Navigating Global Economic Policies
How Nations Are Shaping Economic Policy in Outer Space

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I. Overview

As humanity grows beyond its borders, space has become an increasingly important arena for economic activity, driven by both private and public sector innovation and discovery. In addition to government space agencies, different countries and companies are hoping to take part in their own space initiatives. These initiatives include satellite infrastructure used to collect data about Earth from space, as well as other space-based manufacturing.

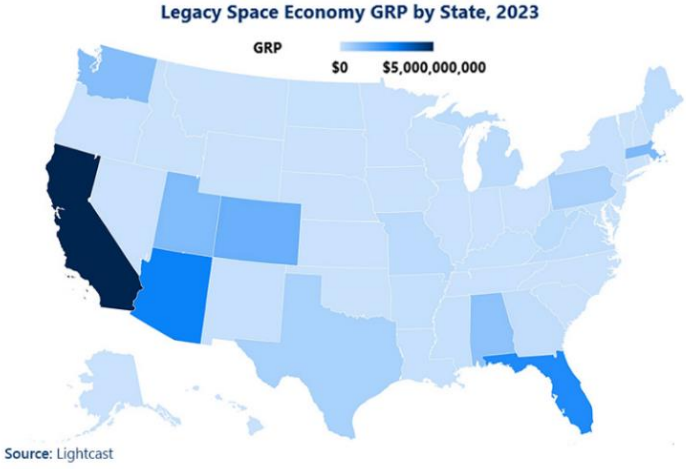
As technology becomes more advanced, the need for countries to develop policies and agreements that put into motion further investments and collaboration in outer space grows more urgent. Without cohesive frameworks, issues like ownership, competition, and sustainability could lead to conflict or exploitation. We will also be examining cases from the European Union, China, and the US. Each reflects a different strategy: China concentrates on state-led space expansion aligning with national strategic goals, the U.S. prioritizes commercial leadership and private-sector partnerships, and the EU pursues cooperative, regulatory projects that put sustainability and global coordination first.

By analyzing how the world is approaching space economics, this paper explores how nations are shaping economic policies to navigate the emerging space economy.

II. The Emerging Space Economy

a) The Shifting Market: The Legacy Space Economy

Part of this new, rapidly emerging space economy is infrastructure. Over the past 50 years, human activity in outer space has transitioned from being predominantly government-led to a highly privatized and competitive industry. The phrase “Legacy Space Economy” refers to the traditional, government owned sectors, such as NASA, ESA (Europe), Roscosmos (Russia), and others. Aerospace corporations such as Boeing and Raytheon Technologies have also been central players.



Top Legacy Space Economy States by GRP, 2023

State Name	GRP
California	$5.96 B
Arizona	$2.86 B
Florida	$2.61 B
Colorado	$1.52 B
Massachusetts	$1.21 B
Utah	$1.17 B
Washington	$1.06 B
Alabama	$950.49 M
Texas	$511.47 M
Pennsylvania	$485.99 M

