



## Space Debris

**For Prelims:** Space debris, Kessler Syndrome, Project NETRA, European Space Agency (ESA), Inter-Agency Space Debris Coordination Committee (IADC), Peaceful Uses of Outer Space.

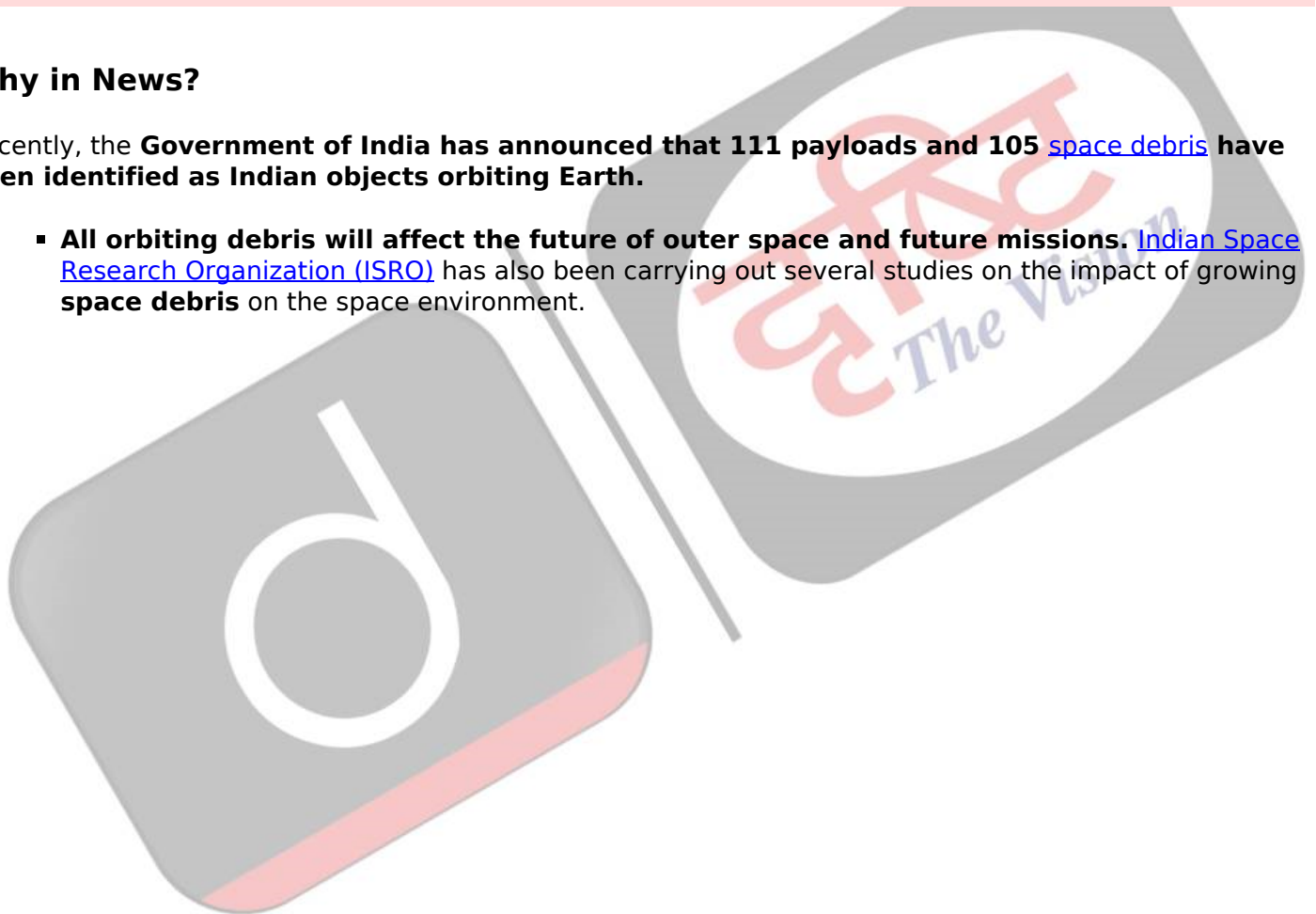
**For Mains:** Potential Hazard related to Space Debris, Initiatives to Curb Space Debris.

