SPACE SUSTAINABILITY

PRESERVING THE USABILITY OF OUTER SPACE

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Space holds vast benefits to humanity that we leverage through satellites.

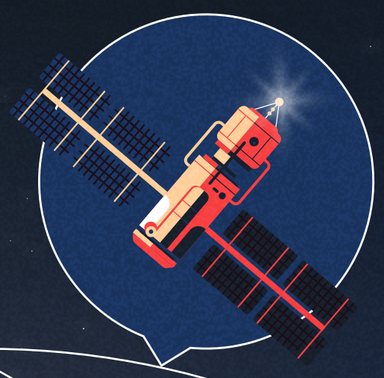
However, the orbits in which satellites travel constitute a limited natural resource because there is a finite amount of space becoming increasingly crowded with satellites and space junk.

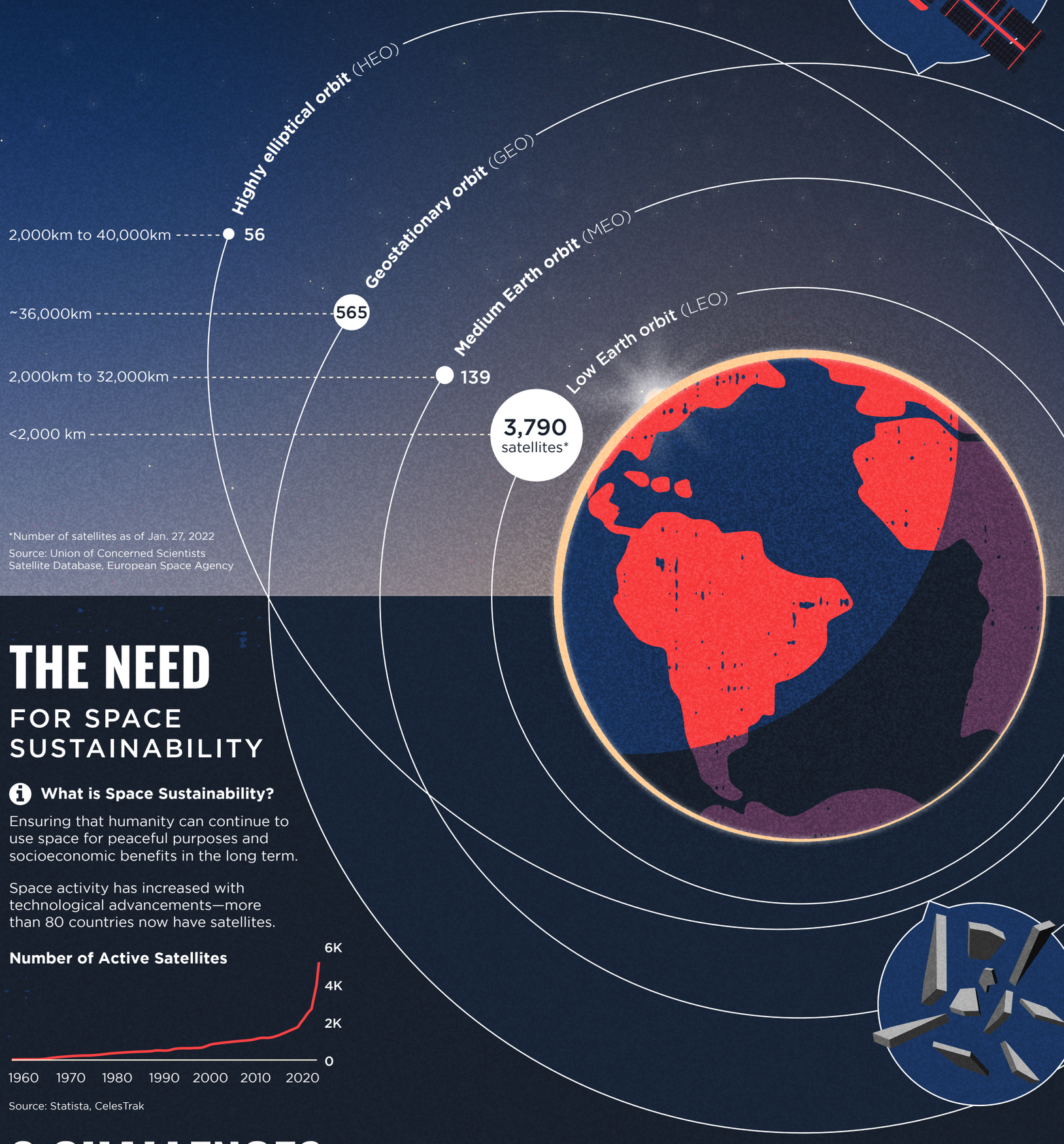
Managing this resource for the future requires the world to look towards sustainable management of space through policy and technical capacity.

HOW WE USE SPACE

SATELLITES AND THEIR ORBITS

Thousands of satellites orbit the Earth at different altitudes, enabling many of the technologies we use on a daily basis.





*Number of satellites as of Jan. 27, 2022

Source: Union of Concerned Scientists Satellite Database, European Space Agency

As of Jan. 2022, there were 4,550 operational satellites in space, with several applications:

- Science and exploration
- Environmental monitoring
- Military surveillance
- Navigation
- Research and development
- Disaster management
- In-orbit satellite servicing
- Missile warning systems
- Satellite broadband

THE NEED

FOR SPACE SUSTAINABILITY

What is Space Sustainability?

