### Innovation

#### Private entities are key to future space exploration and increased goods and services.

**Weinzierl**, M., **& Sarang**, M. (20**21**, **Feb**ruary **12**). The Commercial Space Age Is Here. Harvard Business Review. Retrieved December 10, 2021, from <https://hbr.org/2021/02/the-commercial-space-age-is-here> //ear

**Today, however, there is reason to think that we may finally be reaching the first stages of a true space-for-space economy.** SpaceX’s [recent achievements](https://www.nasa.gov/press-release/nasa-s-spacex-crew-1-astronauts-headed-to-international-space-station/) (in cooperation with NASA), as well as upcoming efforts by [Boeing](https://www.nasa.gov/feature/boeing-s-starliner-makes-progress-ahead-of-flight-test-with-astronauts), [Blue Origin](https://www.blueorigin.com/news/nasa-selects-blue-origin-national-team-to-return-humans-to-the-moon), and [Virgin Galactic](https://spacenews.com/virgin-galactic-prepares-to-transition-to-operations) to put people in space sustainably and at scale, mark the opening of a new chapter of spaceflight led by private firms. **These firms have both the intention and capability to bring private citizens to space as passengers, tourists, and — eventually — settlers, opening the door for businesses to start meeting the demand those people create over the next several decades with an array of space-for-space goods and services.**

#### L - Space Exploration directly creates innovation and increases technological knowledge

**I**nternational **S**pace **E**xploration **C**oordination **G**roup. (20**13**, September). //ear Benefits Stemming from Space Exploration. **Nasa.Gov**. Retrieved December 8, 2021, from <https://www.nasa.gov/sites/default/files/files/Benefits-Stemming-from-Space-Exploration-2013-TAGGED.pdf> ISECG is a collab between NASA and other governments space programs.

**To a great extent, the benefits from space exploration are rooted in the generation of new knowledge,** **which is the first reward and which has inherent value to humankind**. **Technological knowledge, generated when high‐performance space systems are developed to address the extreme challenges of space missions, yields many innovations that benefit the public.** Scientific knowledge acquired from space expands humankind's understanding of nature and frequently unlocks creative and useful Earth‐based applications for society. **In the longer term, the knowledge accumulated over many missions and the expansion of human presence into the Solar System help people gain perspective on the fragility and rarity of life in the Universe and on humankind's accomplishments, potential, and destiny**. **Space exploration stimulates the creation of both tangible and intangible benefits for humanity**. **Tangible impacts include all the innovation‐related applications and benefits resulting from investments in these programmes, such as new devices and services that spin off into the marketplace. In addition, space exploration leads to advances in science and technology, and furthers workforce development and industrial capabilities, thus leading to an overall stimulation of private companies and industries, all of which contributes significantly to the economic progress of space‐faring nations**. Space exploration is also known to attract young people into careers in science and technology to the general benefit of society and the economy (see chapter 2.1). Space exploration also results in various intangible impacts due to the social and philosophical dimensions that address the nature and meaning of human life. Intangible benefits include the enriching of culture, the inspiration of citizens, and the building of mutual understanding as a result of international cooperation among space‐faring nations. The fundamental benefits generated by space exploration are grouped in this document as follows: (i) innovation; (ii) culture and inspiration; and (iii) new means to address global challenges. The delivery of these benefits to society provides the main rationale for investment in space exploration. An illustration on how these benefits are delivered by space agencies is given in the box below. Space exploration’s capacity to continue delivering significant benefits to humanity was recognized by high‐level government representatives from around the world when they convened in Lucca, Italy, in November 2011. They concluded that space exploration provides:

#### IL - Technology developed in space innovation is key to resolve climate change

**Derr**, E. (20**21**, **September 17**). Space is Crucial to Understanding Climate Change. Nuclear Energy Institute. Retrieved December 9, 2021, from <https://www.nei.org/news/2021/space-is-crucial-to-understanding-climate-change> //ear Emma Derr works as a Manager, Digital Communications at Nuclear Energy Institute, which is a Membership Organizations company with an estimated 133 employees; and founded in 1994. They are part of the Digital Marketing team within the Marketing Department and their management level is Manager. Emma is currently based in Washington, D.C., United States.

