**Framework- we agree**

**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.”

**Internet and technological regimes manipulate lesser developed countries so they become dependent.**

**Wade**, R. H. (20**02**, December). *Bridging the Digital Divide: New Route to Development or New Form of Dependency?* (Global Governance Vol. 8; Research Report No. 04). Brill. <https://www.jstor.org/stable/27800358>. Robert Hunter Wade is a political economy and development scholar. He is currently Professor of Global Political Economy at the Department of International Development, London School of Economics. //ech

**In this section, I look at the impact of the global ICT industry and the international ICT regimes on LDCs. ICTs seem to have a large quotient of public goodness about them and therefore high spillover benefits.** "The Internet was created in the United States, but its cost-slashing consequences for information and communications enhance people's opportunities everywhere," in the words of the Human Development Re port.16 **This might be taken to imply that LDCs are not much disadvantaged by the structure of the global ICT regimes. Not so. In several ways, developing country users are being tied more tightly into hardware and software escalation with ramifications difficult to anticipate (like the more abstruse parts of derivatives markets). Escape is increasingly limited, and the costs grow as the dependence of the users increases. This is a new form of international digital dependence for which we need a new version of the 1970s dependency theory.** The U.S./Microsoft Privilege in Software Developing countries are placed at a growing disadvantage by the soft ware-hardware arms race in the global market for savvy computer users. The software is constantly being rewritten to take advantage of unused slack in memory and speed, and then the hardware manufacturers esca late the headroom so that the new software can run as fast. The result ing complexity is attractive to the minority of younger, wealthier, and better-educated people but is a deterrence for others, who perceive that software is actually getting worse for many word processing and spreadsheet uses because the new features cause glitches and slow downs. **The effect of this technological arms race is to keep widening the digital divide between the prosperous democracies and the rest of the world. Every time Microsoft comes out with a new version of its software that can only run on the latest generation of chip, LDCs either face more costly and hassle-filled communication with customers and suppliers in the OECD countries, or spend scarce foreign exchange to re place their old machines and software.** **This is an inbuilt gravitational force against their ascent across the digital and income divide.** It is where Microsoft is most abusing its monopoly power, checked only a little by the unorganized anger of the "orphans" left with incompatible document formats.17 Almost certainly the software-hardware race and the constant need for further investment represents a huge misallocation of resources, not only in LDCs but even in the OECD countries. The rush to upgrade software, and hence hardware, comes first from large companies, ostensibly because they "need" the new capabilities. Large multinationals promote the idea of twenty-four-hour global working, for which they need to have messages and designs winging their way to Tokyo as Los Angeles closes down, and vice versa. But the rush to upgrade software is probably driven as much by organizational pressures from ICT staff and from top managers. Since salaries are linked to budgets, ICT staff press for whatever keeps ICT budgets high and fully spent by year's end. The top managers worry that the "brand" of the company will be downgraded if the company does not boast the latest ICT. Smaller organizations have to follow this trend, because otherwise they have difficulties exchanging attachments and various other text- and graphics bearing bits of software with the large companies with which they do business

**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.**

**Innovation DA (Warming Version)**

**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.**

**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:

**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.**

**Climate change is the greatest threat-it magnifies every extinction risk**

**Torres 16** (Phil Torres, PhD candidate @ Rice University in tropical conservation biology, affiliate scholar @ Institute for Ethics and Emerging Technologies, July 22, 2016. “Op-ed: Climate Change Is the Most Urgent Existential Risk”. <http://ieet.org/index.php/IEET/more/Torres20160807>)