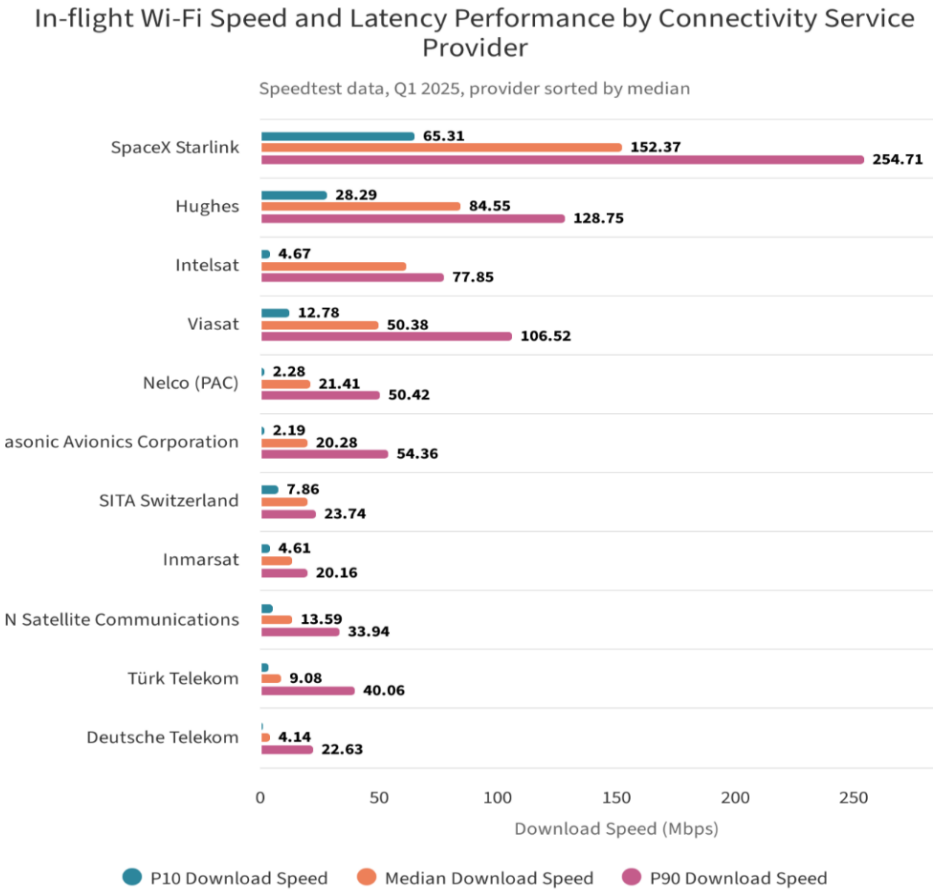
Source: Lightcast

Funding is mostly public, and geared towards scientific exploration, national security, and technological innovation. The Legacy Space Economy's gross regional product (GRP) by U.S. state varies, concentrating highly in states with headquarters or aerospace hubs. In 2023, California led with $5.96 billion, followed by Arizona ($2.86 billion), and Florida ($2.61 billion). These numbers demonstrate how the traditional space sector activity is dispersed geographically, especially in areas with well-established aerospace infrastructure.

b) The Shifting Market: The Modern Space Economy

In the early 2000's the Modern Space Economy emerged. This newly developed sector consisted of private sector companies such as SpaceX, Blue Origin, and Rocket lab. This economy focused primarily on technological innovations that improved efficiency and made space exploration more affordable and ethical. The Modern Space Economy also aims to increase global connectivity and commercial accessibility to space. One of the most significant examples of this shift is SpaceX's Starlink satellite network.

SpaceX's Starlink satellites are the world's largest low Earth orbit (LEO) satellite internet service at this point. These satellites aim to provide reliable, widespread internet coverage to rural areas around the globe, as well as improve in-flight internet.



According to a Q1 2025 Speedtest data, SpaceX's Starlink performed better than any other in-flight internet provider and was nearly twice as fast as its nearest rival.

III. Biotech Research and Environmental Impact

a) Biotech

Advances in biotechnology, particularly patentable inventions that support the human species in outer space, are largely influencing the frontier of space exploration. Important developments include CRISPR-based gene editing of hypoxia-tolerant crops and NASA's Passive Nutrient Delivery System (PONDS), which allows for food production in difficult environments. In addition, fermentation-based bioreactors are being developed to produce biofuels and systems that remove carbon dioxide from certain environments. This technology is essential to create an atmosphere where humanity can survive for extended periods of time.

