

12th Dec, 2024

1. Hemophilia A GS 2 (Health)

- **Why in News:** Scientists in India have successfully used gene therapy to treat severe hemophilia A, a rare genetic disorder that causes spontaneous and potentially life-threatening bleeding due to a missing blood clotting factor.

- **How Gene Therapy Works?**

- Traditionally, **severe hemophilia A** is treated by injecting a **clotting factor** called **Factor VIII** into the body regularly to prevent bleeding.
- However, gene therapy offers a **one-time treatment**. It involves **introducing a new gene** into the patient's body, which then teaches the body to produce enough **Factor VIII on its own**. This reduces the need for frequent injections.
- **Comparison with Global Treatments:** The only gene therapy approved for hemophilia A globally is **Roctavian**, which was approved by the U.S. FDA in 2023.
 - It has shown to reduce bleeding incidents from 5.4 per year to 2.6 per year over a 3-year follow-up.
 - However, Roctavian requires the use of **corticosteroids** to suppress the immune system for the therapy to work, and it uses an adenovirus to deliver the therapeutic gene
- In contrast, the Indian trial used a different method. The gene was delivered using a **lentivirus (a safer option than the adenovirus)**, and the therapy focused on **fusing stem cells** from the patients with the clotting factor gene.
- This approach is considered safer and might even be suitable for children, as it avoids the use of immunosuppressive drugs.

- **Hemophilia A in India:**

- Hemophilia A is a **hereditary bleeding disorder** caused by a lack of **blood clotting Factor VIII**.
- Without enough factor VIII, the blood cannot clot properly to control bleeding.
- During bleeding, a series of reactions take place in the body that helps blood clots form. This process is called the **coagulation cascade**.
- It involves as many as **20 different special proteins** called **coagulation, or clotting, factors**. **Factor VIII (eight)** is one such coagulation factor. Hemophilia A is the result of the body not making enough factor VIII.
- **Causes:**
 - **Genetic Inheritance:** Hemophilia A is inherited through an **X-linked recessive trait**. This means the gene responsible for the disorder is located on the X chromosome.
 - **Males:** Have one X chromosome, so if they inherit the faulty gene, they will develop hemophilia A.
 - **Females:** Have two X chromosomes, so if one X carries the faulty gene, the other X can compensate. Females are usually carriers and do not show symptoms but can pass the gene to their children.
 - **Family History:** Having a family member with hemophilia A increases the risk.
- **Symptoms:** Prolonged Bleeding; Joint Bleeding; Bruising and Internal Bleeding; Unexplained Bleeding
- While it is a rare condition, India has **one of the largest patient populations in the world**, with an estimated 40,000 to 100,000 people living with hemophilia. Severe cases involve having less than 1% of the necessary clotting factor.
- These patients manage their condition through **repeated Factor VIII replacements** or other treatments, which can be expensive.
- The cost of treating a hemophiliac in India can reach ₹2.54 crore over 10 years.

Indian scientists develop novel gene therapy to provide one-time solution for haemophilia

Jacob Koshy
NEW DELHI

Scientists in India have reported success with using gene therapy to treat severe haemophilia A, a rare hereditary condition resulting from a faulty gene which triggers severe, spontaneous, and potentially fatal bleeding episodes. Though only tested on five patients in Tamil Nadu so far, none of them have reported bleeding episodes over an average follow-up period of 14 months. It is not unusual for those with haemophilia to have weekly bleeding episodes, requiring frequent treatment. The results of the study were reported in the peer-reviewed *New England Journal of Medicine* (NJM) earlier this week. The trial was led by Alak Srivastava of the Centre for Stem Cell Research (CSCR) at the Christian Medical



Costly affair: Per-patient cost of treating haemophilia in India is reported to be ₹2.54 crore over a 10-year period. GETTY IMAGES

jections at frequent intervals, with infusions of a "clotting factor" to prevent bleeding. Gene therapy treatments, however, promise to be a one-time solution. A gene introduced into the body teaches it to create enough of the clotting factor that can prevent such haemorrhage. Haemophilia can be classified as minor or severe depending on the percentage of clotting factor present. Haemophilia A, the more common version of the condition, is caused by the absence of a blood-clotting factor called Factor VIII. Even though haemophilia is a rare disorder, India has the world's second-largest patient pool, with an estimated 40,000

to 100,000 patients. Those with severe haemophilia A have less than 1% of the clotting factor, and manage the condition with repeated Factor VIII replacement, monoclonal antibodies, or injecting substances that mimic Factor VIII to stop or prevent bleeding. Because of the nature of the condition and the relatively low numbers of patients, treatment can be expensive. A March 2024 research study in the journal *Hepylon* estimates the per-patient cost of treating a haemophilia patient in India to be \$300,000 (or ₹2.54 crore) over a 10-year period.

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2. Guruvayur Temple GS 1 (Art and Culture)

- **Why in News:** The Supreme Court recently agreed to examine a plea against the Kerala High Court order in favour of the administration of the Guruvayur temple, which decided to discontinue the ancient ritual of "udayasthamana pooja" on Ekadasi, citing crowd management issues.

About Guruvayur Temple:

- **Guruvayoor Sree Krishna Swamy Temple**, also known as the **Dwarka of the South**, is a Hindu temple dedicated to **Lord Krishna**.
- It is located in the small town of Guruvayur, in the Thrissur District of Kerala.
- The **earliest temple records** date back to the **17th century**, but **other literary texts** and legends indicate that the temple may be around **5000 years old**.
- **In 1716 AD, the Dutch plundered and set fire to the temple. It was rebuilt in 1747 AD.**
- **In terms of devotees every day, it is the fourth biggest shrine in India.**
- **Features:**
 - Lord Krishna, or **Guruvayoorappan**, is the **chief deity** of this temple
 - The temple is built in the traditional **Kerala architectural style**.
 - It is believed that the central shrine of the temple was reconstructed in the year 1638 C.E.
 - Structures like the Nalambalam (temple structure surrounding the sanctum sanctorum), Balikkal (sacrificial stone), and Deepastambam (pillar of lights) are situated on the temple premises.
 - The **wall of the sanctum sanctorum** is decked with ancient **17th-century murals**.
 - Another famous sight here is the **Dwajasthamba**. It is a **flagstaff, around 70 feet tall, fully covered with gold**.
 - The **Thulabharam** is one of the **most popular offerings** at Guruvayur Temple. In this ritual, **devotees are weighed against** jaggery, coconuts, sugar, or bananas on a giant set of scales. This quantity is then given to the Lord as an offering.
 - The temple is also noted for being **home to a large population of captive male Asian elephants**.
 - The **Punnathur Kotta elephant sanctuary**, where 56 elephants live, is very close to the temple.

