DAILY CURRENT AFFAIRS

13th August 2025

The Hindu Analysis 13th August 2025

Topics Covered

- Clear the myths, recognise organ donation as a lifeline
- Justice and equality
- Before tackling stray dogs issue, India must count them properly
- Dogs and laws
- How does satellite internet work?
- ICMR set to monitor wastewater for 10 viruses in 50 cities

Clear the myths, recognise organ donation as a lifeline

Syllabus :

GS Paper II – Governance, Polity & Social Justice
GS Paper IV – Ethics, Integrity & Aptitude

Clear the myths, recognise organ donation as a lifeline

Organ transplantation is one of modern medicine's greatest triumphs. A miracle of 20th century medicine, organ transplants are the gold standard treatment for terminal and irreversible organ failure. Yet, in India, more than half a million lives are lost every year for lack of a suitable donor organ.

This is despite the number of transplants performed every year, from 4,990 in 2013 to 18,378 in 2023. However, this number includes only 1,099 deceased organ donors after brain death. The Indian organ donation rate per million population is only 0.8, which is much lower than the highest rate of over 45 per million population in Spain and the United States. As I have often said, losing a fellow Indian due to the lack of an organ for transplant is a preventable fatality we cannot, and must not accept.

Helping families to overcome their fears

The reasons for this gap between demand and supply include deep-seated myths and misconceptions that discourage families from consenting to donation after a patient's death. To change this situation, we must launch sustained education and awareness campaigns.

Many families believe that donating one's organs disfigures the body, preventing proper funeral rites. Families worry about the deceased person's physical integrity being affected or of violating religious traditions. In reality, organ retrieval is performed with the utmost respect and care, ensuring that the donor's appearance is preserved for viewing and final ceremonies. Health-care teams work within the framework of cultural practices, and leaders across faiths have publicly affirmed that organ donation is an act of compassion aligned with spiritual values espoused in all religions.

Another widespread myth is the fear that some families harbour that hospital staff might prematurely declare brain death just to harvest organs. This is a complete falsehood as a declaration of brain death requires strict adherence to a structured legal and clinical framework established under the Transplantation of Human Organs and Tissues Act, 1994. This involves strict medical criteria, a multidisciplinary board of experts, defined clinical assessments repeated after a stipulated interval, and thorough documentation on prescribed forms. The procedure is robust, transparent and ethically sound to ensure an unbiased confirmation of irreversible neurological death, an upholding of ethical standards, and the enabling of timely organ retrieval for transplantation.

Dr. Prathap C. Reddy

is Founder-Chairman, Apollo Hospitals Group

Sustained awareness campaigns can ensure that no life is lost for want of an organ

The issue of age and health

Age and health status often give rise to another misunderstanding – that only young accident victims can donate organs. While certain organs perform best when recovered from younger donors, many organs and tissues, such as the kidneys, liver segments, the lungs, and the corneas can come from older donors or those who die of natural causes. Every contribution counts, with even donations of bone, skin and heart valves able to save or dramatically improve lives.

Addressing these myths requires a sustained focus. Audio-visual campaigns on television and social media can reach younger audiences. Using real donor families and transplant recipients in communication can show how transplants save real lives. Community workshops, led by trained counsellors, can provide safe spaces for questions and discussions, directly addressing concerns about funeral rites, medical protocols, and donor eligibility.

Donation awareness must be instilled in schools and colleges from a young age. By integrating organ donation education into the life sciences and ethics curriculum, we can nurture a culture of giving. Peer-to-peer education empowers students to take ownership of the message, fostering empathy and debunking myths through relatable storytelling.

Health-care professionals themselves must also become champions of organ donation. Regular training sessions can equip physicians, nurses and other health-care staff with the knowledge and the skills to initiate compassionate conversations with families of potential donors. At Apollo Hospitals, we have dedicated transplant coordination teams who guide families through the complex decision-making process with sensitivity and clarity.

Steps to ensure public confidence

I strongly believe that India needs a collective national will to bridge the massive gap between organ supply and demand. The push given to organ donation on this day must be sustained going forward through policy reforms and grass-roots engagement. One promising policy proposal is presumed consent, adopted in countries in Europe such as Spain and Croatia, with significant success. Under this system, every adult is considered an organ donor unless they register an objection. Alongside presumed consent, robust family support systems and grievance redress mechanisms are vital to ensure public confidence and ethical oversight.

Organ donation is not just a medical procedure. It is a profound act of charity. And to donate one's organs so that others may live is perhaps the noblest legacy one can leave.