**Space developments in the last two decades have greatly contributed to our** [**understanding of our planet’s climate**](https://climate.nasa.gov/evidence/). **Satellite imaging, space exploration, and new technologies give us an idea of the big picture and how we can adapt to address climate change**. **For example, satellites in space have played a critical role in our understanding of the causes of global warming by providing us with a large body of data to examine the variations in the Earth’s orbit.** **Data from these** [**capabilities**](https://www.thespacereview.com/article/4230/1) **were essential inputs into the Intergovernmental Panel on Climate Change’s (IPCC) recent** [**report**](https://www.ipcc.ch/report/ar6/wg1/#SPM) **that focused on how the physical science of climate change informs likely impacts under five different emissions scenarios. The report also found that climate change is happening quicker than we thought, making the need to reduce emissions imminent. To address this, space infrastructure such as** [**positioning, navigation, and timing**](https://www.transportation.gov/pnt/what-positioning-navigation-and-timing-pnt#:~:text=While%20PNT%20encompasses%20so%20much,GPS%20is%20a%20major%20component.&text=%E2%80%9CA%20U.S.%2Downed%20utility%20that,segment%2C%20and%20the%20user%20segment.) **(PNT) can help identify efficient transportation routes and sources of emissions, ultimately aiding mitigation efforts.** Time Progression of the Ozone Hole Over Antarctica This series of images shows the size and shape of the thinning ozone layer over Antarctica each year from 1979-2019. Red and yellow areas indicate the ozone hole. Credit to nasa.gov. NASA’s [Earth System Observatory](https://www.nasa.gov/press-release/new-nasa-earth-system-observatory-to-help-address-mitigate-climate-change), the next generation of Earth science satellites that will launch in the next decade, reflect the importance of Earth imaging. This constellation of satellites is designed to provide information about our planet ranging from the location of forest fires to the sea level rise to our agricultural processes. It will be able to collect data at the regional and local levels and connect critical interactions between the atmosphere, land, ocean and ice, significantly bolstering our understanding of the Earth’s climate. **Another large** [**focus**](https://www.axios.com/white-house-nasa-earth-science-satellites-climate-c560c9d8-2dfd-4964-bfcf-fd6cb54117e5.html) **of the initiative is predicting severe weather and answering questions surrounding aerosols, which are particles in the atmosphere that are a key source of uncertainty in predicting climate change**. Alongside adding funding to FEMA, the Biden Administration [announced](https://www.whitehouse.gov/briefing-room/statements-releases/2021/05/24/fact-sheet-biden-administration-invests-1-billion-to-protect-communities-families-and-businesses-before-disaster-strikes/) the development of the Earth System Observatory, indicating its support for the program in understanding how climate change is impacting communities. **Space exploration is foundational to climate science because it provides us with more information about the Earth, our solar system and the role of gases in our atmosphere, and nuclear energy has played an important role powering our missions into space.** In 1969, NASA launched [Nimbus III](https://rps.nasa.gov/missions/8/nimbus-iii/), a nuclear-powered spacecraft, that is the first U.S. satellite to gather vital oceanographic data, such as measurements of sea ice and the ozone layer. The spacecraft also measured atmospheric temperature, water vapor and ozone, as well as the amount of ultraviolet radiation reaching our atmosphere from the sun. [Cassini](https://solarsystem.nasa.gov/missions/cassini/overview/), a nuclear-powered probe into Saturn and its moons, released the Huygens probe which collected important data about what earth may have looked like in its state before humans evolved. The mission revealed Titan to be one of the most Earth-like worlds we’ve encountered and has shed light on the history of our home planet. Nuclear energy has powered dozens of interplanetary missions, which have gathered critical information about our universe. These make up some of the most successful and inspiring missions in U.S. space exploration history. **Climate and space technologies build off of each other, as evidenced by solar photovoltaic panels first gaining a foothold in the space industry. Nuclear energy can be positioned to experience such a catalyst with** [**new investments**](https://www.nei.org/news/2021/nuclear-taking-us-faster-and-farther-into-space) **in nuclear space technologies. As climate change intensifies, space exploration and Earth observation will become** [**increasingly important**](https://www.axios.com/space-critical-to-climate-science-2051-0361889a-5ae9-47eb-960f-e83f1b6779c7.html) **to gathering critical data. We must meet the moment by investing in these missions and recognizing nuclear power’s important role in space technologies.**