3. Vaikom — two States, two leaders and a tale of reform GS 2 (Social Issues)

- **Why in News:** The centenary of the **Vaikom Struggle**, a landmark **socio-political movement** that sought the right of backward caste Hindus to walk on streets adjacent to the **Vaikom Mahadeva temple**, is being commemorated on December 12, 2024. This event marks a significant moment in **South India's social reform trajectory**, which saw leaders like **Periyar E.V. Ramasamy** and **B.R. Ambedkar** driving transformative changes. The struggle set the stage for future mass movements focused on religious reform and egalitarianism, facilitated in part by constitutional changes introduced by Ambedkar.
- **The Vaikom Struggle and the Rise of Social Justice Movements**

Vaikom — two States, two leaders and a tale of reform

A little over a 100 years ago was a landmark socio-political moment like no other. The Vaikom Struggle, which culminated in the lifting of the barriers to the entry of backward caste Hindus to the local temple in the erstwhile Travancore princely state, would be the first of many mass movements that brought political attention to religious reform. Since then, the Dravidian Movement founded by Periyar E.V. Ramasamy and its self-respect principles have enabled wider reforms within the Hindu religion and paved the way for a more egalitarian society. What is less understood is that this was made possible only due to the insertion of a key clause in the Constitution by Dr. B.R. Ambedkar. Celebrating the centenary of Vaikom is not just a tribute to Periyar's persistence and B.R. Ambedkar's acumen but also a re-assertion of the strong reformist tendencies that continue to pervade through modern-day politics in South India.



Mammal Shammugan Sundaram
an advocate practicing before the Madras High Court and Joint Secretary of the Dravida Munnetra Kazhagam (DMK)

India was progressing at a faster pace with the Legislature Assembly introducing a Bill to allow temple entry in 1932, followed by the Travancore Temple Entry Proclamation in 1936, the Malabar Temple Entry Bill 1938. There was also the entry of backward castes in the Madurai Meezhalai Sundaravar Temple and the Thanjavur Brhadisaravara Temple in 1939. The Madras Temple Entry Authorization Act 1947 enabled Hindus of all castes to enter and offer worship in all temples within the then Madras Presidency.

Though many of these reforms took place prior to the adoption of the Constitution of India, the Constituent Assembly took great care in delineating the right to freedom of religion. During discussions on December 7, 1946, B.R. Ambedkar included the prefix 'subject to public order, morality and health' restricting the extent of the fundamental right and thereby enabling state intervention when necessary.

These seven words went on to form the legal and legitimate basis for reforms within the field of religion, thereby enabling constitutional courts to intercede when there was a contestation of fundamental rights, namely between those of equality and religion.

State and the issue of regulation

The larger issue has always been whether temples, and religion at large, can be regulated by the state. If this is allowed, some argue, then the government will lose its secular character. There can be nothing further from the truth or logic. The intervention of the State to regulate temples, which are public spaces, is to ensure equality and access. A long history, beginning with the enactment of the Madras Hindu Religious Endowments Act 1927 to the present-day Tamil Nadu Hindu Religious and Charitable Endowments Act 1989, would make it apparent the legislative intent to manage religious affairs in

consonance with public order and morality. This position has been confirmed through various judgments beginning from *The Commissioner, Hindu Religious Endowments, Madras vs Sri Lakshminarayanan Thiruvannamalai* (1954) (Shirur Math case), where the Supreme Court of India upheld the proposition that the state can manage the secular affairs of the temple and propounded the test of essential religious practice.

Since then, successive governments in Tamil Nadu, beginning in 1970, have enacted laws to enable backward caste Hindus to be appointed as archakas (priests), which some have regarded as a contentious act of interference in religious affairs. In such instances, the Court has upheld the right of the State to manage secular matters in temples while carving out a special category of 'Agnostic temples'.

Change and resistance

Over the last few years, Governments of Kerala and Tamil Nadu have appointed hundreds of trained archakas, Odhavas and Bhattacharyas from non-Brahmin castes. These have been met with resistance within and outside the courts of law. These reforms challenge orthodox religious beliefs and entrenched social dikats.

Nevertheless, the push for reforms is stronger than before. One hundred years after Vaikom and over 75 years since the Constituent Assembly debate on this issue, there is a compelling moral consensus that is emerging. While the Governments of Tamil Nadu and Kerala have collaborated to commemorate the centenary of the Vaikom Struggle on December 12, 2024, they are also celebrating a historic event that brought together two States. They are paying tribute to the start of a social reform trajectory that was made possible due to the coming together of two of the greatest leaders.

SC seeks response from Guruvayur panel on 'Udayasthamana' puja plea

Krishnadas Rajagopal
NEW DELHI

The Supreme Court has sought a response from the Guruvayur Devasthanam management committee on a plea challenging a decision to stop the 'Udayasthamana Puja' on Vrishchika Ekadasi day for the sake of public convenience.

"The puja has been stopped on the pretext of causing inconvenience to the public? The puja is for the deity, for increasing the divinity of the deity. Management will have to find other ways to increase public convenience," a Bench headed by Justice J.K. Maheshwari said. The



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SUPREME COURT BENCH

Bench also issued notice to the head priest or the temple thanthri and the State of Kerala, posting the case after four weeks. Meanwhile, the court directed the schedule of the temple to remain unchanged.

The petitioners led by P.C. Hary, represented by senior advocate C.S. Vaidyanathan and advocate

Karthik Ashok, are members of the Puzhakkara Chennas Mana, the thanthri family of the Guruvayur temple.

The petitioner contended that the decision taken by the Guruvayur Devasthanam management committee to not perform the Udayasthamana puja in the temple on the day of Guruvayur Vrishchika Ekadasi was encroachment into the age-old custom and tradition of the temple.

Section 10 of the Guruvayur Devasthanam Act, 1978, mandates the committee to exercise its duties subject to the custom and usage followed by the temple.

The Act bars the committee from interfering with religious and spiritual matters.

"Guruvayur Ekadasi is one of the most important annual festivals observed in the temple. Udayasthamana puja is the most important puja performed on this auspicious day," the petition said.

- **Initial Struggle:** The Vaikom Struggle, initiated against the exclusion of backward caste Hindus from walking on public streets near the Vaikom temple, began as a protest led by Kerala State Congress and other social activists.
- **Periyar's Involvement:** In 1924, **Periyar E.V. Ramasamy** joined the struggle, transforming it into a mass movement. This culminated in November 1925 with the **lifting of restrictions**, signaling a shift toward social justice activism across India.
- **Nationwide Impact:** The Vaikom Struggle inspired similar movements across India, such as **Ambedkar's protests** for Dalit entry into temples like **Ambadevi and Kalaram Mandir**, setting a precedent for broader religious reforms.

Has the government clarified its stance on ONOS?

Why did the One Nation, One Subscription plan invite criticism after it was unveiled last month?

The Hindu Threat

The story so far: On November 25, the Indian government announced the launch of the 'One Nation, One Subscription' (ONOS) plan to improve access to research journals for the country's public education and research institutions. The announcement was accompanied with scant details and broadsheet widespread criticism from the research community, especially over what was perceived to be its disproportionate expense and lack of support for open access publishing. On December 11, government officials conducted a press conference in New Delhi that addressed many of these concerns.