### Why in News?

Recently, the **Government of India has announced that 111 payloads and 105 [space debris](#) have been identified as Indian objects orbiting Earth.**

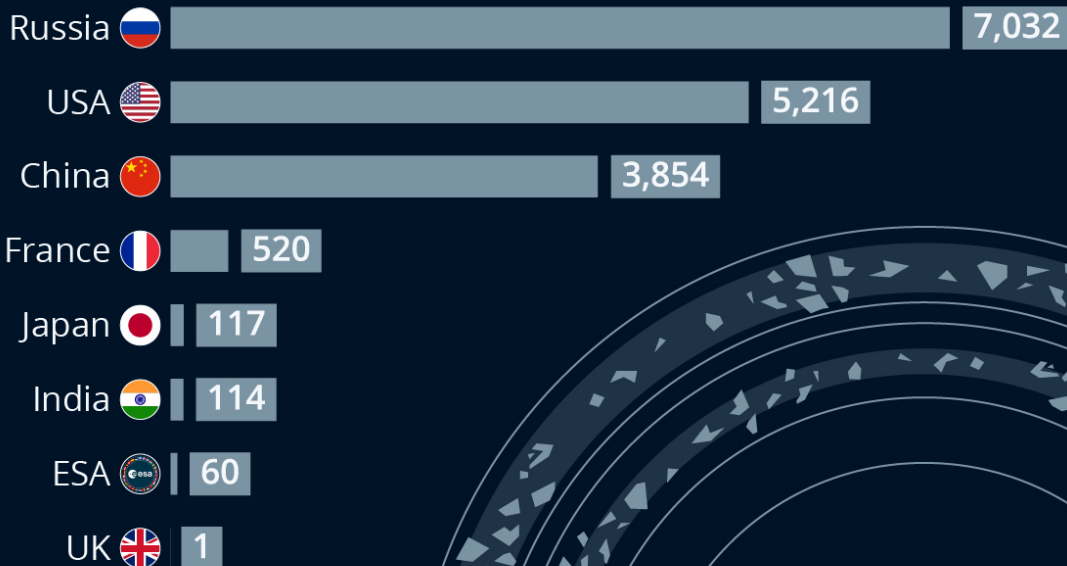
- **All orbiting debris will affect the future of outer space and future missions.** [Indian Space Research Organization \(ISRO\)](#) has also been carrying out several studies on the impact of growing **space debris** on the space environment.

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# Who's Responsible for Space Junk?

Number of spent rocket bodies and other pieces of debris



\* as of 4 Feb 2022

## What is Space Debris?

- **About:**
  - **Space debris** refers to **man-made objects in Earth's orbit** that no longer serve a useful purpose.
    - This includes **defunct satellites, spent rocket stages, and fragments of debris** from collisions or other events.
- **Potential Hazard:**
  - **Threat for Operational Satellites:**
    - The floating space debris is a **potential hazard for operational satellites** and colliding with them can leave the **satellites dysfunctional**.
      - This **overpopulation of space with objects and debris** is referred to as **[Kessler Syndrome](#)**.
  - **Reduction of Orbital Slots:**
    - The accumulation of space debris in specific orbital regions can **limit the availability of desirable orbital slots** for future missions.
  - **Space Situational Awareness:**
    - The **increasing amount of space debris makes it more challenging for satellite operators** and space agencies to accurately track and predict the orbits of objects in space.
- **Initiatives to Curb Space Debris:**
  - **India:**
    - In 2022, **ISRO set up the System for Safe and Sustainable Operations Management (IS 4 OM)** to continually monitor objects posing collision threats, predict the evolution of space debris, and mitigate the risk posed by space debris.
      - **ISRO also carried out 21 collision avoidance manoeuvres of Indian**

**operational space assets in 2022** to avoid collisions with other space objects.

- ISRO has also set up a **Centre for Space Debris Research** to **monitor and mitigate the threat** of space debris.
- **'Project NETRA'** is also an **early warning system** in space to detect debris and other hazards to Indian satellites.
- **Global:**
  - The **Inter-Agency Space Debris Coordination Committee (IADC)**, an international governmental forum, was established in 1993 **to coordinate efforts between spacefaring nations** to address the issue of space debris.
  - The **United Nations** has established the Committee on the **Peaceful Uses of Outer Space (COPUOS)** to develop guidelines for the **long-term sustainability of outer space activities**, including the mitigation of space debris.
  - The **European Space Agency (ESA)** has launched the **Clean Space initiative**, aimed at reducing the amount of space debris and promoting sustainable space activities.

## Way Forward

- **Improved Tracking and Monitoring:** Improving the **ability to track and monitor space debris** can help mitigate the risks it poses to operational satellites and human space missions.
- **Reusable Launch Vehicles:** Using **reusable launch vehicles** instead of single-use rockets can help reduce the number of new debris generated from launches.
- **Materials and Design improvements:** Using **more durable materials** and **designing satellites for eventual de-orbiting** can reduce the number of debris generated in the long term.

## UPSC Civil Services Examination, Previous Year Question (PYQ)

### Prelims

**Q.1 In the context of space technology, what is “Bhuvan”, recently in the news? (2010)**

- (a) A mini satellite launched by ISRO for promoting the distance education in India
- (b) The name given to the next Moon Impact Probe, for Chandrayaan-II
- (c) A geoportal of ISRO with 3D imaging capabilities of India
- (d) A space telescope developed by India

**Ans: (c)**

### Mains

**Q.1** What is India's plan to have its own space station and how will it benefit our space programme? **(2019)**

**Q.2** Discuss India's achievements in the field of Space Science and Technology. How the application of this technology helped India in its socio-economic development? **(2016)**

**Source: PIB**