Humanity faces a number of formidable challenges this century. Threats to our collective survival stem from asteroids and comets, supervolcanoes, global pandemics, climate change, biodiversity loss, nuclear weapons, biotechnology, synthetic biology, nanotechnology, and artificial superintelligence. With such threats in mind, an informal survey conducted by the Future of Humanity Institute placed the probability of human extinction this century at 19%. To put this in perspective, it means that the average American is more than a thousand times more likely to die in a human extinction event than a plane crash.\* So, given limited resources, which risks should we prioritize? Many intellectual leaders, including Elon Musk, Stephen Hawking, and Bill Gates, have suggested that artificial superintelligence constitutes one of the most significant risks to humanity. And this may be correct in the long-term. But I would argue that two other risks, namely **climate change** and biodiveristy loss, should **take priority** right now over **every other known threat**. Why? Because these ongoing catastrophes **in slow-motion** will frame our **existential predicament** on Earth not just for the rest of this century, but for literally **thousands of years** to come. As such, they have the capacity to **raise** or lower the **probability of other risks scenarios** unfolding. Multiplying Threats Ask yourself the following: are **wars** more or less likely in a world marked by **extreme weather events**, **megadroughts**, **food supply disruptions**, and sea-level rise? Are **terrorist attacks** **more** or less **likely** in a world beset by **the collapse of global ecosystems**, **agricultural failures**, **economic uncertainty**, and political instability? Both government officials and scientists agree that the answer is **“more likely.”** For example, the current Director of the CIA, John Brennan, recently identified “the impact of **climate change**” as one of the “deeper causes of this rising instability” in countries like **Syria**, **Iraq**, **Yemen**, **Libya**, and **Ukraine**. Similarly, the former Secretary of Defense, Chuck Hagel, has described climate change as a **“threat multiplier”** with “the potential to exacerbate many of the challenges we are dealing with today — from infectious disease to terrorism.” The Department of Defense has also affirmed a connection. In a 2015 report, it states, “Global climate change will aggravate problems such as **poverty**, **social tensions**, environmental degradation, **ineffectual leadership** and **weak political institutions** that threaten stability in a number of countries.” **Scientific studies have further shown a connection between the environmental crisis and violent conflicts.** For example, a 2015 paper in the Proceedings of the National Academy of Sciences argues that climate change was a causal factor behind the record-breaking 2007-2010 drought in Syria. This drought led to a mass migration of farmers into urban centers, which fueled the 2011 Syrian civil war. Some observers, including myself, have suggested that this struggle could be the beginning of World War III, given the complex tangle of international involvement and overlapping interests. The study’s conclusion is also significant because the Syrian civil war was the Petri dish in which the Islamic State consolidated its forces, later emerging as the largest and most powerful terrorist organization in human history. A Perfect Storm The point is that climate change and biodiversity loss could **very easily** push societies **to the brink of collapse**. This will exacerbate **existing geopolitical tensions** and introduce entirely **new power struggles** between state and nonstate actors. At the same time, advanced technologies will very likely become increasingly powerful