What is ONOS's purpose? When scientists conduct an experiment, they write up their methods and findings and publish it as a paper in a journal. The journal collects, reviews, edits, publishes, and archives these papers as a service to other scholars and the people at large. In exchange, journals levy a fee. Subscription-based journals charge readers a fee to read papers. Some forms of Open Access (OA) journals, called 'gold' OA, charge researchers to publish their paper. Institutes in India had subscribed to subscription journals through 10 or so consortia within the country. ONOS will replace these consortia as a single window through which all government-funded institutes in the country will be able to access more than 15,000 journals published by 30 major international publishers.

Why did ONOS provoke criticism? At the time of announcement, a Ministry of Education press release didn't specify which journals would be part of ONOS, how ONOS would be implemented, how its allocation of ₹5,000 crore (for three

calendar years) would be spent, and how ONOS would support efforts to make research OA. Experts on the topic also asked whether the allocation for foreign journals could have been used to support domestic publishing efforts instead. Also, it wasn't clear whether ONOS would help scientists pay to publish in gold OA journals or whether these payments – called article processing charges (APCs) – could be discounted. What was revealed on December 11? The press conference was attended by officials from the office of the Principal Scientific Advisor (PSA), the Department of Science & Technology, and the Department of Higher Education. The package includes and staff at all public institutes will be able to access all papers in the journals participating in ONOS irrespective of their discipline. Negotiations are underway to bring in more journals.

Phases Ramya Hardiman, a scientist at the PSA's office, said the government would implement ONOS in three phases: (i) merge all the consortia and work to facilitate journal access in all public institutes; (ii) expand to include private institutions; (iii) create "universal access" to all content through integrated access points at public libraries. Open access is a plus, ONOS would not make APCs cover a year to pay for APCs. The government has also negotiated APC discounts for researchers to publish in certain OA journals. The officials said they are aware of transformative OA models and that ONOS would encompass them as it progressed. As of today, they said, around 85% of papers published by Indian scientists were in subscription-based journals. Domestic efforts like scale at the press conference acknowledged the need to support domestic publishers. They said there were few repositories in the country where researchers could deposit digital copies of their papers and where others could freely access them – but that scientists were using them to a lesser-than-ideal degree. They added that other efforts need to take place, such as "institutional promotion, and support of Indian journals" and changes in how researchers, especially to reduce dependence on journal fees and increase focus on the merit of each person's work.

THE GIST

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▪ The Role of Legislative and Constitutional Reforms

- **Pre-Independence Reforms:** South India saw progressive reforms, including the **Travancore Temple Entry Proclamation (1936)** and the **Madras Temple Entry Authorization Act (1947)**, which allowed backward castes to enter temples, paving the way for broader temple access.
- **Ambedkar's Constitutional Clause:** During the **Constituent Assembly debates in 1948**, **Ambedkar inserted a crucial clause** in the Constitution: **'subject to public order, morality and health,'** enabling state intervention in religious matters when necessary.
- **Legal Basis for Reform:** This clause formed the **legal foundation** for future religious reforms, allowing constitutional courts to intervene in cases where **fundamental rights, such as equality**, clashed with religious practices.

▪ State Regulation of Temples and Contemporary Reforms

- **State Regulation of Religious Affairs:** The state's role in regulating temples has been upheld by several laws, including the **Madras Hindu Religious Endowments Act (1927)** and the **Tamil Nadu Hindu Religious and Charitable Endowments Act (1959)**, ensuring **secular management** of temples in line with public order.
- **Court's Stance on Secular Management:** The **Shirur Mutt case (1954)** affirmed the state's right to regulate secular matters of temples, particularly when it concerns **equality and public access**, even allowing non-Brahmin priests to be appointed.
- **Recent Challenges and Reforms:** Modern reforms, such as the appointment of **non-Brahmin archakas** in temples, have faced resistance but reflect a **stronger push for social reform**, challenging orthodox beliefs and traditional caste-based practices.

4. One Nation, One Subscription (ONOS) Initiative

GS 2 (Governance)

- **Why in News:** The Indian government launched the **'One Nation, One Subscription' (ONOS)** initiative to improve access to research journals for public education and research institutes. This plan aims to address the high costs of subscribing to scientific journals, which many public institutions struggle to afford.
- **Purpose of ONOS:**
 - **Scientific journals** are used to publish research findings. These journals usually charge fees for access. **Subscription-based journals** charge readers to access published papers, while **open-access journals (OA)** allow free access but often charge researchers to publish.
 - Before ONOS, India had around **10 consortia** that helped public institutes subscribe to journals at a collective cost.
 - ONOS will replace these consortia with a single platform to provide **more than 13,000 journals** from **30 international publishers**, like Springer-Nature, Wiley, and Taylor & Francis, to all government-funded educational and research institutes in the country.
- **Criticism of ONOS:**

- When ONOS was first announced, it faced several criticisms:
 - **Lack of clarity:** The government did not specify which journals would be included, how the **Rs 6,000 crore budget** would be used, or how ONOS would support **open-access publishing**.
 - **Domestic vs foreign journals:** Experts questioned if the funds allocated for foreign journals could have been better used to support **Indian publishing**.
 - **Open access concerns:** It was unclear whether ONOS would support **Article Processing Charges (APCs)** for publishing in open-access journals.

- **Clarifications**

- **Access to journals:** Students and staff at all public institutions can now access papers from participating journals for free.
 - The initiative will include journals from major publishers, and **negotiations** are underway to add more journals to ONOS.
 - Institutes will not have to pay any additional fees to access these journals.
- **Phased Implementation:**
 - **Phase I:** Merge existing consortia to facilitate access to journals in all public institutes
 - **Phase II:** Expand the plan to include **private institutions**.
 - **Phase III:** Provide **universal access** to all citizens through public libraries.
- **Open Access (OA):**
 - **Pilot for OA:** Rs 150 crore annually will be allocated to support **APCs** for publishing in open-access journals. The government has also negotiated **discounted APCs** for Indian researchers.
 - Currently, about **60-70% of the journals** included in ONOS are **subscription-based**.
 - Officials acknowledged that **open-access models** are evolving and ONOS will adapt to support them as the system matures.
- **Support for Domestic Publishers:** The government acknowledged the need to support **Indian publishers**. While India has five digital repositories for researchers to upload papers for free access, they are not being used widely enough.
 - A new **research evaluation framework** will be developed to focus more on the **merit** of researchers' work rather than just the **prestige** of the journals they publish in.
- **Global Context:** The officials clarified that ONOS is not meant to promote one publishing model over another but is a **practical solution** tailored to India's needs. The aim is to bridge the gap until a more sustainable **open-access model** is globally achieved.