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### Digital Divide DA

#### Digital divides are growing, especially because of the pandemic.

Li, C. (2021, October 11). *Worsening global digital divide as the US and China continue zero-sum competitions*. Brookings. Retrieved December 14, 2021, from https://www.brookings.edu/blog/order-from-chaos/2021/10/11/worsening-global-digital-divide-as-the-us-and-china-continue-zero-sum-competitions/ Cheng Li is the director of the John L. Thornton China Center and a senior fellow in the Foreign Policy program at Brookings. He is also a director of the National Committee on U.S.-China Relations. Li focuses on the transformation of political leaders, generational change, the Chinese middle class, and technological development in China. Li is also the author or the editor of numerous books. //ech

The COVID-19 crisis has interrupted daily life and business routines across the world, caused a massive loss of millions of lives, and exacerbated economic disparities within and between countries. **COVID-19 has also revealed fundamental challenges in the international order.** As Kissinger has asserted, “the world will never be the same after the coronavirus.” One can reasonably expect that cynicism regarding regional and global integration, as well as radical populism, racism, ultranationalism and xenophobia, will likely continue to rise around the world. At this critical juncture, it has become even more essential to examine the urgent challenges that the world confronts and to engage in global cooperation instead of devolving into constant contention and confrontation. **One of the most urgent tasks for the international community is to overcome growing digital divides. Digital divides in least developed countries (LDCs) have been particularly salient, as digitally disconnected populations have been left further behind during the pandemic. The U.S. and China, two superpowers in the digital era, should work in tandem with the international community to jointly combat digital divides and COVID-19. Despite the global growth of digital technologies, a 2021 United Nations report noted that nearly half of the world’s population, 3.7 billion people, lack internet access. Deficiency of digital connectivity is especially prevalent within LDCs, where more than 80% of the population are still offline.** In comparison, the unconnected population in developed countries and developing countries stands at 13% and 53%, respectively. LDCs account for about 14% of the world’s population, and they comprise more than half of the world’s extremely poor. **Digital divides both reflect and reinforce socioeconomic disparities. The pandemic has aggravated existing inequalities, often resulting in a widening gap of digital skills. As a result of COVID-19-induced economic difficulties, the population of extreme poor in LDCs expanded by 32 million, and the number of people in poverty in LDCs grew to 36% in 2020, 3% more than in prior years. More specifically, LDCs lag further behind in the following three areas.**

#### Starklink and other private entity developments could bridge existing digital divides, but regulations are inhibiting them.

Estes, A. C. (2020, September 26). *The pandemic is speeding up the space internet race*. Vox Recode. Retrieved December 14, 2021, from <https://www.vox.com/recode/2020/9/26/21457530/elon-musk-spacex-starlink-satellite-broadband-amazon-project-kuiper-viasat>. Adam Clark Estes is the deputy editor of Recode. He was previously a senior editor at Gizmodo, an associate editor at Motherboard, and a staff writer at The Atlantic Wire. //ech