and accessible. As I’ve written elsewhere, the malicious agents of the future will have bulldozers rather than shovels to dig mass graves for their enemies. The result is a perfect storm of more conflicts in the world along with unprecedentedly dangerous weapons. If the conversation were to end here, we’d have ample reason for placing climate change and biodiversity loss at the top of our priority lists. But there are other reasons they ought to be considered urgent threats. I would argue that they could make humanity more vulnerable to a catastrophe involving superintelligence and even asteroids. The basic reasoning is the same for both cases. Consider superintelligence first. Programming a superintelligence whose values align with ours is a formidable task even in stable circumstances. As Nick Bostrom argues in his 2014 book, we should recognize the “default outcome” of superintelligence to be “doom.” Now imagine trying to solve these problems amidst a rising tide of interstate wars, civil unrest, terrorist attacks, and other tragedies? The societal stress caused by climate change and biodiversity loss will almost certainly compromise important conditions for creating friendly AI, such as sufficient funding, academic programs to train new scientists, conferences on AI, peer-reviewed journal publications, and communication/collaboration between experts of different fields, such as computer science and ethics. It could even make an “AI arms race” more likely, thereby raising the probability of a malevolent superintelligence being created either on purpose or by mistake. Similarly, imagine that astronomers discover a behemoth asteroid barreling toward Earth. Will designing, building, and launching a spacecraft to divert the assassin past our planet be easier or more difficult in a world preoccupied with other survival issues? In a relatively peaceful world, one could imagine an asteroid actually bringing humanity together by directing our attention **toward a common threat**. **But** if the “**conflict multipliers**” of climate change and biodiversity loss have already **catapulted civilization** into chaos and turmoil, I strongly suspect that humanity will become more, rather than less, susceptible to dangers of this sort. Context Risks We can describe the dual threats of climate change and biodiversity loss as “context risks.” Neither is likely to directly cause the extinction of our species. But **both will define the context in which civilization confronts all the other threats** before us. In this way, they could **indirectly** contribute to the **overall danger of annihilation** — and this worrisome effect could be significant. For example, according to the Intergovernmental Panel on Climate Change, the effects of climate change will be “severe,” “pervasive,” and “irreversible.” Or, as a 2016 study published in Nature and authored by over twenty scientists puts it, the consequences of climate change “will extend longer than the entire history of human civilization thus far.” Furthermore, a recent article in Science Advances confirms that humanity has already escorted the biosphere into the sixth mass extinction event in life’s 3.8 billion year history on Earth. Yet another study suggests that we could be approaching a **sudden**, **irreversible**, catastrophic **collapse of the global ecosystem**. If this were to occur, it could result in “widespread social unrest, economic instability and loss of human life.” Given the **potential** for environmental degradation to **elevate the likelihood of nuclear wars**, **nuclear terrorism**, **engineered pandemics**, a **superintelligence takeover**, and perhaps even **an impact winter**, it ought to **take precedence over all other risk concerns**— at least in the near-term. Let’s make sure we get our priorities straight.