5. Climate footprint of Space Exploration GS 3 (Environment)

- **Why in News:** As the world increasingly depends on space technologies for vital functions like **climate monitoring**, concerns about the **environmental impact of space activities** are growing. The rapid rise in the number of satellites and space missions is leading to two main issues:
 - **Pollution from rocket emissions**
 - **Orbital debris**
- **Environmental Impact of Space Activities**
 - Space activities, particularly rocket launches, have environmental consequences:
 - **Rocket emissions:** Every rocket launch releases gases like **carbon dioxide (CO₂)**, **black carbon**, and **water vapour** into the atmosphere. Black carbon is particularly harmful as it absorbs sunlight and contributes more to global warming than CO₂.
 - **Ozone depletion:** Some rocket propellants, especially **chlorine-based chemicals**, damage the ozone layer, which protects Earth from harmful ultraviolet radiation. This leads to increased UV exposure and disruptions in atmospheric circulation, affecting global climate.
 - **Satellite production:** Building satellites is an energy-intensive process that involves extracting and processing metals, which contributes to carbon emissions. Satellites also use propulsion systems that emit additional pollutants.

- **Space mining:** While not yet active, extracting resources from asteroids could further increase industrial activities both in space and on Earth, adding to environmental concerns.
- **Risks of Orbital Debris (Space Junk)**
 - **Orbital debris** refers to defunct satellites, rocket stages, and broken-up pieces of satellites floating in **Low Earth Orbit (LEO)**.
 - As of **September 2024**, there are about **19,590 satellites** in orbit, with **13,230 still in space**. Around **10,200 of these are functional**.
 - Space debris poses risks to both active satellites and space missions. Even small pieces of debris, traveling at speeds up to **29 km/s**, can damage satellites, disrupting services like communication, navigation, and climate monitoring.
 - The increasing amount of debris makes it harder to avoid collisions, adding costs to space missions due to the need for protective measures like **shielding satellites** and performing **costly manoeuvres**.
- **Barriers to Space Sustainability**
 - Currently, there are no clear international regulations on space emissions or debris, which complicates efforts to ensure sustainability:
 - **Lack of regulation:** Space activities are not covered by agreements like the **Paris Agreement**, which addresses climate change. Without clear regulations, emissions from rockets and satellites could worsen global warming.
 - **Crowded orbits:** The growing number of satellites and debris in LEO increases the risk of collisions, which raises the costs of future missions and makes space less accessible.
 - **Need for international cooperation:** Bodies like the **Committee on the Peaceful Use of Outer Space (COPUOS)** can help create global standards, but current efforts lack enforceability.
- **Solutions for Sustainable Space Exploration**
 - Achieving sustainability in space requires technological advancements and regulatory changes:
 - **Reusable rockets:** Companies like **SpaceX** and **Blue Origin** have developed rockets that can be reused, reducing manufacturing waste and mission costs. However, these rockets are heavier and consume more fuel, which complicates scaling the technology.
 - **Clean fuels:** Using **liquid hydrogen** or **biofuels** could reduce harmful emissions. However, hydrogen is currently produced using non-renewable energy, which limits its environmental benefits. **Cryogenic fuels** offer more power but are expensive and complex to use.
 - **Biodegradable satellites:** Designing satellites with materials that can disintegrate when they re-enter Earth's atmosphere could help reduce space debris. However, these materials are not yet durable enough for space conditions.
 - **Autonomous debris removal:** Technologies like **robotic arms** and **laser systems** could help remove space junk, but they are expensive and need clearer legal frameworks before they can be used effectively.
 - **Space traffic management:** A global system to track satellites and debris could help avoid collisions and optimize the use of orbits. However, data-sharing challenges, particularly due to security and commercial concerns, hinder progress.
- **What Needs to Be Done?**
 - **Regulations and international agreements:** Governments must create binding agreements to set limits on emissions, manage debris, and improve data-sharing. This can be done through **COPUOS** and other international bodies.

Climate impact of exploring space passing below the radar

Making satellites is an energy-intensive process. Every launch also releases carbon dioxide, black carbon, and water vapour. Rocket propellants deplete the ozone layer and disrupt atmospheric circulation. Satellites burning up in the air release ash into the atmosphere's middle layers.

Shantanu Dasgupta

As the world becomes more reliant on space technology for vital functions like climate monitoring, the environmental consequences of space activities also become increasingly urgent and the need of space attention. The rapid growth of the number of satellites in orbit has led to concerns about interference with climate monitoring systems and the accumulation of orbital debris. With no specific international regulation addressing these challenges, it is crucial the world's governments act quickly to ensure space exploration doesn't drift into unsustainability.

How rockets affect the environment

Rocket launches release carbon dioxide, black carbon, and water vapour into the atmosphere. Black carbon has a particular concern because it also absorbs sunlight, so even more effectively than carbon dioxide does, amplifying global warming. As commercial space ventures become more common, the cumulative impact of these emissions will worsen.

Rocket propellants, especially those using chlorine-based fuels, deplete the ozone layer at high altitudes. Increasing exposure to ultraviolet radiation is a concern because it can lead to skin cancer and other health problems. According to a December 9 article in *NAT*, "The rockets' exhaust, 'burns up' in the atmosphere" once their missions end, they release "satellite bits" in the middle layers of the earth's atmosphere. This creates a risk to the atmosphere and potentially alters the climate.

Next, the many other forms of manufacturing the production of satellites, launch systems, and other components, including those used for communication, navigation, and to monitor climate change, are also responsible for carbon emissions. Satellite launches also release carbon dioxide, black carbon, and water vapour into the atmosphere. Black carbon has a particular concern because it also absorbs sunlight, so even more effectively than carbon dioxide does, amplifying global warming. As commercial space ventures become more common, the cumulative impact of these emissions will worsen.

For example, space surveillance



A SpaceX Falcon 9 rocket is off from Cape Canaveral Space Force Station, Florida. The rocket carrier is in the background.

The mass of objects in orbit exceeds 10,000 tonnes. As this increases, the collision risks increase as well. Most space junk can reach speeds of up to 29 km/hr. Even a minuscule piece can smash through a satellite.

International cooperation through bodies like the Committee on the Peaceful Use of Outer Space (COPUOS) is necessary to create global standards. Governments can also ensure that space activities are sustainable. The Paris Agreement, which addresses the global climate crisis, is a good example of international cooperation. The Paris Agreement is a landmark agreement that aims to limit global warming to well below 2°C, preferably to 1.5°C, compared to pre-industrial levels. To achieve this, countries have agreed to work together to reduce greenhouse gas emissions and to adapt to the impacts of climate change.

Achieving sustainability in space exploration requires innovative solutions, which also present challenges of their own. For example, reusable rockets like those developed by SpaceX and Blue Origin reduce manufacturing waste and lower costs, but they also require more rocket components in multiple countries. For the reusable parts to be effective, they also need to be made in multiple countries. This also has limited applicability for high-risk missions, and their wear and tear could create additional waste. Scaling this technology while maintaining efficiency remains a hurdle.

Second, transitioning to cleaner fuels like liquid hydrogen and biofuels could reduce harmful emissions during launches. However, these fuels are not yet widely available, and their production and distribution are still in the early stages.

Designing satellites with materials that can disintegrate when they re-enter Earth's atmosphere could help reduce space debris. However, these materials are not yet durable enough for space conditions.

Technologies like robotic arms and laser systems could help remove space junk, but they are expensive and need clearer legal frameworks before they can be used effectively.

A global system to track satellites and debris could help avoid collisions and optimize the use of orbits. However, data-sharing challenges, particularly due to security and commercial concerns, hinder progress.