**In vast swaths of the United States and the world, there are millions of people who don’t have reliable internet access.** These unconnected people aren’t just in far-flung places like rural America or New Zealand or sub-Saharan Africa, either. There are plenty of people living in dense city centers with limited access to affordable broadband. **The**[Covid-19](https://www.vox.com/coronavirus-covid19)**pandemic has brought new urgency to the challenge of getting everyone connected**, and while companies like Google and Facebook have floated far-out ideas for solving the problem, the internet technology that’s most promising is also one that’s already proven: satellite broadband. In early March, just days before cities across the US shut down due to the pandemic, **Elon Musk**[shared the latest details](https://arstechnica.com/information-technology/2020/03/musk-says-starlink-isnt-for-big-cities-wont-be-huge-threat-to-telcos/)**about his plan to build a satellite broadband service called Starlink. Speaking at a satellite conference in Washington, DC, Musk described how a constellation of Starlink satellites will “blink” when they enter low-Earth orbit**. As described, they almost sound like streaks of glitter in the night sky, or magic bands of flying gadgets that can beam internet down to anyone on the planet. Combined with improvements to existing technology like DSL, cable, and fiber — not to mention 4G and 5G cellular networks — **futuristic satellite broadband stands to bridge the digital divide in the US and elsewhere.** And because the pandemic has prompted explosive demand for better, more widely available internet connectivity, fast progress seems more inevitable than ever. Musk’s new satellites went online in early September, giving beta testers download speeds [that rival those of terrestrial broadband](https://www.theverge.com/2020/9/3/21419841/spacex-starlink-internet-satellite-constellation-download-speeds-space-lasers). **SpaceX has now put 700 Starlink satellites into orbit in the past 16 months and**[has plans to deliver](https://spacenews.com/spacex-submits-paperwork-for-30000-more-starlink-satellites/)**as many as 30,000 more in the next few years. More satellites mean more bandwidth and faster speeds, and eventually, SpaceX says, its low-Earth orbit satellite constellations could deliver high-speed internet to the entire US.** [Amazon](https://www.theverge.com/2019/4/4/18295310/amazon-project-kuiper-satellite-internet-low-earth-orbit-facebook-spacex-starlink), [Facebook](https://www.wired.com/story/facebook-confirms-its-working-on-new-internet-satellite/), and several startups have made similar promises in recent years. The concept of satellite-based internet service is actually decades old. However, **the innovative low-Earth orbit satellite technology being developed by SpaceX and others could be essential, if not transformative, for everything from telemedicine to remote learning in places that aren’t already connected.** [Satellite broadband](https://www.vox.com/recode/2020/9/10/21426810/internet-access-covid-19-chattanooga-municipal-broadband-fcc) could also be very profitable for whichever company figures it out first. One could imagine Amazon using satellite broadband to boost its Amazon Web Services (AWS) business, or Facebook using it to ensure that more people get on its platform. And if Musk gets his way, his Starlink constellations will generate billions of dollars in profits to fund his mission to colonize Mars. This all sounds futuristic, but satellite broadband is already a very real thing. In fact, if you’ve ever connected to wifi on a plane or cruise ship, you’ve probably used it. The basic idea is that ground stations connected to the internet, known as gateways, can send data up to a satellite which then relays that data to antennas somewhere else on the ground — or on a ship or an airplane. **The problem with this technological feat is that it’s all very expensive**. **It can cost** hundreds of millions of dollars to launch satellites into space, and that’s not even taking into account what it takes **to get over regulatory hurdles**. Plenty of companies have tried and failed to crack the business model in the past 20 years. But rather suddenly, the space internet game has changed. “**The Covid-19 crisis has significantly accelerated attention to and investment in satellite technology**,” Babak Beheshti, dean of the College of Engineering and Computing Sciences at the New York Institute of Technology, told Recode. Beheshti added that the number of launches had gone up tenfold from last year to this year. “Why? Because schools, local governments, and others suddenly needed to have broadband internet access in areas where there was really no infrastructure in place.”

#### The digital divide amplifies gender inequality and leads to decreased women in STEM.

**Gromova**, K., Anderson, R., & Gupta, G. (20**21**, November 4). *Opening a global conversation about the gender digital divide*. World Bank Blogs. Retrieved December 16, 2021, from <https://blogs.worldbank.org/digital-development/opening-global-conversation-about-gender-digital-divide>. Kate Gromova worked for more than 15 years at the intersection of economics, law, technology, and entrepreneurship development. Reyn is a born lawyer, digital development specialist, and excellent project manager. Garima is a corporate lawyer turned digital development enthusiast.  //ech