**Warming causes extinction**

Bill **McKibben 19**, Schumann Distinguished Scholar at Middlebury College; fellow of the American Academy of Arts and Sciences; holds honorary degrees from 18 colleges and universities; Foreign Policy named him to their inaugural list of the world’s 100 most important global thinkers. "This Is How **Human Extinction** Could Play Out." Rolling Stone. 4-9-2019. <https://www.rollingstone.com/politics/politics-features/bill-mckibben-falter-climate-change-817310/>

Oh, it could get **very bad**. In 2015, a study in the Journal of Mathematical Biology pointed out that if the world’s **oceans** kept warming, by 2100 they might become hot enough to “**stop oxygen production** by **phyto-plankton** by disrupting the process of photosynthesis.” Given that **two-thirds** of the **Earth’s oxygen** comes from phytoplankton, that would “likely result in the **mass mortality of animals and humans**.”A year later, above the Arctic Circle, in Siberia, a heat wave thawed a reindeer carcass that had been trapped in the permafrost. The exposed body released anthrax into nearby water and soil, infecting two thousand reindeer grazing nearby, and they in turn infected some humans; a twelve-year-old boy died. As it turns out, **permafrost** is a “very good preserver of **microbes** and **viruses**, because it is cold, there is no oxygen, and it is dark” — scientists have managed to revive an eight-million-year-old bacterium they found beneath the surface of a glacier. Researchers believe there are fragments of the **Spanish flu virus**, **smallpox**, and **bubonic plague** buried in Siberia and Alaska. Or consider this: as ice sheets melt, they take weight off land, and that can **trigger earthquakes** — seismic activity is already increasing in Greenland and Alaska. Meanwhile, the added weight of the new seawater starts to bend the Earth’s crust. “That will give you a **massive increase in volcanic activity**. It’ll activate faults to create earthquakes, submarine landslides, tsunamis, the whole lot,” explained the director of University College London’s Hazard Centre. Such a landslide happened in Scandinavia about eight thousand years ago, as the last Ice Age retreated and a Kentucky-size section of Norway’s continental shelf gave way, “plummeting down to the abyssal plain and creating a series of **titanic waves** that roared forth with a vengeance,” **wiping all signs of life** from coastal Norway to Greenland and “drowning the Wales-sized landmass that once connected Britain to the Netherlands, Denmark, and Germany.” When the waves hit the Shetlands, they were sixty-five feet high. There’s even this: if we keep raising carbon dioxide levels, we may not be able to think straight anymore. At a thousand parts per million (which is within the realm of possibility for 2100), human cognitive ability falls 21 percent. “The largest effects were seen for Crisis Response, Information Usage, and Strategy,” a Harvard study reported, which is too bad, as those skills are what we seem to need most. I could, in other words, do my best to scare you silly. I’m not opposed on principle — changing something as fundamental as the composition of the atmosphere, and hence the heat balance of the planet, is certain to trigger all manner of horror, and we shouldn’t shy away from it. The dramatic uncertainty that lies ahead may be the most frightening development of all; the physical world is going from backdrop to foreground. (It’s like the contrast between politics in the old days, when you could forget about Washington for weeks at a time, and politics in the Trump era, when the president is always jumping out from behind a tree to yell at you.) But let’s try to occupy ourselves with the most likely scenarios, because they are more than disturbing enough. Long before we get to tidal waves or smallpox, long before we choke to death or stop thinking clearly, we will need to concentrate on the most mundane and basic facts: everyone needs to eat every day, and an awful lot of us live near the ocean. FOOD SUPPLY first. We’ve had an amazing run since the end of World War II, with crop yields growing fast enough to keep ahead of a fast-rising population. It’s come at great human cost — displaced peasant farmers fill many of the planet’s vast slums — but in terms of sheer volume, the Green Revolution’s fertilizers, pesticides, and machinery managed to push output sharply upward. That climb, however, now seems to be running into the brute facts of heat and drought. There are studies to demonstrate the dire effects of warming on coffee, cacao, chickpeas, and champagne, but it is cereals that we really need to worry about, given that they supply most of the planet’s calories: corn, wheat, and rice all evolved as crops in the climate of the last ten thousand years, and though plant breeders can change them, there are limits to those changes. You can move a person from Hanoi to Edmonton, and she might decide to open a Vietnamese restaurant. But if you move a rice plant, it will die. A 2017 study in Australia, home to some of the world’s highest-tech farming, found that “**wheat productivity** has **flatlined** as a **direct result of climate change**.” After tripling between 1900 and 1990, wheat yields had stagnated since, as temperatures increased a degree and rainfall declined by nearly a third. “The chance of that just being variable climate without the underlying factor [of climate change] is less than one in a hundred billion,” the researchers said, and it meant that despite all the expensive new technology farmers kept introducing, “they have succeeded only in standing still, not in moving forward.” Assuming the same trends continued, yields would actually start to decline inside of two decades, they reported. In June 2018, researchers found that a two-degree