# SPACE SUSTAINABILITY PRESERVING THE USABILITY OF OUTER SPACE

Geostationary orbit (GEO)

139

560

5K

4K 3K Medium Earth orbit (MEQ)

3,328

satellites<sup>3</sup>

Low Earth orbit (LEO)

# 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.

2,000km to 40,000km ----- 57

2,000km to 32,000km ----

<2,000 km - - - -

\*Number of satellites as of May 1, 2021 Source: Union of Concerned Scientists

Satellite Database, European Space Agency

## THE NEED FOR SPACE SUSTAINABILITY

Space holds vast benefits to humanity that we leverage through sat<u>ellites.</u>

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.

As of May 2021, there were 4,084 operational satellites in space, with several applications:



#### Who is Active in Space?

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

#### i 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

2K 1K 1960 1970 1980 1990 2000 2010 2020

Source: Statista, CelesTrak

# **3 CHALLENGES** TO SPACE SUSTAINABILITY

#### 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 >10cm 1-10cm 1mm-1cm

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

### 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.



### 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 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



### 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

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.





Promoting Cooperative Solutions for Space Sustainability