[**The COVID-19 pandemic showed how critical digital technologies are in today’s world — they kept businesses, education, government services, healthcare, and economies running despite the health crisis and global economic downturn.**](https://twitter.com/intent/tweet?text=The+COVID-19+pandemic+showed+how+critical+digital+technologies+are+in+today%E2%80%99s+world+%E2%80%94+they+kept+businesses%2C+education%2C+government+services%2C+healthcare%2C+and+economies+running+despite+the+health+crisis+and+global+economic+downturn.&url=https://blogs.worldbank.org/digital-development/opening-global-conversation-about-gender-digital-divide/?cid=SHR_BlogSiteTweetable_EN_EXT&via=WBG_DigitalDev)But it also shed light on another issue — many people and communities have been left out of their country’s digital transformation. Why is this a problem? Because economic development has become more dependent on digital technologies. **Those with limited or no access to technology are falling further and further behind. In many developing countries, women and girls fall into this category**. Barriers and constraints in accessing the internet impede their full participation in the social and economic life of their communities and countries. [**Today, we are seeing long-standing development gaps between men and women moving online. It is called the gender digital divide.**](https://twitter.com/intent/tweet?text=Today%2C+we+are+seeing+long-standing+development+gaps+between+men+and+women+moving+online.+It+is+called+the+gender+digital+divide.%20&url=https://blogs.worldbank.org/digital-development/opening-global-conversation-about-gender-digital-divide/?cid=SHR_BlogSiteTweetable_EN_EXT&via=WBG_DigitalDev)**Digital transformation can’t achieve its potential when half of the world’s population is excluded or limited from the process, making it an important and relevant topic in development.** [**Closing this divide is imperative for ensuring women and girls have better and more access to healthcare, education, jobs, and civic participation.**](https://twitter.com/intent/tweet?text=Closing+this+divide+is+imperative+for+ensuring+women+and+girls+have+better+and+more+access+to+healthcare%2C+education%2C+jobs%2C+and+civic+participation.&url=https://blogs.worldbank.org/digital-development/opening-global-conversation-about-gender-digital-divide/?cid=SHR_BlogSiteTweetable_EN_EXT&via=WBG_DigitalDev)**However,**[**bridging the gender digital divide is complex — its causes are multifactorial, and the mix of factors changes across a woman’s lifetime.**](https://twitter.com/intent/tweet?text=bridging+the+gender+digital+divide+is+complex+%E2%80%94+its+causes+are+multifactorial%2C+and+the+mix+of+factors+changes+across+a+woman%E2%80%99s+lifetime.&url=https://blogs.worldbank.org/digital-development/opening-global-conversation-about-gender-digital-divide/?cid=SHR_BlogSiteTweetable_EN_EXT&via=WBG_DigitalDev) These include the legal and regulatory environment, the availability and accessibility of affordable internet, digital skills development, relevant content, online safety and security, and opportunities for education and employment in the CT sector. **Cutting across all these factors are social and cultural norms and expectations concerning girls’ and women’s roles and their relationship to technology.** For instance, cost concerns may limit the number and sophistication of smartphones used in a household. When the supply of phones or computers is limited, women’s and girls’ access is not prioritized. [Affordability concerns can also impact internet availability for girls and women; lower-cost internet access plans are usually more restrictive in terms of service and are of lower quality.](https://twitter.com/intent/tweet?text=Affordability+concerns+can+also+impact+internet+availability+for+girls+and+women%3B+lower-cost+internet+access+plans+are+usually+more+restrictive+in+terms+of+service+and+are+of+lower+quality.+&url=https://blogs.worldbank.org/digital-development/opening-global-conversation-about-gender-digital-divide/?cid=SHR_BlogSiteTweetable_EN_EXT&via=WBG_DigitalDev)The poor user experience may decrease women’s interest—or appetite — in using the internet or seeing it as a valuable resource. Security and privacy concerns also creep in, like online harassment and cyberstalking. These threats further discourage women from becoming active internet users. [**The ability to use digital technologies productively and safely requires digital literacy, skills, and confidence that may not be provided or encouraged for women and girls.**](https://twitter.com/intent/tweet?text=The+ability+to+use+digital+technologies+productively+and+safely+requires+digital+literacy%2C+skills%2C+and+confidence+that+may+not+be+provided+or+encouraged+for+women+and+girls.&url=https://blogs.worldbank.org/digital-development/opening-global-conversation-about-gender-digital-divide/?cid=SHR_BlogSiteTweetable_EN_EXT&via=WBG_DigitalDev)**Pursuing STEM education may be actively discouraged, narrowing the pipeline of potential female leaders, role models in technology fields, and gender-based innovation.**