Governments must create binding agreements to set limits on emissions, manage debris, and improve data-sharing. This can be done through COPUOS and other international bodies.

For example, space surveillance

- **Funding for green technologies:** Governments and private companies should invest in **clean technologies, debris removal systems, and biodegradable satellites** to reduce space's environmental footprint.
- **Incentives for sustainable practices:** Financial rewards, subsidies, or penalties could encourage companies to adopt more sustainable practices.

6. WHO's World Malaria Report 2024

GS 2 (Health)

- **Why in News:** The 2024 'World Malaria Report' has been released by WHO. As per the report, India has made "significant progress" in reducing malaria incidence and mortality.

• Malaria

○ About

- It is an acute febrile illness caused by **Plasmodium parasites**, which are spread to people through the bites of **infected female Anopheles mosquitoes**. It is a life-threatening disease primarily found in tropical countries.
- It is preventable and curable.

○ Transmission of Malaria

- Malaria is not contagious and cannot spread from one person to another; the **disease is transmitted through the bites of female Anopheles mosquitoes**.
- **Five species of parasites** can cause malaria in humans and 2 of these species – **Plasmodium falciparum and Plasmodium vivax** – pose the greatest threat.

• Key highlights of the WHO's World Malaria Report 2024

- **Global Burden (2023):**
 - 263 million cases and 597,000 deaths were reported globally.
 - African Region accounted for 95% of deaths, disproportionately affecting young children and pregnant women.
- **Global Progress Since 2000:**
 - 2.2 billion malaria cases and 12.7 million deaths were averted.
 - Case incidence dropped significantly, with steady improvements in many regions.
- **Certification of Malaria-Free Countries**
 - As of November 2024, **WHO has certified 44 countries and one territory, including Egypt most recently, as malaria-free**.
 - Certification requires three consecutive years of zero indigenous malaria cases.
 - 25 malaria-endemic countries now report fewer than 10 cases annually, up from 4 in 2000.
- **Country-Specific Trends in Malaria Cases**
 - **Reduction in Cases (2022-2023):** Nepal (-58.3%), India (-9.6%), Bangladesh (-9.2%), and Indonesia (-5.7%).
 - **Increases in Cases:** North Korea (+47.9%), Thailand (+46.4%), and Myanmar (+45.1%).
 - Timor-Leste and Bhutan reported zero indigenous malaria cases in 2023.
- **South-East Asia's Contribution to Malaria Reduction**
 - The WHO South-East Asia Region accounted for **1.5% of global malaria cases in 2023**, with **India contributing nearly half** and Indonesia about one-third.
 - Estimated malaria cases in the region dropped by 82.4%, from 22.8 million in 2000 to 4 million in 2023.

India's malaria caseload, deaths fall by 69% each in 6 yrs: Report

ANURADHA MASCARENHAS
PUNE, DECEMBER 11

INDIA HAS finally managed to control malaria, reduce mortality and get out of the High-Burden-High-Impact (HBHI) group of endemic countries, according to the World Malaria Report 2024 released on Wednesday.

India reduced its malaria caseload by 69% from 6.4 million in 2017 to 2 million in 2023, and during the same period, the estimated malaria deaths fell 69% from 11,100 to 3,500.

Every year, the report, which provides a snapshot of efforts to control and eliminate the vector-borne disease in 83 countries, serves as a vital tool to evaluate global progress and gaps in the fight against malaria.

"India has made progress in reducing the malaria burden because of its multi-sectoral approach and political commitment to bring down the burden," said Dr Daniel Madandi, Director

of Global Malaria Programme.

"It's never as fast as we would like, and there are some worrying plateaus but the trends are still encouraging. Apart from India, countries like Liberia and Rwanda have seen huge drops in cases," said Dr Arnaud Le Menach, lead author of this year's report and head of the Strategic Information for Response unit within the WHO Global Malaria Programme.

What worked for India?

According to Dr Rajni Kant Srivastava, Indian Council of Medical Research (ICMR) Chair for Disease Elimination, this was possible due to the Artemisinin-based combination therapy (ACT) and long-lasting insecticidal nets (LLIN). The artemisinin first kills the majority of malaria parasites by attacking a certain protein, and the partner drug clears the small number of parasites that remain.

When mosquitoes try to bite a person sleeping under a LLIN, they are not only blocked by the net but also killed by the insecticide coating.

According to the CDC, if more than half of a community uses an insecticide-treated net, the number of mosquitoes in the area and their lifespan will be reduced.

Effective monitoring and evaluation helped in case management.

"The use of these tools in forested and tribal areas in Jharkhand, Odisha, Chhattisgarh and North-East has made an impact," said the former founder-director, ICMR Regional Medical Research Centre, Corakhpur.

According to the report, targeted interventions resulted in improved access to diagnostics, treatments and drugs. New generation insecticide-treated nets, which provide better protection against malaria than the standard pyrethroid-only nets, are being deployed more widely.

This year's report presents some encouraging data and trends in global malaria control. Between 2000 and 2023, 2.2 billion cases and 12.7 million deaths were averted worldwide.

- Malaria deaths in the region fell by 82.9%, from 35,000 in 2000 to 6,000 in 2023, with India and Indonesia accounting for 88% of these deaths.
- **Challenges**
 - **In Africa**
 - Despite global progress, Africa remains the region most affected by malaria.
 - **Funding and Systemic Challenges**
 - Funding in 2023 reached \$4 billion, far below the \$8.3 billion target set by the Global Technical Strategy.
 - Insufficient funding resulted in gaps in insecticide-treated nets, medicines, and other critical tools.
 - Additional challenges include fragile health systems, weak surveillance, and threats such as drug and insecticide resistance.
 - Exacerbating factors include conflicts, natural disasters, climate change, and population displacement.
 - **Recommendations for Equity and Innovation**
 - Emphasis on robust data systems to monitor health inequities, with disaggregated data by sex, age, and social factors.
 - Advocacy for equity, gender equality, and human rights as foundational principles of anti-malaria innovation.
 - Engagement of affected communities in designing and evaluating new tools and approaches to combat malaria.
- **Call to Action**
 - To sustain progress and address persistent challenges, the WHO urges increased investments, innovative approaches, and targeted action in high-burden regions, particularly in Africa.
- **India specific observations in the WHO's World Malaria Report 2024**
 - **India Exits HBHI Group: Milestone in Malaria Control**
 - India has successfully reduced its malaria burden, exiting the High-Burden-High-Impact (HBHI) group of endemic countries.
 - The **country's malaria cases decreased by 69%**, from 6.4 million in 2017 to 2 million in 2023, and malaria deaths fell from 11,100 to 3,500 in the same period.
 - **Key Strategies Behind India's Success**
 - **Artemisinin-Based Combination Therapy (ACT):**
 - Artemisinin kills most malaria parasites, while a partner drug clears the remaining parasites
 - **Long-Lasting Insecticidal Nets (LLIN):**
 - These nets block and kill mosquitoes, reducing mosquito populations and their lifespan when widely used.
 - **Targeted Interventions:**
 - Focused efforts in forested and tribal areas in Jharkhand, Odisha, Chhattisgarh, and the North-East improved access to diagnostics, treatments, and drugs.
 - Deployment of new-generation insecticide-treated nets offered enhanced protection.
 - **Effective Monitoring and Case Management:**
 - Consistent evaluations helped ensure proper implementation of interventions.