More funding is being directed toward biotechnology that can support health in space. As space missions grow longer, NASA and other private companies are investing in new tools to better understand how the human body responds to space conditions. Currently, researchers are developing ways to test how drugs might work in space and how to treat issues like bone loss, which can become a significant problem in a weightless environment. Other efforts focus on creating compact systems that can grow cells or monitor health without needing constant human oversight. As investment in the space economy grows, biotech innovations are becoming a key area of focus, aimed at supporting astronaut health and safety. It is important to note that many of the technologies being developed could also improve healthcare and environmental conditions on Earth.

b) Environmental Concerns

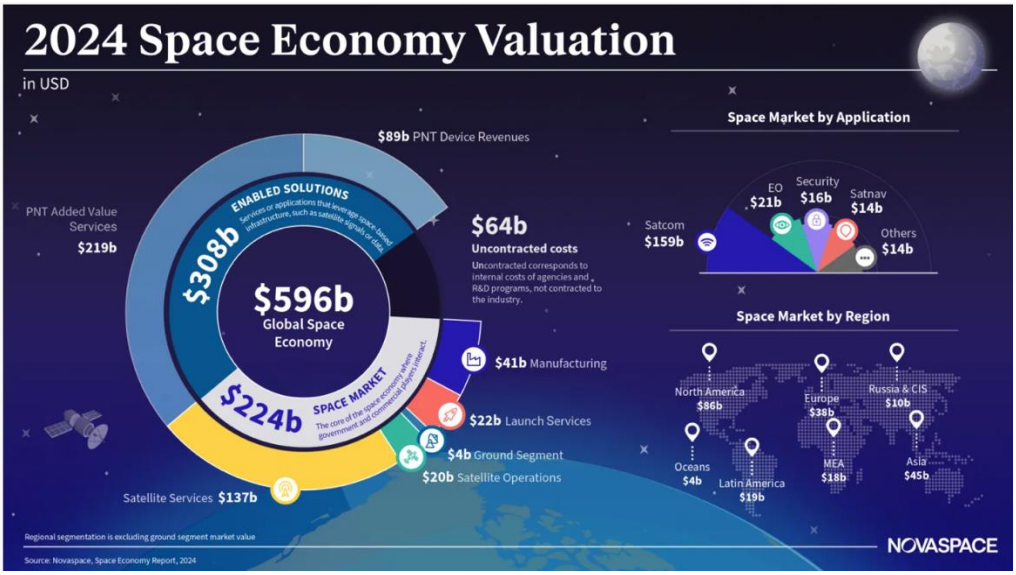
Environmental concerns are growing along with national space initiatives. Space debris such as fragments from satellites, rockets, and other missions has become a significant problem, clogging Earth's orbit. Rocket launches used to be scarce, and government controlled in the early days of spaceflight, which reduced their environmental impact. Regulators are no longer able to ignore the rise of private space institutions and the increasing number of launches, which currently exceed 100 annually. These launches emit a variety of pollutants, including alumina particles and black carbon, which are known to retain heat and cause climate change. Companies like Virgin Galactic and SpaceX are expecting hundreds or even thousands of launches in the coming year, increasing the risk of negative environmental effects drastically.

If the launch rate continues to rise, some rockets could cause measurable warming and ozone depletion as they generate as much black carbon every flight as thousands of plane trips across the Atlantic. Existing laws such as the Clean Air Act and the National Environmental Policy Act (NEPA) have provided little oversight and frequently fail to consider cumulative or high-altitude effects. Better design practices and international rules aimed at maintaining space sustainability are some of the ways that governments and businesses are starting to address these concerns.

IV. National Economic Strategies in Space

a) United States

While the United States leads with a hybrid approach built on public-private partnerships, other major space powers still favor more traditional, government-controlled strategies. Most of the $596 billion global space economy is derived from commercial activities, including satellite services and technologies. More than half of the total is enabled solutions, such as apps that make use of space infrastructure, demonstrating how space is becoming increasingly incorporated into larger economic systems. Global investment and diversification are increasing, as the image illustrates, reflecting both national goals and the increasing significance of space as a field of economic competitiveness.



In fact, Novaspace, a space consulting and intelligence firm predicts the space economy to grow from the $596 shown in the graphic above, to $944 billion by 2033.

b) China

China pursues a centrally directed, state-led space strategy that tightly integrates space activities with national development and geopolitical goals. The China National Space Administration (CNSA) oversees a network of powerful state-owned enterprises, including CASC and CASIC, which manage everything from satellite launches to space missions. This model pushes for technological self-reliance and state control over competitive private growth.

