unless defensive measures are taken.**
- In 2022, NASA spacecraft Double Asteroid Redirection Test (**DART**) impacted Dimorphous, reducing the minor-planet moon's orbital period by 32 minutes.
- This mission constitutes the first successful attempt at asteroid deflection.
- In 2025, China's CNSA plans to launch another deflection mission to near-Earth object 2019 VL5, a 30-metre-wide (100 ft.) asteroid.
- This will include both an impactor and observer spacecraft.
- **India's Journey in Planetary Defence:**
 - **Observing Apophis:**
 - ◆ In 2004, Indian observatories were able to see an object that was 340 metres in size.
 - ◆ They came to the conclusion that there is a substantial risk that this asteroid will reach and impact Earth.
 - ◆ **The object is known as Apophis**, and its sphere is 360 days (almost one Earth year), and it can often be seen in the vicinity of Earth.
 - ◆ **On April 13, 2029**, it will come to a distance of around 32,000 km away from Earth and there is a fear that if there is any change in gravity, it will have an impact on Earth in 2036.
 - **ISRO's plans for Apophis:**
 - ◆ ISRO is looking to study the asteroid in 2029 in order to prepare for planetary defence efforts to prevent the asteroid from crashing onto Earth.
 - ◆ For this, ISRO could be collaborating with the **Apophis asteroid mission** - a joint mission of JAXA, ESA and NASA.
- **India's Future in Planetary Defence:**
 - **Opportunities:**
 - ◆ While asteroids pose potential threats to Earth, **they also offer significant opportunities for scientific discovery**, potentially revealing insights into the universe's formation and the origins of life on earth.
 - ◆ As a major spacefaring nation with the capability to carry out complex missions of taking a spacecraft from one place to another, India will be in a position to
 - Handle an asteroid mission,
 - Land on an asteroid, and
 - Possibly carry out a planetary defence action to protect Earth.
 - ◆ **India should start by collaborating** with other nations that have already started work in this area. **For example**, Japan's JAXA has gone to an asteroid and collected samples.
 - ◆ ISRO should also be a part of the **worldwide planetary defence programme** in collaboration with other agencies.
 - **Funding challenges:** With ISRO heavily invested in the human space mission to launch an astronaut into space, the space agency is believed to be lacking funds for new projects like asteroid missions.
 - **Learning from NASA's DART mission:** The DART mission shows the possibilities of imparting a change of trajectory to an asteroid and causing it to depart from its course.

7. UK General Election 2024

GS 2 (International Relations)

- **Why in news:**
 - The United Kingdom is all set for a crucial general election today (July 4). Rishi Sunak, the current Prime Minister of the United Kingdom, called a snap general election for July 4, 2024, even though the next election was not required until December 2024.
 - Experts and polling data suggest a landmark election is imminent, with the Labour Party likely to end the Conservatives' 14-year rule.
- **Nature of the Parliament of UK**
 - The UK Parliament is a bicameral legislature, consisting of two houses:
 - ◆ **House of Commons**
 - The lower house, made up of 650 MPs elected by the public through FPTP.
 - 533 for England; 59 for Scotland; 40 for Wales; 18 for Northern Ireland

- It is the primary legislative body, responsible for making and passing laws.
- The party (or coalition) with the majority of seats forms the government, and its leader becomes the Prime Minister.
- The opposition is made up of MPs from parties not in government.

◆ House of Lords

- The upper house, which is unelected and includes life peers, bishops, and hereditary peers.
- It reviews and suggests amendments to legislation proposed by the House of Commons.
- While it can delay legislation, it cannot ultimately prevent bills passed by the Commons from becoming law.

● Nature of the Governance System

- The United Kingdom operates under a constitutional monarchy and a parliamentary democracy. Key features include:

◆ Monarch

- The head of state is the monarch, currently King Charles III.
- The role is largely ceremonial, with real political power vested in elected bodies.

◆ Prime Minister

- The head of government is the Prime Minister, who is the leader of the majority party in the House of Commons.
- The Prime Minister is appointed by the monarch and is responsible for running the government, making policy decisions, and representing the UK domestically and internationally.

◆ Cabinet

- Comprises senior government ministers chosen by the Prime Minister.
- Ministers are typically heads of government departments and are responsible for implementing government policy.

● Voting System of the United Kingdom

■ Background

- ◆ The House of Commons, Scottish Parliament, Welsh Parliament, Northern Ireland Assembly and UK local authorities use different voting systems.

■ First-past-the-post

- ◆ **The House of Commons**, mayoral elections in England, Police and Crime Commissioner elections and local councils in England and Wales use the first-past-the-post system.
- ◆ Voters select their preferred candidate. The candidate with the most votes wins.

■ Formation of the government

- ◆ If a single party wins a majority of the 650 seats, their leader will become the new Prime Minister.
- ◆ If no party achieves a majority, a hung parliament will be declared, and the largest party may attempt to form a coalition government.
- ◆ In this year's election, the two main contenders for Prime Minister are Rishi Sunak of the Conservative Party and Keir Starmer of the Labour Party.