The time to act is now. Every eligible adult must register as a donor, and every family must pledge to respect their decision. For patients with end-stage disease where an organ transplant is the only treatment, organ donation is a lifeline. By busting myths and with an unwavering commitment, we can ensure that no Indian loses their life for want of an organ. Today, on World Organ Donation Day (August 13 every year), let us all pledge to embrace this cause as a shared responsibility.

Justice and equality

Justice and equality

Those most in need of organ transplantation should not be denied it

When decisions are based on the principle of natural justice, they serve a particular social purpose or aim to right a specific wrong. The National Organ and Tissue Transplant Organization's (NOTTO) recent advisory, stating that women patients and relatives of deceased donors awaiting transplants will get priority as beneficiaries, walks the path of rewriting a gender trope. There is a gender skew as NOTTO's decadal data (2013-23) indicates. As per NOTTO, in 2023, women constituted 63% of all living donor transplants, and yet they comprised between 24% (for heart) and 47% (lung) as beneficiaries of organs for transplantation. In kidney transplants, women were only 37% of the beneficiaries in 2023, while for liver, women's share was 30%. For pancreas transplant, women totalled up to 26% of total beneficiaries. Analysis in the *British Medical Journal* showed that in the past five years, women contributed to 36,038 of the 56,509 living organ donations in India, and benefited from transplantation in only 17,041 cases. NOTTO, in its advisory, said the recommendation was an attempt to address the gender imbalance among organ transplant recipients; to make provisions for additional points in the allocation criteria for women patients in the waiting.

While certainly laudable in what it sets out to do, this move could well be beset with procedural hassles. Currently, organ allotment protocols do not allow for prioritising any one recipient over another, except on grounds of health. There are, therefore, no provisions to prioritise women and/or near relatives of previous donors. Since the NOTTO advisory, questions have also been raised about whom the definition of 'near relatives' should include, and if all families involved in donating cadaveric organs for transplantation (since 1995) would be considered beneficiaries. The primary fear among implementers seems to be that this might become another backdoor way to facilitate out-of-turn allotments, particularly as organ harvesting rackets continue to be busted in India. However, it makes little sense to throw the baby out with the bathwater, particularly when operating with the intent to be more inclusive, in a society shaped by patriarchal norms. It is crucial that NOTTO makes this a participative process, taking along various agencies involved in implementation. While it is important to ensure proper implementation under the Transplantation of Human Organs Act, and widen access to the limited pool of organs, above all, it is imperative that the principle of not denying anyone whose need for an organ is the greatest, based on health parameters, is always adhered to.

Key Takeaways from the Article

Organ Transplantation in India

- Recognised as a medical breakthrough for terminal organ failure.
- Over **5 lakh lives lost annually** in India due to the lack of suitable donor organs.
- Transplants increased from **4,990 (2013)** to **18,378 (2023).**
- Only **1,099 deceased organ donors** in 2023.
- Organ donation rate in India: **0.8 per million population** (vs. **>45 in Spain & USA).**

Barriers to Organ Donation

- **Myths & Misconceptions:**
  - Fear of disfigurement and disruption of funeral rites.
  - Misbelief that organ donation violates religious traditions (fact: all major religions support it as an act of compassion).
  - Fear of premature declaration of brain death to harvest organs.
  - Misunderstanding that only young accident victims can donate.

- **Reality:**
  - Organ retrieval preserves body appearance.
  - Brain death declaration follows strict **Transplantation of Human Organs and Tissues Act, 1994** protocols – multidisciplinary verification, repeated assessments, and legal documentation.
  - Older donors and natural deaths can also yield viable organs and tissues (e.g., kidneys, liver segments, corneas, skin, heart valves).
- **Awareness and Education Strategies**
  - Audio-visual & social media campaigns using **real donor families & recipients.**
  - **Community workshops** with counsellors to address cultural and emotional concerns.
  - Integration of organ donation awareness into **school & college curricula** (life sciences, ethics).
  - Training healthcare professionals to counsel grieving families.
  - Dedicated hospital-based **transplant coordination teams** for guidance.
- **Policy Recommendations**
  - **Presumed consent system** (opt-out model) as in Spain & Croatia – every adult considered a donor unless they opt out.
  - **Robust family support** & grievance redress systems to ensure trust.
  - Continuous public engagement beyond symbolic days like **World Organ Donation Day (13 August).**

Way Forward

- **Legislative Reform**
  - Consider **presumed consent** with safeguards to maintain ethical integrity and family trust.
- **Mass Awareness & Myth-Busting**
  - Sustained national multimedia campaigns featuring real success stories, religious endorsements, and medical clarity.
- **Education from a Young Age**
  - Mandatory inclusion of organ donation ethics & science in school and university curricula.
- **Healthcare System Strengthening**
  - Expand trained transplant coordinators, standardised brain death protocols, and counselling services in hospitals.
- **Building Public Confidence**
  - Transparent monitoring, legal oversight, and prompt grievance redress mechanisms to ensure trust in the system.