7. 'Gross misuse' of Domestic Violence Laws GS 2 (Social Issues)

- Why in News:** The case of Bengaluru Techie who died by suicide citing alleged harassment by his estranged wife has opened up a debate on misuse of anti-dowry law. The Supreme Court expressed concern over the rampant misuse of **Section 498A of the Indian Penal Code (IPC)**, which penalises cruelty by husbands and their relatives against married women.
- Purpose of Laws**
 - India has made significant progress in protecting women's rights through various laws. These laws aim to promote gender equality, and ensure social, political, and economic justice for women.
 - However, some women misuse these laws for personal gains, leading to serious concerns about the misuse of the legal system.
 - This misuse is referred to as the "weaponization of laws."
 - Laws Misused:** Several laws meant to protect women have been misused:
 - Dowry Laws (Section 498-A of IPC):** These laws aim to stop dowry-related harassment but have been misused for extortion and false accusations against husbands and their families.
 - Domestic Violence Act:** Although meant to protect women from domestic abuse, it has been used to harass innocent family members, including elderly relatives, during family disputes.
 - Sexual Harassment at Workplace (POSH) Act:** Some women have falsely accused colleagues or superiors to settle personal scores.
 - Rape Laws:** There are cases where women have falsely accused men of rape to gain personal benefits or seek revenge.
 - Child Custody Laws:** Some women misuse these laws in divorce cases to gain sole custody of children, even when it's not in the child's best interest.
- NCRB Data on False Cases**
 - According to the National Crime Records Bureau (NCRB), a significant number of cases are found to be false:
 - In 2022, out of 650,033 cases investigated, 36,715 (5.65%) were found to be false.
 - The false cases were particularly high in certain categories:
 - Rape:** 9.69% of rape cases were false.
 - Attempt to Commit Rape:** 15.23% were false.
 - Assault on Women with Intent to Outrage Modesty:** 5.93% were false.
- Factors Behind Misuse**
 - Several factors contribute to the misuse of laws:**
 - Lack of Legal Consequences:** There's often no severe punishment for those who file false cases, making it easy for them to misuse the system.
 - Societal Pressure:** There's societal pressure on authorities to favor women in such cases, leading to bias against the accused.
 - Economic Motives:** In some cases, women misuse laws for financial gains, such as seeking alimony or property.
 - Emotional Turmoil:** Disputes, particularly in family matters, can drive people to misuse legal provisions out of anger or revenge.

TOP COURT QUASHES FIR, CITES 'VENDETTA' SC: 'Growing misuse' of IPC Section 498A against husbands, their relatives

ANANTHAKRISHNAN G
NEW DELHI, DECEMBER 11

THE SUPREME Court has come down heavily on the "growing tendency to misuse provisions like Section 498A of the Indian Penal Code" intended to protect married women "as a tool for unleashing personal vendetta against the husband and his family by a wife".

A bench of Justices B Nagarathna and Kottiswar Singh said on Tuesday, "The inclusion of Section 498A of the IPC by way of an amendment was intended to curb cruelty inflicted on a woman by her husband and his family, ensuring swift intervention by the State. However, in recent years, as there have been a notable rise in matrimonial disputes across the country, accompanied by growing discord and tension within the institution of marriage, consequently, there has been a growing tendency to misuse provisions like Section 498A of the IPC as a tool for unleashing personal vendetta against the husband and his family by a wife."

Writing for the bench, Justice Nagarathna said that "making vague and generalised allegations during matrimonial conflicts, if not scrutinised, will lead to the misuse of legal processes and an encouragement for use of arm-twisting tactics by a wife and/or her family".

The bench was hearing a plea filed by a man, his parents and three sisters-in-law against a Telangana High Court order that rejected their prayer to quash the charges against them.

Quashing the FIR against them under section 498A and certain provisions of the Dowry Prohibition Act 1961, the SC said, "A bare perusal of the FIR shows that the allegations made by respondent No.2 (wife of the man) are vague and omnibus. Other than claiming that 'her husband harassed her and that the others instigated him to do so', she has not provided any specific details or described any particular instance. She has also not mentioned the time, date, place, or manner in which the alleged harassment occurred. Therefore, the FIR lacks concrete and precise allegations."

The bench added, "Given the facts of this case and in view of the timing and context of the FIR, we find that the wife 'left the matrimonial house on 03.10.2021 after quarrelling with her husband' with respect to her interactions with a third person in their marriage. Later she came back to her matrimonial house assuring to have a cordial relationship". "However, she again left the matrimonial house. When the husband 'issued a legal notice seeking divorce on 13.12.2021, the present FIR came to be lodged on 01.02.2022 by the wife. Therefore, we are of the

opinion that the FIR filed by the wife is not a genuine complaint, rather it is a retaliatory measure intended to settle scores with her husband and his family members." The bench said "it is noteworthy that the woman has not only deserted her husband but has also abandoned her two children as well, who are now in the care and custody of the husband."

The bench said the applicant's parents and sisters-in-law "have no connection to the matter at hand and have been dragged into the web of crime without any rhyme or reason".

The bench further said, "A mere reference to the names of family members in a criminal case arising out of a matrimonial dispute, without specific allegations indicating their active involvement, should be nipped in the bud. It is a well-recognised fact, borne out of judicial experience, that there is often a tendency to implicate all the members of the husband's family when domestic disputes arise out of a matrimonial discord."

"Such generalised and sweeping accusations unsupported by concrete evidence or particularised allegations cannot form the basis for criminal prosecution. Courts must exercise caution in such cases to prevent misuse of legal provisions and the legal process and avoid unnecessary harassment of innocent family members."

- **Difficulty for Accused to Prove Innocence:** The person accused in a false case often struggles to prove their innocence due to the burden of proof being on them, causing them to suffer financially, emotionally, and mentally.
- **Impact on Men**
 - The psychological toll on men falsely accused of crimes is immense. It can ruin their reputation, harm their mental health, and even lead to acts of revenge. The social stigma that comes with being falsely accused can last for a long time, affecting not just the individual but also their family and future generations.
- **Key ethical aspects related to the misuse of laws:**
 - **Moral Responsibility of Individuals:** The act of filing false cases or misusing the legal system is not only legally wrong but also ethically irresponsible. Ethics emphasizes personal responsibility and honesty. Misuse of laws to harass innocent people violates **moral principles of fairness and justice**.
 - **Trust in Legal Systems:** For a society to function ethically, the rule of law must be upheld with integrity. The misuse of laws erodes public trust in the legal system, causing long-term societal harm. Ethical governance requires ensuring that laws are applied correctly and that those who misuse them are held accountable.
 - **Ethical Dilemmas of False Allegations:** When false accusations are made, they lead to ethical dilemmas for all involved—**judges, police, and society at large**. Legal professionals are ethically bound to ensure justice is done, but false claims complicate their ability to do so. This puts them in situations where they must balance empathy for the victim with a duty to protect the accused.
 - **Prevention of Abuse of Power:** Misuse of laws is also an abuse of power. Ethical governance requires checks and balances to prevent individuals from using their power within the legal system for personal or malicious purposes.
 - **Equity vs. Equality:** While laws protecting women's rights are essential for gender equality, misuse of these laws presents a conflict between equity and equality. Ethical principles highlight the need to balance the protection of vulnerable groups with fairness to all individuals, regardless of gender. Misuse of laws for personal gain undermines the very principles of gender equality that such laws are meant to protect.
 - **Empathy and Compassion:** Ethics also stresses the importance of empathy and compassion in handling sensitive issues like domestic violence or sexual harassment. While the law is meant to protect, it should also be used in a manner that fosters genuine concern and empathy for those who truly need help, rather than being manipulated for personal motives.