● What Labour's win could mean for India-UK FTA?

■ Background

- ◆ India and UK have been negotiating a proposed free trade agreement (FTA) for more than two years to boost trade between the two nations.
- ◆ The agreement could result in a mutual tariff relaxation on a range of goods such as cars, clothes, alcoholic beverages, and medical instruments.

Elections in the UK

After post-Brexit economic crises, scandals, and political tumult, Conservatives are likely to face a record defeat in Thursday's elections. But many remain skeptical about what a Labour govt will really change

ALNO CHAUHAN & ARJUN SENGUPTA
NEW DELHI, JULY 3

AS THE United Kingdom votes on Thursday, Keir Starmer's Labour Party is headed for a landslide victory — some opinion polls have given Labour more than 60% of the vote in the House of Commons. This will end the 14-year rule of the Conservative Party, also known as the Tory party, currently led by Prime Minister Rishi Sunak.

Falling living standards

The UK has been mired in economic turmoil since it voted to leave the European Union in 2016. Currently, the biggest concern for voters is their deteriorating living standards. While the rate of inflation fell to 2% in May after peaking at 11.1% in October 2022, real wages have contracted by 10% and food prices are up 10% since the last election in May 2019. This has made the outgoing Conservative Party try to show the British people some of their policies have worked. The party has promised to spend up to £100 billion on infrastructure, to be paid for by 2025, and to cut taxes for the middle class. A record number of citizens newly have been registered to vote in the election.

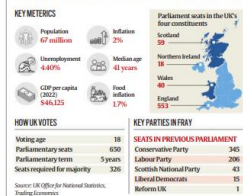
Tory party in disarray

Boris has also been followed by political uncertainty. It cost Conservative Prime Minister David Cameron, who opposed Brexit, to lose his seat in the 2015 general election. Since then, the party has been in a state of disarray. Sunak's leadership has been questioned, and he has been accused of being a weak leader. The party's internal divisions have been exposed, and it is unclear if Sunak can lead the party to victory. The party's internal divisions have been exposed, and it is unclear if Sunak can lead the party to victory.



Labour Party chief Keir Starmer (left) and Prime Minister Rishi Sunak, in May.

ALL YOU NEED TO KNOW ABOUT THE UK & NATIONAL ELECTIONS



HOW UK VOTES

Voting age	18
Parliamentary seats	650
Parliamentary term	5 years
Seats required for majority	326

KEY PARTIES IN FRAY

SEATS IN PREVIOUS PARLIAMENT	
Conservative Party	345
Labour Party	206
Scottish National Party	43
Liberal Democrats	15
Reform UK	1

Labour's plan for 'change'

In the run-up to the election, Labour leader Starmer has promised to be the agent of change for the British people. He has said the first mission of his government would be to boost economic growth.

According to Labour's manifesto, the party will establish a National Infrastructure Bank with £52 billion, which aims to attract three periods of private investment for every pound of public money to support growth and clean energy.

Labour has vowed to cut income tax for the 'working people'. There will be no increase in the basic, higher or additional rates of income tax. National Insurance, or VAT, Corporation tax will be capped at the current level of 25%.

Starmer has also claimed he will resolve issues with the NHS by adding 40,000 more appointments every week, increasing staff to carry out extra appointments one at a time, and using the 'spare capacity' in the private sector. He has promised to recruit an additional 8,000 new staff to treat children and adults.

While Starmer has been a vocal critic of Brexit, he has also promised to bring down net migration by introducing visa restrictions, raising workers in sectors where there is domestic scarcity and increasing border security. Labour has promised to scrap Sunak's 'Brexit bill'.

Labour has promised to end up-regulated Great British Energy, which has been a controversial energy company. The party has also promised to end the 'one-size-fits-all' approach to energy, and to introduce a 'green energy' plan.

Starmer has also promised to end the 'one-size-fits-all' approach to energy, and to introduce a 'green energy' plan. He has also promised to end the 'one-size-fits-all' approach to energy, and to introduce a 'green energy' plan.

Starmer has also promised to end the 'one-size-fits-all' approach to energy, and to introduce a 'green energy' plan. He has also promised to end the 'one-size-fits-all' approach to energy, and to introduce a 'green energy' plan.

Starmer has also promised to end the 'one-size-fits-all' approach to energy, and to introduce a 'green energy' plan. He has also promised to end the 'one-size-fits-all' approach to energy, and to introduce a 'green energy' plan.

Starmer has also promised to end the 'one-size-fits-all' approach to energy, and to introduce a 'green energy' plan. He has also promised to end the 'one-size-fits-all' approach to energy, and to introduce a 'green energy' plan.

Starmer has also promised to end the 'one-size-fits-all' approach to energy, and to introduce a 'green energy' plan. He has also promised to end the 'one-size-fits-all' approach to energy, and to introduce a 'green energy' plan.

Starmer has also promised to end the 'one-size-fits-all' approach to energy, and to introduce a 'green energy' plan. He has also promised to end the 'one-size-fits-all' approach to energy, and to introduce a 'green energy' plan.