Principle of Natural Justice

- Decisions should serve a social purpose or correct a specific wrong.
- Recent NOTTO advisory prioritises women patients and relatives of deceased donors for organ transplants — an attempt to correct the gender imbalance.

Gender Skew in Organ Transplant Data (2013–2023)

- **Living donor transplants (2023):** Women made up 63% of donors.
  - **Recipients:**
    - Heart: **24%** women
    - Lung: **47%** women
    - Kidney: **37%** women
    - Liver: **30%** women
    - Pancreas: **26%** women
- **BMJ Analysis (past 5 years):**
  - Women contributed **36,038** of 56,509 living donations.
  - Women received only **17,041** transplants in the same period.
- **NOTTO's Aim**
  - Address gender imbalance among recipients.
  - Add extra points in allocation criteria for women patients on the waiting list.
- **Procedural Challenges**
  - Current protocols allow prioritisation only based on medical urgency/health.
  - No provision yet to prioritise by gender or relation to past donors.
  - Questions raised:
  - Who qualifies as 'near relatives'?
  - Should all families who donated since 1995 be included?
- **Concerns**
  - Risk of backdoor, out-of-turn allotments.
  - Ongoing threat of organ trafficking and rackets in India.
- Gender inclusivity is important, especially in patriarchal contexts.
- Avoid discarding reforms due to procedural fears ("don't throw the baby out with the bathwater").
- Ensure a **participative process** involving all implementing agencies.
- Proper enforcement under the Transplantation of Human Organs Act.
- Main principle: **No one in greatest medical need should be denied,** regardless of gender, while also expanding access to the limited organ pool.

Before tackling stray dogs issue, India must count them properly

Syllabus :

GS Paper II – Governance, Polity & Social Justice
GS Paper III – Environment, Ecology & Biodiversity

Before tackling stray dogs issue, India must count them properly

Current policies about stray dogs are being framed based on estimates using outdated censuses

DATA POINT

Devyanshi Bihani
Vignesh Radhakrishnan

On August 11, the Supreme Court directed the Delhi government and local bodies to immediately capture stray dogs and put them in shelters. The Court was hearing a suo motu case on the increasing instances of stray dog attacks on children, including infants. The Court said, "Not a single dog picked up shall be released back on the streets/public spaces."

The order has divided public opinion. While some people agree with it given the extent of the problem of dog bites, others have questioned the effectiveness of simply relocating dogs to shelters, pointing out that Delhi lacks shelters to keep so many dogs.

Whether or not India has a stray dog problem, it certainly has a dog-counting problem. Getting that right could be key to making any policy, whether it is confining dogs or vaccinating them, effective.

The most recent nationwide stray dog count is the Livestock Census of 2019. In fact, reports show that the Delhi-specific dog census was conducted even earlier, in 2016. So, in 2025, policies are being framed using estimates of the dog population based on an outdated censuses. More importantly, an analysis of the 2019 Census itself raises several questions.

Take the case of Tamil Nadu. In 2019, there were 4.4 lakh stray dogs in the State. In the same year, according to data from the Integrated Disease Surveillance Platform, Tamil Nadu recorded 8.3 lakh dog bites **(Chart 1)**. In other words, that year, there were two dog bites for every stray dog in the State. Even allowing for the possibility of the same dog biting multiple people, the number of dog bites remains staggeringly high compared to the estimated dog population. In the case of Manipur, the 2019 Livestock Census recorded no stray dogs in the State. That data point alone is hard to fathom. Yet, that same year, Manipur reported around 5,500 dog bite cases. In Odisha, there were 17.3 lakh dogs in 2019. Odisha housed the second highest number of dogs among all the States. Yet, there were only 1.7 lakh bites that year in Odisha.

If the data is correct, then States such as Tamil Nadu – which suffer "severely" from dog bites with nearly 1,900 bites for every 1,000 dogs, as shown in **Chart 2** – could learn from States such as Odisha, which report only about 100 bites per 1,000 dogs. Such knowledge-sharing could help address the crisis. The fact that this has not happened clearly points to a data mismatch rather than ground reality. Since all dog bites will be reported by the victims due to fear of rabies, and since hospitals are required to record these cases, the data mismatch likely lies in dog population figures.

With the World Health Organization (WHO) estimating that 99% of human rabies cases are caused by the bite of infected dogs, India's National Action Plan for Dog-Mediated Rabies Elimination by 2030 had proposed strategic mass dog vaccination as the way forward in 2018. The plan had stated that vaccinating 70% of dogs and sustaining the effort for three years can eliminate rabies. The WHO also recognises this as a cost-effective strategy.