8. Pressuring the RBI to lower the interest rate isn't going to solve the problem GS 3 (Economy)

- **Why in News:** Recent statements made by the **Commerce and Finance Ministers of India** regarding the **Reserve Bank of India's (RBI) monetary policy** have raised concerns about government interference in the central bank's functioning. The ministers have expressed concerns about high-interest rates, with an implication that these rates could be contributing to slowing growth. The ministers' suggestions reflect the government's anxiety over economic growth, particularly manufacturing, as quarterly growth rates have been declining since April.
- **The Role of the RBI and Government Interference**
 - **Independence of the RBI:** The RBI, as India's central bank, must remain **independent** in its decision-making process, particularly in terms of monetary policy. The government should refrain from advising or exerting pressure on the bank, as this undermines the **separation of powers** and compromises the central bank's credibility.

- **Mandate of RBI:** Since 2016, the RBI is primarily tasked with **controlling inflation**, with a target inflation rate of 4%. The RBI has the autonomy to vary interest rates to achieve this target, and the government should not influence these decisions in public.
- **Ministers' Interventions:** Both the **Commerce and Finance Ministers** have suggested actions that could lead to a reduction in interest rates. The Commerce Minister advocates excluding food-price inflation from the inflation index, while the Finance Minister is concerned about insufficient credit availability, both implying a desire for lower interest rates.

Don't lean on the RBI

By pressuring central bank to lower the rate of interest, the government is proposing a supply-side solution to a demand-side problem



PULAPRE BALAKRISHNAN

RECENT STATEMENTS MADE independently by the commerce and finance ministers have amounted to advising the Reserve Bank of India (RBI) on how to conduct its monetary policy. The crux of what they had in mind has to do with the rate of interest being too high, though it was not communicated so directly. While we cannot be certain of what prompted the ministers' statements, speculation is that the government is concerned that growth may be slipping, reflected in lowering quarterly growth rates observed since April. If this is so, it reflects an extreme short-termism. After all, the economy notched up a GDP growth rate of 8.2 per cent in 2023-24. That is a historic high. Moreover, should a government be only concerned about growth, throwing all concern about its distribution out of the window? But this is a larger question, and less relevant in the context. What is relevant in the context is whether the government should interfere in the functioning of the RBI and whether the RBI can make a significant difference to the growth of the economy today.

On whether the government should interfere in the functioning of the RBI, even to the extent of exhorting it to undertake certain actions, the answer would be a resounding 'no'. India's central bank is governed by its board, which the government has had a say in choosing, after which it should let them take things forward independently. This would be in the spirit of the separation of powers between the executive and India's public institutions. In the context of the RBI's conduct of monetary policy in particular, the current arrangement gives the RBI a certain autonomy. To be precise, since 2016, the RBI is mandated to mainly control inflation, and a target inflation rate of 4 per cent has been set by the government. Once this has been agreed to, the RBI should be allowed to vary the interest rate as it sees fit. It is not appropriate that the government makes public recommendations to the bank, undermining its credibility as an independent actor. The Commerce Minister has proposed that food-price inflation, which currently is very high, be taken out from the inflation target and the Finance Minister has expressed concern that credit may not be sufficiently made available. Both observations are aimed at persuading the RBI to lower the rate of interest.

The answer to whether the RBI can do something about the growth of the Indian economy in the present conjuncture is also very clear, though it would require some reflection to get the full picture. Presumably, it is the growth of the manufacturing sector

that is the source of the worry. Real GDP has been estimated to have grown by 6 per cent in the first half of 2024-25, having grown at 8.2 per cent in the first half of 2023-24. Manufacturing growth over the same period has been 6 per cent and 4.5 per cent, respectively. Though a detached observer would not be particularly moved by performance recorded over such short periods, it is conceivable that it is galling to a government that has devoted much of its policy attention for over a decade to manufacturing. However, it is likely to be disappointed if it believes that the RBI can do much about growth in the economy presently.

In the past two years, growth has been driven by a scorching increase in public investment by the central government. This has made up for tardy private investment. But it may not have been able to counteract the slow growth of consumption. While national income data do not show any decline at all in the growth of private consumption in the first half of the current financial year, the leading corporates of the consumer-goods sector speak of slow growth of sales. This suggests that demand is not growing fast enough. It is not surprising for we have witnessed a decline in real wages continuously for close to six years by now. If what the economy is experiencing in the medium term is actually a slow growth of demand, then a reduction in the interest rate is not going to help even if the RBI will heed the pressure from the government. Firms expand production in response to expanding sales, and are unlikely to borrow more solely because the rate of interest is lower if their anticipation of sales remains unchanged. By pressuring the RBI to lower the rate of interest, the government is proposing a supply-side solution to a demand-side problem.

In all of this, the Commerce Minister's proposal, earlier made by the Chief Economic Advisor, that food inflation be taken out of the official index of inflation, is a solution for neither growth nor inflation, if food inflation is subdued it can affect the growth of the non-agricultural sector, especially of manufacturing, by crimping consumer budgets as households must first meet their expenses on food before anything else. Second, to have the price of food taken out of the official inflation index without proposing a policy for controlling food inflation, which exceeded 10 per cent in the month of October, is tantamount to just giving up on inflation control.

The comments by cabinet ministers responsible for the economy reveal a certain nervousness on the part of the government about growth. They amount to exhorting the RBI to prioritise growth over inflation control. Apart from the propriety of these interventions, it is not clear that a reduction of the interest rate will do much for growth when the market is not growing fast enough. A central bank cannot grow the market.

The writer is honorary visiting professor, Centre for Development Studies, Thiruvananthapuram

• Can the RBI Impact Growth in the Current Economic Situation?

- **Manufacturing Sector Concerns:** The **growth of the manufacturing sector** has slowed significantly in the first half of 2024-25 (from 9.6% in 2023-24 to 4.5%), which could be contributing to government concerns. However, short-term fluctuations in growth are not a compelling reason for immediate policy changes.
- **Government Investment and Consumption:** Growth in the economy in recent years has largely been driven by **public investment**. Despite this, there are signs of slow growth in **private consumption**, which is exacerbated by **declining real wages** over the past six years.
- **Limitations of Interest Rate Cuts:** If demand remains sluggish, reducing interest rates is unlikely to spur significant economic growth. **Firms need expanding demand** to justify increasing production and borrowing, and low interest rates will not drive expansion if sales expectations remain unchanged.