Celsius rise in temperature — which, recall, is what the Paris accords are now aiming for — could cut U.S. corn yields by 18 percent. A four-degree increase — which is where our current trajectory will take us — would cut the crop almost in half. The United States is the world’s largest producer of corn, which in turn is the planet’s most widely grown crop. **Corn is vulnerable** because even a week of high temperatures at the key moment can **keep it from fertilizing**. (“You only get one chance to pollinate a quadrillion kernels of corn,” the head of a commodity consulting firm explained.) But even the hardiest crops are susceptible. Sorghum, for instance, which is a staple for half a billion humans, is particularly hardy in dry conditions because it has big, fibrous roots that reach far down into the earth. Even it has limits, though, and they are being reached. Thirty years of data from the American Midwest show that heat waves affect the “vapor pressure deficit,” the difference between the water vapor in the sorghum leaf’s interior and that in the surrounding air. Hotter weather means the sorghum releases more moisture into the atmosphere. Warm the planet’s temperature by two degrees Celsius — which is, again, now the world’s goal — and sorghum yields drop 17 percent. Warm it five degrees Celsius (nine degrees Fahrenheit), and yields drop almost 60 percent. It’s hard to imagine a topic duller than sorghum yields. It’s the precise opposite of clickbait. But **people have to eat**; in the human game, the single most important question is probably “What’s for dinner?” And when the answer is “Not much,” things **deteriorate fast**. In 2010 a severe heat wave hit Russia, and it wrecked the grain harvest, which led the Kremlin to ban exports. The global **price of wheat spiked**, and that helped **trigger the Arab Spring** — Egypt at the time was the largest wheat importer on the planet. That experience set academics and insurers to work gaming out what the next **food shock** might look like. In 2017 one team imagined a vigorous El Niño, with the attendant floods and droughts — for a season, in their scenario, corn and soy yields declined by 10 percent, and wheat and rice by 7 percent. The result was chaos: “quadrupled commodity prices, civil unrest, significant negative humanitarian consequences . . . **Food riots** break out in urban areas across the Middle East, North Africa, and Latin America. The euro weakens and the main European stock markets lose ten percent.” At about the same time, a team of British researchers released a study demonstrating that even if you can grow plenty of food, the transportation system that distributes it runs through just fourteen major choke-points, and those are vulnerable to — you guessed it — massive disruption from climate change. For instance, U.S. rivers and canals carry a third of the world’s corn and soy, and they’ve been frequently shut down or crimped by flooding and drought in recent years. Brazil accounts for 17 percent of the world’s grain exports, but heavy rainfall in 2017 stranded three thousand trucks. “It’s the glide path to a perfect storm,” said one of the report’s authors. Five weeks after that, another report raised an even deeper question. What if you can figure out how to grow plenty of food, and you can figure out how to guarantee its distribution, but the food itself has lost much of its value? The paper, in the journal Environmental Research, said that rising carbon dioxide levels, by speeding plant growth, seem to have reduced the amount of protein in basic staple crops, a finding so startling that, for many years, agronomists had overlooked hints that it was happening. But it seems to be true: when researchers grow grain at the carbon dioxide levels we expect for later this century, they find that minerals such as calcium and iron drop by 8 percent, and protein by about the same amount. In the developing world, where people rely on plants for their protein, that means huge reductions in nutrition: India alone could lose 5 percent of the protein in its total diet, putting 53 million people at new risk for protein deficiency. The loss of zinc, essential for maternal and infant health, could endanger 138 million people around the world. In 2018, rice researchers found “significantly less protein” when they grew eighteen varieties of rice in high–carbon dioxide test plots. “The idea that food became less nutritious was a surprise,” said one researcher. “It’s not intuitive. But I think we should continue to expect surprises. We are completely altering the biophysical conditions that underpin our food system.” And not just ours. People don’t depend on goldenrod, for instance, but bees do. When scientists looked at samples of goldenrod in the Smithsonian that dated back to 1842, they found that the protein content of its pollen had “declined by a third since the industrial revolution — and the change closely tracks with the rise in carbon dioxide.” Bees help crops, obviously, so that’s scary news. But in August 2018, a massive new study found something just as frightening: crop pests were thriving in the new heat. “It gets better and better for them,” said one University of Colorado researcher. Even if we hit the UN target of limiting temperature rise to two degrees Celsius, pests should cut wheat yields by 46 percent, corn by 31 percent, and rice by 19 percent. “Warmer temperatures accelerate the metabolism of insect pests like aphids and corn borers at a predictable rate,” the researchers found. “That makes them hungrier[,] and warmer temperatures also speed up their reproduction.” Even fossilized plants from fifty million years ago make the point: “**Plant damage** from insects **correlated** with rising and falling **temperatures**, reaching a maximum during the warmest periods.”