Evidence from a data-driven rabies elimination programme in Goa, published in the journal *Nature*, showed that vaccinating 70% of the State's dogs eliminated human rabies cases by 2019 and reduced monthly canine rabies cases by 92% **(Chart 3)**.

In fact, Goa recorded the highest number of dog bites per capita in 2019. As can be seen from **Chart 4**, there were 1,412 dog bites for every 1 lakh people in Goa in 2019, the highest among all the States.

The measure of the problem

The data for the charts were sourced from the Livestock Census-2019, the Department of Animal Husbandry and Dairying and the Ministry of Health and Family Welfare. Some of the datasets were accessed through Dataful developed by Factly

Chart 1: Number of dog bites and stray dogs in each State in 2019

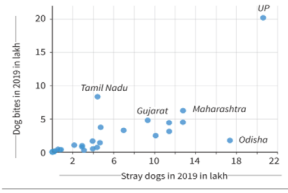


Chart 4: Number of stray dogs and dog bites for every 1 lakh people in each State in 2019

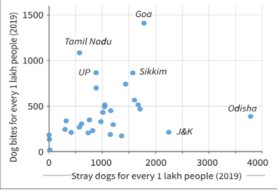


Chart 2: Number of dog bites for every 1,000 stray dogs in each State in 2019

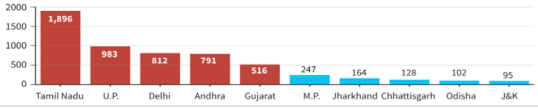
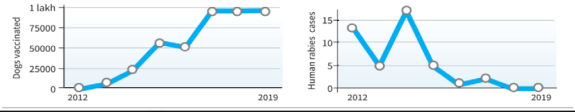


Chart 3: Results from a data-driven rabies elimination programme in Goa show that vaccinating dogs helps reduce human rabies cases



Dogs and laws

Dogs and laws

Urban local bodies need funding for shelters and sterilisation drives

The August 11 Supreme Court order represents the most forceful judicial intervention yet on the matter of free-roaming dogs. By directing Delhi and its satellites to collect every street dog within eight weeks, confine them permanently in pounds, and expand shelter capacity at speed, the Court has signalled its willingness to override administrative lethargy. Delhi records roughly 30,000 dog bite cases a year and rabies still kills poor urban residents with patchy access to post-exposure prophylaxis. The Court's blunt instrument conflicts with the Animal Birth Control Rules 2023, specifically its doctrine of "capture, neuter, vaccinate, release", and which forbid municipalities from permanently relocating healthy dogs or impounding them for long periods except if a dog is rabid, incurably ill or found to be dangerously aggressive by a veterinarian. The Rules have failed the test of numbers, however. Urban dog populations have continued to swell despite sporadic sterilisation drives because 70% coverage, below which reproduction rebounds, has almost nowhere been reached. The prescription to return dogs to their territories has entrenched packs in the same high-density neighbourhoods where children play and garbage accumulates. The Rules also block municipalities from exploring alternative strategies such as long-term impoundment. Now, if the Rules are intact, municipal officers who confine dogs could be prosecuted; if they obey the Rules, they risk contempt of court.

Policymakers should treat this conflict as an opportunity to confront an outdated legal setup. The Prevention of Cruelty to Animals Act 1960 was enacted when India's urban footprint was modest. Today's conurbations with dense informal settlements cannot afford such dog populations. Entrenched ideological positions that romanticise "community dogs" and regard confinement as oppression take insufficient account of the dense human ecology. A modern statute should clearly distinguish between sociable dogs that can find homes; aggressive or chronically ill dogs that require euthanasia; and the large residual category that can live in proper shelters – but none on public roads. Cities should impose duties on municipalities, specify minimum staffing and veterinary standards for pounds, and tie fiscal transfers to reductions in morbidity. Urban local bodies also need steady funding, perhaps under the National Centre for Disease Control, to bankroll the construction and operation of shelters and to fund large-scale sterilisation teams. Veterinary education councils should integrate shelter medicine into curricula to ensure a workforce exists to staff new facilities. Without such support, Delhi risks swapping its dog menace with underfunded canine slammers at the city's edge, invisible but also cruel.

Key Takeaways from the Article

Supreme Court Order (Aug 11, 2025)

- Directs Delhi & NCR cities to collect **all street dogs** within **8 weeks,** keep them permanently in shelters, and rapidly expand shelter capacity.
- Aims to tackle **30,000 dog bite cases annually in Delhi** and reduce **rabies fatalities** (especially among poor residents with limited access to post-exposure prophylaxis).