• Flaws in Proposals to Address Inflation and Growth

- **Commerce Minister's Proposal:** The proposal to **exclude food inflation** from the official inflation index is flawed. **Food inflation**, which exceeded 10% in October 2024, directly impacts consumer budgets, especially in terms of non-agricultural and manufacturing sectors. Ignoring food inflation without a **policy to control it** would be an ineffective approach to managing inflation.
- **Impact on Consumer Budgets:** High food prices reduce the **purchasing power** of households, making it harder for consumers to spend on non-essential goods and services. This weakens demand, which is already under pressure from declining real wages.
- **Supply-side vs. Demand-side Solutions:** Pressuring the RBI to reduce interest rates is proposing a **supply-side solution** to a **demand-side problem**. Interest rate cuts are unlikely to help when the core issue is slow growth in consumer demand, not the cost of borrowing.

9. Ghost gun

Recent events of importance

• Why in News:

- Luigi Mangione, the person suspected of the fatal shooting of UnitedHealthcare CEO Brian Thompson, was carrying a "ghost gun" when he was apprehended.
- The police suspect Mangione's gun may have been made using a 3D printer.

• 3D printing

○ Background

- Invented in the 1980s, 3D printing burst into the mainstream around the 2010s.
- The technology, however, at that time was expensive, slow and prone to making errors. In recent years, some of these flaws have been done away with, making 3D printing more prevalent than ever before.

- **About**

- 3D printing, also known as **additive manufacturing**, is a process of creating three-dimensional objects from digital models by adding material layer by layer.
- It is an additive process, in which layers of a material like plastic, composites or bio-materials are built up to construct objects that range in shape, size, rigidity and colour.
- This process allows for more efficient and customized production compared to traditional subtractive manufacturing methods.

- **Some notable examples**

- 3D printing is being used in a host of different industries like healthcare, automobile and aerospace.
- In May 2023, aerospace manufacturing company Relativity Space launched a test rocket made entirely from 3D-printed parts, measuring 100 feet tall and 7.5 feet wide.
- Shortly after its take off, however, it suffered a failure.
- At the peak of the Covid-19 pandemic in 2020, the healthcare industry **used 3D printers to make much-needed medical equipment, like swabs, face shields, and masks, as well as the parts to fix their ventilator**

- **Ghost Gun**

- **About**

- Ghost guns are untraceable firearms, often made using 3D printers and assembled from various parts, including metals and plastics.
- These guns lack serial numbers, making them difficult for law enforcement to trace.
- Kits for assembling such weapons were initially popular among hobbyists in the US, symbolizing libertarian ideals, but have now gained popularity among criminals due to their anonymity.

- **Concerns**

- The ease of creating ghost guns bypasses background checks required for commercial firearm sales.
- This incident highlights the evolution of 3D printing technology and raises concerns about its misuse in crafting precision equipment like firearms.

- **A Growing Threat in the US**

- **Untraceable and Increasingly Prevalent**

- Ghost guns, formally known as Privately Made Firearms (PMF), are becoming a significant problem in the US due to their untraceable nature.

- **Sharp Rise in Recoveries**

- In 2022, the US Department of Justice recovered 25,785 ghost guns, reflecting a staggering 1,300% increase since 2016.
- Between 2017 and 2021, nearly 38,000 suspected ghost guns were recovered during domestic seizures.

- **Recent Trends**

- The number of ghost guns recovered and traced increased significantly.
- 19,273 in 2021, up from 8,504 in 2020, according to the US Bureau of Alcohol, Tobacco, Firearms, and Explosives (ATF).

- **Are ghost guns legal in the US?**

- **Biden's 2022 Rule for Ghost Guns**

- President Joe Biden introduced a rule in 2022 requiring ghost guns to adhere to the same regulations as commercial firearms.
- The rule mandates serial numbers and background checks for buyers.

GHOST GUN

A 'privately made firearm', a potentially untraceable 3D-printed gun, was found on US murder suspect

SOUMYARENDRA BARIK
NEW DELHI, DECEMBER 11

LUIGI MANGIONE, the 26-year-old Ivy League graduate who is a suspect in the killing of UnitedHealthcare CEO Brian Thompson, was arrested on Monday at a McDonald's in Altoona, Pennsylvania. He was allegedly in possession of a "ghost gun", bullets, multiple fake IDs, and cash.

What are 'ghost guns'?

Ghost guns, formally known as privately made firearms (PMF), are weapons that can be assembled at home and are potentially untraceable. They lack the serial numbers marked on other firearms, which makes it difficult to track them. Ghost guns can be pistols, revolvers, rifles, shotguns, machine guns, etc. These guns can be made using a 3D printer or assembled from a kit. Police suspect Mangione's gun may have been made using a 3D printer.

The arrest warrant described it as "a semi-automatic pistol with what appears to be a 3D-printed loaded receiver with a metal slide and silencer," according to a report by the BBC. The gun was capable of firing 9 mm rounds.

The report also said many of the parts required to make a ghost gun could be legally bought without a background check until August 2023.

Are ghost guns a big problem in the United States?

Ghost guns are increasingly being used by criminals in the US due to their untraceable nature.

In 2022, the US Department of Justice recovered 25,785 ghost guns in domestic seizures, marking a 1,300 per cent increase from 2016.

Law enforcement agencies in the US recovered and submitted nearly 38,000 suspected ghost guns between 2017 and 2021. As many as 19,273 suspected ghost



Luigi Mangione, 26, suspected in the killing of UnitedHealth Chief Executive Brian Thompson. Reuters

guns were recovered and traced in 2021, up from 8,504 in 2020, according to a 2021 report by the US Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF).

Are ghost guns legal in the US?

While gun control remains a polarising issue in the US, President Joe Biden instituted a new rule in 2022 that mandated ghost guns to have similar regulations as commercial firearms, including a serial number and background checks for buyers.

However, the measure was challenged in the Supreme Court, and a final ruling has not been issued in the case.

Supporters of ghost guns say they are meant for hobbyists. They also argue that people have the right to build such weapons under the Second Amendment to the US Constitution, which allows US citizens the right to keep and bear firearms.

The other major firearms control law in the US, the Gun Control Act of 1968, allows private citizens to build guns for personal use. There are few regulations requiring them to be registered or traceable so long as they are not sold by the owner.

- The measure faces legal challenges in the Supreme Court, with no final ruling yet.
- **Arguments Supporting Ghost Guns**
 - Advocates claim ghost guns are for hobbyists and align with the Second Amendment, which protects the right to keep and bear arms.
 - Supporters argue individuals have a right to build firearms for personal use.
- **Existing Legal Framework**
 - The **Gun Control Act of 1968** permits private citizens to construct guns for personal use without mandatory registration or traceability, provided they are not sold.