Ensuring that humanity can continue to use space for peaceful purposes and socioeconomic benefits in the long term.

Space activity has increased with technological advancements—more than 80 countries now have satellites.

Number of Active Satellites

Source: Statista, CelesTrak

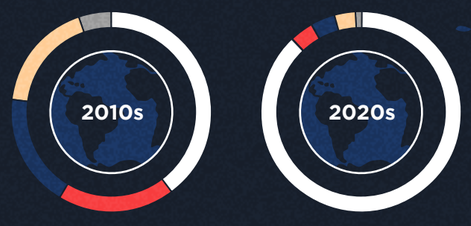
Who is Active in Space?

Space is a global resource where activities by one actor can affect all others who use space.

The rapid increase in the number of satellites, driven by the commercial sector, poses challenges for the future of space activities.

Share of Satellites by Sector and Decade

Commercial · Defense · Amateur/Academic · Civil · Human Spaceflight



Source: Jonathan McDowell, CelesTrak

3 CHALLENGES

TO SPACE SUSTAINABILITY

1 SPACE JUNK

Space junk or orbital debris refers to defunct satellites, rocket bodies, and fragmented objects in space that no longer serve a useful purpose. There are millions of debris objects in space, travelling at high impact speeds.

Number of Debris Objects by Size

8,800 metric tons ---- The mass of debris objects in space.
29,000 km/h -------- Speed at which space junk can travel.

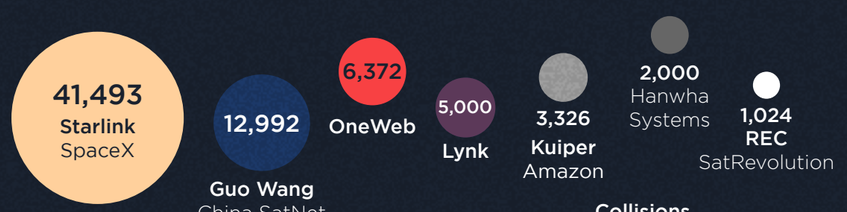
Increasing space debris poses a threat to active satellites and human spaceflight, especially as orbits get more crowded.

Source: European Space Agency, NASA

2 ORBITAL CROWDING

The space in Earth's orbits is limited. Satellite constellations—large networks of satellites that surround the Earth—are becoming more common.

Examples of Planned Satellite Constellations*



Physical crowding of orbits with satellites and debris can lead to a chain reaction, known as **the Kessler syndrome.** ----------

Physical congestion and electromagnetic interference from orbital crowding has adverse effects on communication and security in space.

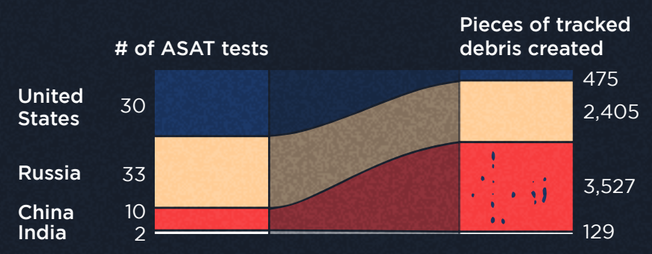
*as of August 10, 2021
Source: Newspace Index, Lynk Global

3 SPACE SECURITY

Militaries are developing capabilities to disrupt, degrade, or destroy satellites for national security reasons. Such actions could have unforeseen consequences for other actors in space.

Debris Generated by Anti-satellite (ASAT) Tests

Since 1959, China, India, Russia and the U.S. have carried out more than 70 tests collectively.

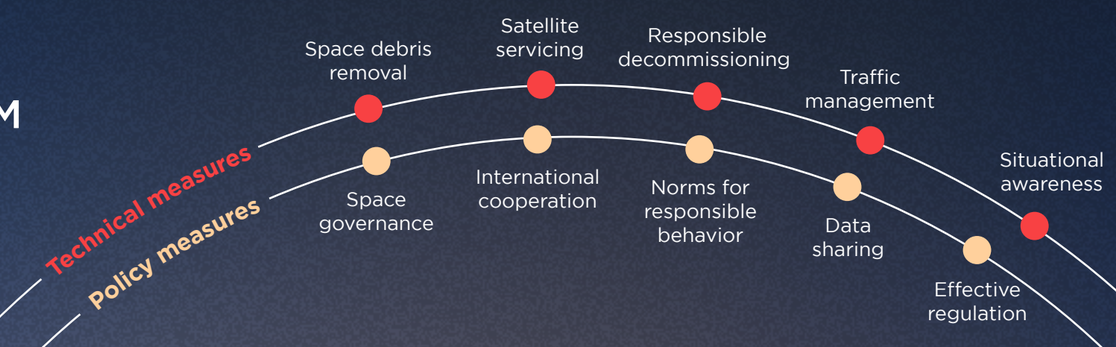


Besides the debris that is large enough to be tracked, deliberately destroying satellites can create thousands of objects too small to track.

Source: Secure World Foundation

SOLVING THE SPACE SUSTAINABILITY PROBLEM

As global reliance on satellite services and applications grows, the importance of policies, practices, and technologies to use space sustainably becomes more critical.



Space is critical for modern life and the technologies we use daily. Space sustainability is of key importance to maintaining these benefits for the future.

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SECURE WORLD FOUNDATION

Promoting Cooperative Solutions for Space Sustainability