Conflict with Animal Birth Control (ABC) Rules, 2023

- ABC Rules follow **"Capture–Neuter–Vaccinate–Release" (CNVR)** approach.
- Forbid long-term confinement unless the dog is rabid, incurably ill, or proven dangerously aggressive.
- Supreme Court's order contradicts this, creating legal risk:
- Obeying the Court → violates ABC Rules (risk of prosecution).
- Obeying ABC Rules → violates Court order (risk of contempt).

Effectiveness Issues with ABC Rules

- Sterilisation coverage has rarely reached the **70% threshold** needed to control population.
- Returning dogs to their territories entrenches packs in high-density urban zones, increasing human–dog conflict.

Need for Legal and Policy Reform

- **Prevention of Cruelty to Animals Act, 1960** is outdated; made when India's urban footprint was small.
- Present urban ecology with dense informal settlements is incompatible with free-roaming dog populations.
- Ideological resistance to confinement ignores public safety in crowded areas.

Proposed Framework in the Article

- Classify dogs into:
  - **Adoptable dogs** – sociable, can be rehomed.
  - **Euthanasia cases** – aggressive or chronically ill.
  - **Shelter category** – large residual population housed in proper facilities.
- **Municipal obligations:**
  - Minimum staffing and veterinary care in shelters.
  - Tie funding to measurable reductions in bite incidents & rabies cases.
- **Funding mechanism:**
  - Dedicated budget under **National Centre for Disease Control (NCDC)** for shelters and sterilisation drives.
- **Veterinary reforms:**
  - Include **shelter medicine** in veterinary curricula to ensure skilled workforce for pounds and sterilisation units.

Risks if Not Properly Funded

- Poorly funded shelters could become overcrowded, inhumane facilities at city peripheries — solving visibility, but not cruelty.

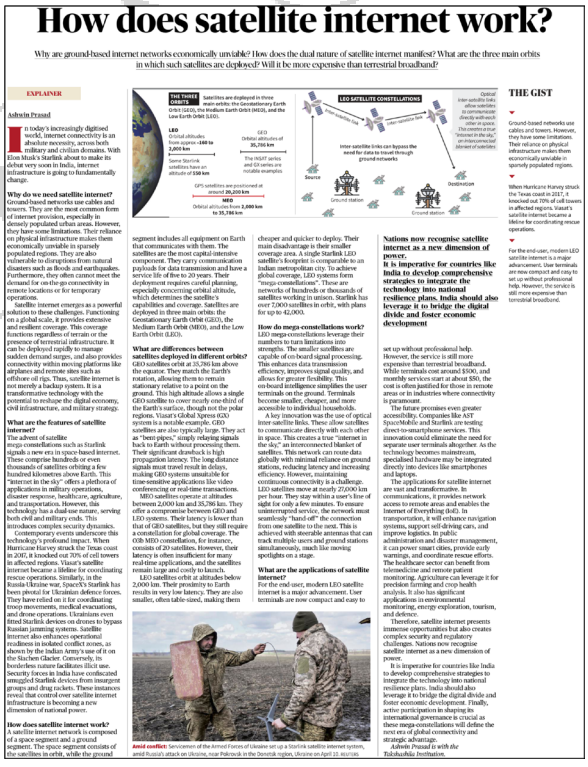
Way Forward

- Legislative Overhaul
  - Amend the **Prevention of Cruelty to Animals Act, 1960** to reflect modern urban realities and public health priorities.
- **Integrated Policy Framework**
  - Harmonise **ABC Rules** with judicial directives; allow flexibility for cities to adopt permanent shelter models with proper safeguards.
- **Sustainable Funding**
  - Create a **central funding window under NCDC** for shelter infrastructure, sterilisation drives, and rabies vaccination campaigns.
- **Capacity Building**
  - Train and deploy **specialised veterinary teams;** integrate shelter medicine in veterinary education to ensure humane, scientific handling.
- **Public Health Linkage**
  - Treat dog population control as a **public health mission,** tying municipal performance metrics to reductions in dog bites and rabies incidence.

How does satellite internet work?

Syllabus :

GS Paper III – Science & Technology Developments in science and technology and their applications and effects in everyday life



How does satellite internet work?

Why are ground-based internet networks economically unviable? How does the dual nature of satellite internet manifest? What are the three main orbits in which such satellites are deployed? Will it be more expensive than terrestrial broadband?

EXPLAINER

Ashwin Prasad

In today's increasingly digitised world, internet connectivity is an absolute necessity, across both military and civilian domains. With Elon Musk's Starlink about to make its debut very soon in India, internet infrastructure is going to fundamentally change.

