# Megaconstellations and the Dangers of Congestion:

## Understanding the hidden dangers posed by megaconstellations on our environment.

15 June 2026

The rapid expansion of commercial space activity has transformed Earth's orbit in ways we had never imagined when the Outer Space Treaty of 1967 was drafted. Thousands of satellites are now being launched to provide global internet coverage, Earth observation (such as with my father's work), navigation, and communications. While these developments seem like promising and significant benefits technologically and economically, they also raise important questions about the sustainability of the orbital environment. Megaconstellations represent one of the most significant changes in the history of spaceflight. Their scale requires policymakers to consider whether existing governance frameworks remain adequate for an increasingly crowded orbital space.

Unlike traditional satellite constellations, which may consist of dozens of spacecraft, megaconstellations involve hundreds or even thousands of satellites operating together in coordinated orbital networks. Their primary purpose is to provide continuous global services, including broadband internet, environmental monitoring, navigation, and communications. By operating numerous satellites in Low Earth Orbit (LEO), these systems can deliver faster connections with reduced latency compared to conventional satellite networks. As launch costs continue to decline access to space becomes increasingly commercialised, additional megaconstellations are expected in the coming decades.

Though there are many cons to megaconstellations, it is equally important to recognise that megaconstellations provide genuine public benefits. Global internet access has the potential to connect remote communities, improve access to education, support emergency communications during disasters, and enhance scientific research in isolated regions. Satellite constellations also contribute to weather forecasting, climate monitoring, disaster response, maritime safety, and environmental observation. These technologies increasingly form part of the infrastructure upon which modern society depends. The challenge is therefore not whether megaconstellations should exists, but how they should be governed responsibly.

When discussing pollution in space, attention is often focused on orbital debris. While this remains one of the most significant risks, the concept of space pollution is considerably broader. LEO is becoming increasingly crowded. As thousands of additional satellites are launched, collision avoidance becomes more complex, requiring continuous monitoring and coordination between operators. The probability of accidental collisions increases as orbital density grows, potentially generating further debris and placing operational satellites at greater risk.

Defunct satellites, fragments from collisions, and remnants of launch vehicles continue to accumulate in orbit. Even objects only a few centimetres across travel at velocities capable of destroying operational spacecraft. A single collision may produce thousands of additional fragments, increasing risks for all space users. Maintaining a sustainable orbital environment therefore requires effective debris mitigation and responsible end-of-life satellite disposal.

Megaconstellations have also created new challenges for astronomical observation. Large numbers of reflective satellites can interfere with observations made by ground-based telescopes, particularly during twilight hours. Long exposure astronomical images increasingly contain satellite trails, reducing the quality of scientific data as well as the life quality of nocturnal and crepuscular wildlife. Although satellite operators have introduced measures to reduce brightness, concerns remain regarding the cumulate impact of increasingly large constellations.

Radio astronomy depends upon extremely sensitive instruments capable of detecting faint signals originating from distant regions of the Universe. Expanding satellite communications increase the risk of radio-frequency interference, requiring careful international coordination to protect scientific data while allowing technological development.

Current international law provides only limited guidance regarding the environmental carrying of Earth's orbital environment. While individual nations remain responsible for their activities under the Outer Space Treaty and the Artemis Accords, questions remain concerning the cumulative effects of thousands of privately operated satellites. Who determines how many satellites should occupy particular orbital regions? How should access be balanced between established operators and emerging space nations? What obligations should companies have to minimise environmental impacts beyond simply avoiding collisions? These questions increasingly extend beyond engineering and have become matters of international governance.

The future of space activity depends not only upon technological innovation but also upon responsible stewardship. Orbital space should not be viewed as an unlimited resource simply because it extends beyond our atmosphere. Like Earth's oceans and polar regions, it represents an environment whose long-term sustainability depends upon careful management. and international cooperation. As commercial activity accelerates, governance frameworks must evolve alongside technological progress. Sustainable access to space will require transparency, shared responsibility, and policies capable of balancing innovation with environmental protection and ethics. Megaconstellations may well define the next era of space exploration. The challenge we have is ensuring they do so without compromising the orbital environment as well as the wildlife and environment here on Earth, upon which future generations will depend.

Teddy Crick

*Founder & Policy Lead, Free Space Initiative*