China's international efforts, such as the International Lunar Research Station (in partnership with Russia) and the Belt and Road Space Information Corridor, aim to expand its global influence by offering satellite services and alternative governance models. While a commercial sector is emerging, it remains closely regulated and largely aligned with national priorities.

Overall, China's strategy reflects a vision of space as a domain of sovereign capability and strategic competition.

c) European Union

The European Union adopts a multilateral, regulation-driven approach to space policy, emphasizing strategic autonomy, civil applications, and international cooperation. Through institutions like the European Space Agency (ESA) and the European Commission, the EU funds major initiatives such as Galileo (satellite navigation), Copernicus (Earth observation), and IRIS² (secure satellite communications). These programs are designed to reduce dependence on U.S. and Chinese systems and promote "space sovereignty" for Europe.

Rather than projecting geopolitical dominance, the EU focuses on norm-setting, data-sharing, and sustainable governance, often positioning itself as a mediator between spacefaring powers. However, limited defense integration and fragmented political will among member states constrain its ability to act as a unified strategic actor in space.

V. Ownership and International Agreements

The Outer Space Treaty of 1967 remains the backbone of international space law, stating that no nation can claim sovereignty over the Moon or other celestial bodies. This principle was reinforced by the 1979 Moon Agreement, though only a few countries ratified it. In recent years, countries have begun to pass national laws to clarify how private companies can extract and use space resources. For example, the U.S. Space Act of 2015 and Luxembourg's 2017 Law on Space Resources both allow companies to own and profit from materials they mine in space. In 2020, NASA, the U.S. Department of State, and seven other initial signatories established the Artemis Accords, which build on the Outer Space Treaty by setting guidelines for resource extraction, safety zones, and shared standards for responsible behavior. Together, these agreements and national laws show how countries are updating and expanding international norms to manage ownership, commercial rights, and economic activity in space.

However, major powers like China and Russia reject the Accords and back separate initiatives, such as the International Lunar Research Station, which reflect different ideas about governance and control. Meanwhile, rapid private-sector growth adds more uncertainty, as existing treaties do not fully clarify how companies can own or sell space resources. As competition grows, new agreements or updates to international law will be needed to prevent conflicts and ensure fair access to space's economic potential.

Key Insights

The Shift from the Modern Space Economy to the Legacy Space Economy

- Over the past decades, the space sector has shifted from mainly government-led programs to a highly competitive commercial market, driven by companies like SpaceX, Blue Origin, and Rocket Lab.
- This shift has made space more accessible and has accelerated innovation in satellite infrastructure, launch services, and global connectivity.
- Private investment and partnerships now play a key role in pushing the boundaries of space exploration and economic development.

Competing National Strategies

- The United States combines public funding with private-sector innovation, using partnerships and international agreements to maintain leadership in space activities.
- China follows a state-directed approach through the China National Space Administration (CNSA) and major state-owned firms, focusing on technological self-reliance and strategic influence.
- The European Union promotes a multilateral, regulatory approach through programs like Galileo, Copernicus, and IRIS² to ensure sustainability and reduce dependence on foreign systems.

Ownership, Resources, and Legal Gaps

- The Outer Space Treaty of 1967 prohibits nations from claiming sovereignty over celestial bodies but leaves many questions about private ownership and resource rights unresolved.
- The Artemis Accords expand on this by setting guidelines for resource extraction and safety zones, but China and Russia have rejected this framework in favor of alternative agreements.
- Rapid growth in commercial mining plans and satellite usage highlights the urgent need for clearer, modern rules to manage ownership and prevent conflict.

Biotech Innovation and Sustainability Challenges

- Biotech innovations like CRISPR, PONDS, and other health monitoring systems are becoming vital to sustaining human life in space and improving health and environmental solutions on Earth.
- Existing regulations like the Clean Air Act and NEPA often fail to address the unique environmental challenges posed by frequent launches and orbital congestion.
- International collaboration and new design standards are needed to reduce risks and protect the orbital environment for future generations.

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