Why do we need satellite internet?

Ground-based networks use cables and towers. They are the most common form of internet provision, especially in densely populated urban areas. However, they have some limitations. Their reliance on physical infrastructure makes them economically unviable in sparsely populated regions. They are also vulnerable to disruptions from natural disasters such as floods and earthquakes. Furthermore, they often cannot meet the demand for on-the-go connectivity in remote locations or for temporary operations.

Satellite internet emerges as a powerful solution to these challenges. Functioning on a global scale, it provides extensive and resilient coverage. This coverage functions regardless of terrain or the presence of terrestrial infrastructure. It can be deployed rapidly to manage sudden demand surges, and also provides connectivity within moving platforms like airplanes and remote sites such as offshore oil rigs. Thus, satellite internet is not merely a backup system. It is a transformative technology with the potential to reshape the digital economy, civil infrastructure, and military strategy.

What are the features of satellite internet?

The advent of satellite mega-constellations such as Starlink signals a new era in space-based internet. These comprise hundreds or even thousands of satellites orbiting a few hundred kilometres above Earth. This "internet in the sky" offers a plethora of applications in military operations, disaster response, healthcare, agriculture, and transportation. However, this technology has a dual-use nature, serving both civil and military ends. This introduces complex security dynamics.

Contemporary events underscore this technology's profound impact. When Hurricane Harvey struck the Texas coast in 2017, it knocked out 70% of cell towers in affected regions. Viasat's satellite internet became a lifeline for coordinating rescue operations. Similarly, in the Russia-Ukraine war, SpaceX's Starlink has been pivotal for Ukrainian defence forces. They have relied on it for coordinating troop movements, medical evacuations, and drone operations. Ukrainians even fitted Starlink devices on drones to bypass Russian jamming systems. Satellite internet also enhances operational readiness in isolated conflict zones, as shown by the Indian Army's use of it on the Siachen Glacier. Conversely, its borderless nature facilitates illicit use. Security forces in India have confiscated smuggled Starlink devices from insurgent groups and drug rackets. These instances reveal that control over satellite internet infrastructure is becoming a new dimension of national power.

How does satellite internet work?

A satellite internet network is composed of a space segment and a ground segment. The space segment consists of the satellites in orbit, while the ground segment includes all equipment on Earth that communicates with them. The satellites are the most capital-intensive component. They carry communication payloads for data transmission and have a service life of five to 20 years. Their deployment requires careful planning, especially concerning orbital altitude, which determines the satellite's capabilities and coverage. Satellites are deployed in three main orbits: the Geostationary Earth Orbit (GEO), the Medium Earth Orbit (MEO), and the Low Earth Orbit (LEO).

What are differences between satellites deployed in different orbits?

GEO satellites orbit at 35,786 km above the equator. They match the Earth's rotation, allowing them to remain stationary relative to a point on the ground. This high altitude allows a single GEO satellite to cover nearly one-third of the Earth's surface, though not the polar regions. Viasat's Global Xpress (GX) system is a notable example. GEO satellites are also typically large. They act as "bent pipes," simply relaying signals back to Earth without processing them. Their significant drawback is high propagation latency. The long distance signals must travel result in delays, making GEO systems unsuitable for time-sensitive applications like video conferencing or real-time transactions.

MEO satellites operate at altitudes between 2,000 km and 35,786 km. They offer a compromise between GEO and LEO systems. Their latency is lower than that of GEO satellites, but they still require a constellation for global coverage. The O3b MEO constellation, for instance, consists of 20 satellites. However, their latency is often insufficient for many real-time applications, and the satellites remain large and costly to launch.

LEO satellites orbit at altitudes below 2,000 km. Their proximity to Earth results in very low latency. They are also smaller, often table-sized, making them cheaper and quicker to deploy. Their main disadvantage is their smaller coverage area. A single Starlink LEO satellite's footprint is comparable to an Indian metropolitan city. To achieve global coverage, LEO systems form "mega-constellations". These are networks of hundreds or thousands of satellites working in unison. Starlink has over 7,000 satellites in orbit, with plans for up to 42,000.

How do mega-constellations work?

LEO mega-constellations leverage their numbers to turn limitations into strengths. The smaller satellites are capable of on-board signal processing. This enhances data transmission efficiency, improves signal quality, and allows for greater flexibility. This on-board intelligence simplifies the user terminals on the ground. Terminals become smaller, cheaper, and more accessible to individual households.