#### Lessening the Digital divide helps solve poverty, especially in Africa, by creating jobs.

**The World Bank**. (20**21**, September 24). *Narrowing the Digital Divide Can Foster Inclusion and Increase Jobs*. IBRD - IDA. Retrieved December 16, 2021, from https://www.worldbank.org/en/news/feature/2021/09/24/narrowing-the-digital-divide-can-foster-inclusion-and-increase-jobs//ech

**A growing body of evidence demonstrates that digital technologies can enable economic transformation in Africa and help create more jobs for its people**. **Digital technologies do so by helping all people, and especially lower-income and lower-skilled entrepreneurs and employees, work better and learn better, catalyzing adoption and productivity of complementary technologies.** World Bank country-level studies, on Nigeria, Senegal, and Tanzania, have analyzed the impact on jobs of mobile internet availability (3G or 4G coverage), including the poor and most vulnerable. **Studies show that both internet availability and use of more sophisticated digital technologies lead to more and better jobs for lower-income, lower-skilled people, and hence reduce poverty. Labor force participation and wage employment increased significantly in areas with internet availability after three years, relative to those with no coverage.** For example, digital technologies such as the use of local language videos on tablet computers and use of a decision support tool app on a smartphone can provide personalized advice resulting in better jobs, and an increase in crop yields of lower-income farmers. Although mobile internet availability has increased, Africa’s internet coverage still lags behind other regions—with digital divides in availability still an issue in remote and poorer areas in all countries. Yet uptake is a bigger problem today than coverage. Africa’s uptake gap has widened, both relative to other regions and relative to availability: while 70 percent of Africa’s regional population have availability of mobile internet, less than 25 percent are using it—resulting in an average uptake gap of almost 50 percent. This uptake gap is highest in rural areas and informal enterprises; it is also high for older and poorer women and rural households. There are growing digital divides in use between richer, urban, literate, and better educated households with electricity and poorer households without electricity. Three World Bank country-level studies, on Nigeria, Senegal, and Tanzania, have analyzed the impact on jobs of mobile internet availability (3G or 4G coverage). **Better jobs and earnings for some people are also associated with large effects on total household consumption and poverty reduction**. **One key takeaway is that the more digital access Africans have, the more likely they are to reduce poverty over time.**

### Licensing cp

#### CP text: States out to introduce a licensing system that decides the use of space using cost benefit analysis on a case to case basis

**Leepuengtham 17**, Tosaporn. “International Space Law and Its Implications for Outer Space Activities.” *Elgar Online: The Online Content Platform for Edward Elgar Publishing*, Edward Elgar Publishing, 27 Jan. 2017, https://www.elgaronline.com/view/9781785369612/06\_chapter1.xhtml.

However, the situation might be more complex if an intellectual property work created involved using outer space resources as a component of its output. Take, as a hypothetical example: Scientist A, a national of the United States, discovers a process to produce nuclear power using Helium-3 as its major constituent. Helium-3 is known to be a valuable resource for generating nuclear power which is rare on earth, but abundant on the Moon.[80](https://www.elgaronline.com/view/9781785369612/06_chapter1.xhtml#Footnote_0080) The production of nuclear power using this process would be cost-effective if produced in outer space. But would the process of producing this nuclear power violate the non-appropriation principle if the Moon’s natural resources are taken as part of this process? A strict interpretation would see use of Helium-3 as a type of appropriation of the Moon’s resources, and so a breach of the non-appropriation obligation. But, if neither the production of such nuclear power nor intellectual property rights protecting the process are allowed, the world community would lose the benefit of this additional source of power. However, a compromise could be put forward which would allow exploitation of this intellectual property work based upon licensing. Any such licensing scheme would need to ensure third parties fair and equitable access to this process in order to uphold the principle of freedom of exploration and use, but with appropriate safeguards in place, exploitation via licensing would guarantee Scientist A an opportunity to enjoy some benefit from his effort and investment. The situation is essentially the same when considering application of the non-appropriation principle to remote sensing and satellite telecommunication. This is because situating a satellite in orbit within a specific spatial area could be considered as an appropriation of outer space, particularly when taking into account the fact that geostationary orbits are considered a ‘limited natural resource’, and access to such resources must comply with the International Telecommunication Union (ITU) Constitution.[81](https://www.elgaronline.com/view/9781785369612/06_chapter1.xhtml#Footnote_0081)