Starmer has also promised to end the 'one-size-fits-all' approach to energy, and to introduce a 'green energy' plan. He has also promised to end the 'one-size-fits-all' approach to energy, and to introduce a 'green energy' plan.

Starmer has also promised to end the 'one-size-fits-all' approach to energy, and to introduce a 'green energy' plan. He has also promised to end the 'one-size-fits-all' approach to energy, and to introduce a 'green energy' plan.

Starmer has also promised to end the 'one-size-fits-all' approach to energy, and to introduce a 'green energy' plan. He has also promised to end the 'one-size-fits-all' approach to energy, and to introduce a 'green energy' plan.

Starmer has also promised to end the 'one-size-fits-all' approach to energy, and to introduce a 'green energy' plan. He has also promised to end the 'one-size-fits-all' approach to energy, and to introduce a 'green energy' plan.

Starmer has also promised to end the 'one-size-fits-all' approach to energy, and to introduce a 'green energy' plan. He has also promised to end the 'one-size-fits-all' approach to energy, and to introduce a 'green energy' plan.

Starmer has also promised to end the 'one-size-fits-all' approach to energy, and to introduce a 'green energy' plan. He has also promised to end the 'one-size-fits-all' approach to energy, and to introduce a 'green energy' plan.

Starmer has also promised to end the 'one-size-fits-all' approach to energy, and to introduce a 'green energy' plan. He has also promised to end the 'one-size-fits-all' approach to energy, and to introduce a 'green energy' plan.

Starmer has also promised to end the 'one-size-fits-all' approach to energy, and to introduce a 'green energy' plan. He has also promised to end the 'one-size-fits-all' approach to energy, and to introduce a 'green energy' plan.

Starmer has also promised to end the 'one-size-fits-all' approach to energy, and to introduce a 'green energy' plan. He has also promised to end the 'one-size-fits-all' approach to energy, and to introduce a 'green energy' plan.

Starmer has also promised to end the 'one-size-fits-all' approach to energy, and to introduce a 'green energy' plan. He has also promised to end the 'one-size-fits-all' approach to energy, and to introduce a 'green energy' plan.

- ◆ However, a landslide victory for the Labour Party in the UK elections could lead to a change in the dynamic of the FTA negotiations.
- **Political certainty might be beneficial for the deal**
 - ◆ Since the UK's unexpected referendum to leave the European Union, London has lacked the political stability needed to negotiate a trade deal with India, which has a high tariff regime.
 - ◆ However, if Labour wins decisively, there might be enough political stability to sign such a deal.
- **Growing support for India in the current Labour Party**
 - ◆ Under Keir Starmer, Labour party has changed. It is not the same party as that headed by his predecessor, Jeremy Corbyn, who called for international intervention in Kashmir.
 - ◆ Starmer has recognised the growing political clout of the UK's Indian origin population — the largest immigrant group in the country.
- **Visas a likely sticking point**
 - ◆ Immigration remains among the most heated issues in British politics. This could be a sticking point for a trade deal with India.
 - New Delhi is seeking temporary visas for its service sector workforce under the FTA — this is where it expects to gain the most in the deal.
 - With the UK being a powerhouse in the IT and financial services segment, India's service sector could benefit from the integration.
 - But given the UK's political climate, Labour is likely to negotiate hard on the visa issue.
- **Tougher negotiations on climate**
 - ◆ India will also likely face tougher negotiations on climate from a Labour government.
 - ◆ India has sought a relaxation on the carbon tax that the UK is expected to implement along the lines of the EU.
 - ◆ A carbon tax is a government-imposed price that emitters pay for each ton of greenhouse gas (GHG) emissions they release.
 - ◆ New Delhi argued during the FTA negotiations that the proposed carbon border adjustment mechanism could take away much of the tariff concessions agreed during the FTA.

MCQ Current Affairs
4th July, 2024

1. Consider the following statements with reference to the humid heat:

- A. It results from high temperatures and high levels of moisture in the air.
B. It feels cooler than the same temperature in a dry environment.

Which of the statements given above is/are correct?

- a) A only
b) B only
c) A and B
d) Neither of two

2. What is the primary function of Coding DNA?

- a) To control metabolic pathways
b) To create proteins in the cell
c) To replicate during cell division
d) To repair damaged DNA

3. Which one of the following statements best describes the term 'Money Mule'?

- a) Someone who invests money for others
b) Someone who provides loans at high interest rates
c) Someone who transfers or moves illegally acquired money on behalf of someone else
d) Someone who offers financial consulting services

4. Exercise Nomadic Elephant, a joint military exercise is conducted between India and:

- a) Saudi Arabia
b) Oman
c) Bhutan
d) Mongolia

5. Consider the following statements with reference to the Meta 3D Gen AI System:

- A. It provides both high-resolution textures and material maps.
B. It uses Physically-Based Rendering (PBR) techniques to build up 3D content from scratch.

Which of the statements given above is/are correct?

- a) A only
b) B only
c) A and B
d) Neither of two

Answers Current Affairs
4th July, 2024

1. a
2. b
3. c
4. d
5. c