A key innovation was the use of optical inter-satellite links. These allow satellites to communicate directly with each other in space. This creates a true "internet in the sky," an interconnected blanket of satellites. This network can route data globally with minimal reliance on ground stations, reducing latency and increasing efficiency. However, maintaining continuous connectivity is a challenge. LEO satellites move at nearly 27,000 km per hour. They stay within a user's line of sight for only a few minutes. To ensure uninterrupted service, the network must seamlessly "hand-off" the connection from one satellite to the next. This is achieved with steerable antennas that can track multiple users and ground stations simultaneously, much like moving spotlights on a stage.

What are the applications of satellite internet?

For the end-user, modern LEO satellite internet is a major advancement. User terminals are now compact and easy to set up without professional help. However, the service is still more expensive than terrestrial broadband. While terminals cost around $500, and monthly services start at about $50, the cost is often justified for those in remote areas or in industries where connectivity is paramount.

The future promises even greater accessibility. Companies like AST SpaceMobile and Starlink are testing direct-to-smartphone services. This innovation could eliminate the need for separate user terminals altogether. As the technology becomes mainstream, specialised hardware may be integrated directly into devices like smartphones and laptops.

The applications for satellite internet are vast and transformative. In communications, it provides network access to remote areas and enables the Internet of Everything (IoE). In transportation, it will enhance navigation systems, support self-driving cars, and improve logistics. In public administration and disaster management, it can power smart cities, provide early warnings, and coordinate rescue efforts. The healthcare sector can benefit from telemedicine and remote patient monitoring. Agriculture can leverage it for precision farming and crop health analysis. It also has significant applications in environmental monitoring, energy exploration, tourism, and defence.

Therefore, satellite internet presents immense opportunities but also creates complex security and regulatory challenges. Nations now recognise satellite internet as a new dimension of power.

It is imperative for countries like India to develop comprehensive strategies to integrate the technology into national resilience plans. India should also leverage it to bridge the digital divide and foster economic development. Finally, active participation in shaping its international governance is crucial as these mega-constellations will define the next era of global connectivity and strategic advantage.

Ashwin Prasad is with the Takshashila Institution.

Nations now recognise satellite internet as a new dimension of power.

It is imperative for countries like India to develop comprehensive strategies to integrate the technology into national resilience plans. India should also leverage it to bridge the digital divide and foster economic development

THE GIST

- Ground-based networks use cables and towers. However, they have some limitations. Their reliance on physical infrastructure makes them economically unviable in sparsely populated regions.
- When Hurricane Harvey struck the Texas coast in 2017, it knocked out 70% of cell towers in affected regions. Viasat's satellite internet became a lifeline for coordinating rescue operations.
- For the end-user, modern LEO satellite internet is a major advancement. User terminals are now compact and easy to set up without professional help. However, the service is still more expensive than terrestrial broadband.

Key Takeaways from the Article

Why Satellite Internet?

- Ground networks use **cables & towers,** viable in dense urban areas but **economically unviable** in sparsely populated/remote areas.
- Vulnerable to **natural disasters** (floods, earthquakes).
- Limited in **on-the-move** or temporary locations (airplanes, ships, remote sites).
- Satellite internet offers **global coverage,** rapid deployment, resilience, and suitability for disaster zones & defence use.

Dual-Use Nature

- **Civilian:** Disaster relief (e.g., Hurricane Harvey – Viasat), healthcare, agriculture, transport.
- **Military:** Ukraine war – Starlink for troop coordination, drone operations, medical evacuation; Indian Army at Siachen.
- **Illicit use:** Smuggled Starlink devices found with insurgents & drug networks in India.

How it Works

- **Space Segment** – satellites in orbit (service life: 5–20 years, costly to deploy).
- **Ground Segment** – user terminals, antennas, and stations communicating with satellites.
- Uses **communication payloads** to transmit data.
- Deployment choice depends on orbit altitude → affects latency, coverage, and cost

Three Main Orbits

- **GEO (Geostationary Earth Orbit)** – 35,786 km altitude, stationary relative to Earth, large coverage (~1/3 of Earth), high latency, unsuitable for real-time use.

  Example: Viasat GX.
- **MEO (Medium Earth Orbit)** – 2,000– 35,786 km altitude, moderate latency, requires constellations. Example: O3b network.
- **LEO (Low Earth Orbit)** – <2,000 km altitude, very low latency, small coverage per satellite, requires mega-constellations.

  Example: Starlink (7,000+ satellites, planned 42,000).

Costs

- Currently **more expensive than terrestrial broadband.** Hardware ~$500, service ~$50/month.
- Costs justified in remote/critical connectivity areas; prices expected to fall with wider adoption.

Future Trends

- Direct-to-smartphone connectivity (Starlink, AST SpaceMobile trials).
- Integration into smart devices without separate terminals.

Applications

- Remote connectivity, Internet of Everything (IoE).
- Disaster management, smart cities, telemedicine, precision agriculture.
- Navigation & logistics for transportation.
- Environmental monitoring, tourism, defence, and strategic communication.

National Security & Governance Implications

- Satellite internet = **strategic asset** in warfare and disaster resilience.
- Borderless nature challenges state regulation.
- India must frame **regulatory, security, and strategic policies** and engage in **global governance frameworks** for space-based internet.

Way Forward

- **National Satellite Internet Policy**
  - Integrate with **Digital India and BharatNet** to bridge the rural–urban connectivity gap.
- **Security Protocols**
  - Regulate imports & use of foreign satellite internet kits; develop indigenous alternatives.
- **International Engagement**
  - Actively participate in framing global norms for megaconstellations and spectrum allocation.
- Public–Private Collaboration
  - Partner with ISRO, IN-SPACe, and private players to develop cost-effective LEO constellations.
- **Affordability & Access**
  - Subsidise costs for remote areas; integrate with emergency services & disaster management systems.

ICMR set to monitor wastewater for 10 viruses in 50 cities

Syllabus :

GS Paper II – Governance, Health & Social Justice

ICMR set to monitor wastewater for 10 viruses in 50 cities

Bindu Shajan Perappadan
NEW DELHI

The Indian Council of Medical Research (ICMR) will initiate wastewater surveillance for 10 viruses across 50 cities, a major jump from the five cities that are currently monitored. The move is aimed at identifying any increase in virus growth trend at the earliest, ICMR head Rajiv Bahl has said.

"The next six months will see the scaling up of surveillance across India which will enable us to pick up any rise in virus load in the community. Currently, the COVID-19 virus and polio virus are under surveillance," explained Dr. Bahl.

The ICMR is involved in establishing environmental surveillance for viruses, including avian influenza virus (AIV), by monitoring surface water and wastewater, particularly in areas with outbreaks, to establish an early warning system.

India also has a robust surveillance system for influenza-like illness (ILI) and severe acute respiratory illness (SARI).

Scaling up surveillance can help identify any increase in viral load in wastewater.

Dr. Bahl added that antimicrobial resistance (AMR) surveillance is already being conducted at several hospitals across the country.

"AMR is the ability of microorganisms – bacteria, viruses, fungi, and parasites to evolve and resist the effects of medications designed to kill or inhibit their growth. This resistance renders treatments ineffective, leading to longer periods of illnesses, higher costs, and increased mortality," said Dr. Bahl.

UPSC CSE 2025

Q. Consider the following statements:
I. No virus can survive in ocean waters.
II. No virus can infect bacteria.
III. No virus can change the cellular transcriptional activity in host cells.
How many of the statements given above are correct?
[A] Only one
[B] Only two
[C] All the three
[D] None

Key Takeaways from the Article

Expansion of Wastewater Surveillance

- **ICMR** to monitor **10 viruses** in **50 cities** (currently in 5 cities).
- Aim: **Early detection** of rising viral load in communities.
- **Timeframe:** Expansion planned over next 6 **months**.

Current Scope

- Monitoring **COVID-19** virus and **Polio virus** in wastewater.
- Surveillance to include other viruses, including **Avian Influenza Virus (AIV).**
- Focus: Surface water & wastewater monitoring in outbreak-prone areas.
- **Purpose & Benefits**
  - Early warning system to detect viral spread before clinical cases spike.
  - Supports public health preparedness and targeted interventions.
- **Existing Surveillance Framework**
  - India already tracks **Influenza-like Illness (ILI) & Severe Acute Respiratory Illness (SARI).**
  - **Environmental surveillance** complements clinical surveillance.
- **Antimicrobial Resistance (AMR) Surveillance**
  - Already operational at several hospitals nationwide.
  - **AMR** = microorganisms evolve to resist medicines → ineffective treatments, prolonged illness, higher costs, increased mortality.
- AMR is a major global health threat flagged by **WHO.**

Way Forward

- **Integrated National Surveillance Grid**
  - Link wastewater data with hospital ILI/SARI reporting for comprehensive disease monitoring.
- **Data-Driven Public Health Response**
  - Use trends from wastewater viral load to trigger rapid containment, vaccination drives, or travel advisories.

- **AMR Mitigation Strategy**
  - Strengthen antibiotic stewardship, regulate over-the-counter antibiotic sales, and promote infection prevention measures.
- **Capacity Building**
  - Equip municipal bodies with labs & trained personnel for routine wastewater testing.
- **Global Collaboration**
  - Share surveillance data with **WHO's Global Influenza Surveillance and Response System** to detect transboundary health threats early.