**Warming is not some future impact. Prefer us on timeframe, the effects of warming are happening now.**

**Milman** et. al. Olivia Milman is an Environment reporter at Guardian News & Media. “The Climate Disaster is Here.” Guardian. 14/10/**2021** https://www.theguardian.com/environment/ng-interactive/2021/oct/14/climate-change-happening-now-stats-graphs-maps-cop26

**This year has provided bitter evidence that even current levels of warming are disastrous**, **with astounding floods in** [**Germany**](https://www.theguardian.com/world/2021/jul/21/germany-floods-one-hundred-fifty-five-still-missing-hope-further-rescue-fade) **and** [**China**](https://www.theguardian.com/world/2021/jul/22/china-floods-military-blasts-dam-release-water-as-floods-death-toll-climbs)**, Hades-like fires from** [**Canada**](https://www.theguardian.com/world/2021/jul/25/lytton-canada-heat-wildfire-record-temperatures) **to** [**California**](https://www.theguardian.com/us-news/2021/oct/03/giant-sequoias-and-fire-have-coexisted-for-centuries-climate-crisis-is-upping-the-stakes) **to** [**Greece**](https://www.theguardian.com/world/2021/sep/30/its-like-a-war-greece-battles-increase-in-summer-wildfires) **and rain, rather than snow,** [**falling for the first time**](https://www.theguardian.com/world/2021/aug/20/rain-falls-peak-greenland-ice-cap-first-time-on-record-climate-crisis) **at the summit of a rapidly melting Greenland**. “**No amount of global warming can be considered safe and people are already dying from climate change**,” said Amanda Maycock, an expert in climate dynamics at the University of Leeds. A “heat dome” that pulverized previous temperature records in the US’s Pacific northwest and Canada's west coast in June, [killing](https://www.theguardian.com/us-news/2021/jul/08/pacific-northwest-heatwave-deaths) hundreds of people as well as a billion sea creatures [roasted alive in their shells off the coast](https://www.theguardian.com/environment/2021/jul/08/heat-dome-canada-pacific-northwest-animal-deaths), would’ve been “virtually impossible” if human activity hadn’t heated the planet, scientists have calculated, while the German floods were made [nine times more likely](https://www.theguardian.com/environment/2021/aug/23/climate-crisis-made-deadly-german-floods-up-to-nine-times-more-likely) by the climate crisis. “**The fingerprint of climate change on recent extreme weather is quite clear**,” said Michael Wehner, who specializes in climate attribution at Lawrence Berkeley National Laboratory. “But even I am surprised by the number and scale of weather disasters in 2021.” **After a Covid-induced blip last year, greenhouse gas emissions have roared back in 2021, further dampening slim hopes that the world will keep within the 1.5C limit**. “There’s a high chance we will get to 1.5C in the next decade,” said Joeri Rogelj, a climate scientist at Imperial College London. For humans, a comfortably livable planet starts to spiral away the more it heats up. **At 1.5C, about 14% of the world’s population will be hit by severe heatwaves** [**once every five years**](https://www.ipcc.ch/sr15/)**. with this number jumping to more than a third of the global population at 2C. Beyond 1.5C, the heat in tropical regions of the world will** [**push societies to the limits**](https://www.theguardian.com/science/2021/mar/08/global-heating-tropical-regions-human-livability)**, with stifling humidity preventing sweat from evaporating and making it difficult for people to cool down. Extreme heatwaves could make** [**parts of the Middle East**](https://www.theguardian.com/environment/2015/oct/26/extreme-heatwaves-could-push-gulf-climate-beyond-human-endurance-study-shows) **too hot for humans to endure, scientists have found, with rising temperatures also posing enormous risks for** [**China**](https://www.theguardian.com/environment/2018/jul/31/chinas-most-populous-area-could-be-uninhabitable-by-end-of-century) **and** [**India**](https://www.theguardian.com/environment/2017/aug/02/climate-change-to-cause-humid-heatwaves-that-will-kill-even-healthy-people). **A severe heatwave historically expected once a decade will happen every other year** [**at 2C**](https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM.pdf)**.** “**Something our great-grandparents maybe experienced once a lifetime will become a regular event,”** said Rogelj. Globally, **an extra 4.9 million people will die each year from extreme heat should the average temperature race beyond this point**, [scientists have estimated](https://www.nature.com/articles/s41598-021-99156-5). At [2C warming](https://www.wri.org/insights/half-degree-and-world-apart-difference-climate-impacts-between-15c-and-2c-warming), 99% of the world’s coral reefs also start to dissolve away, essentially ending warm-water corals. Nearly one in 10 vertebrate animals and almost one in five plants will lose half of their habitat. Ecosystems spanning corals, wetlands, alpine areas and the Arctic “are set to die off” at this level of heating, according to Rogelj. Across the planet, people are set to be strafed by cascading storms, heatwaves, flooding and drought. Around 216 million people, mostly from developing countries, will be forced to flee these impacts by 2050 unless radical action is taken, the World Bank has [estimated](https://www.reuters.com/business/environment/climate-change-could-trigger-internal-migration-216-mln-people-world-bank-2021-09-13/). As much as $23tn is on track to be [wiped from the global economy](https://www.swissre.com/institute/research/topics-and-risk-dialogues/climate-and-natural-catastrophe-risk/expertise-publication-economics-of-climate-change.html), potentially upending many more. **Some of the most dire impacts revolve around water** – both the lack of it and inundation by it. **Enormous floods, often fueled by abnormally heavy rainfall, have become a regular occurrence recently, not only in Germany and China but also from the US,** where the Mississippi River spent most of 2019 in a state of flood, to the UK, which was hit by floods in 2020 after storms delivered the equivalent of one month of rain in 48 hours, to Sudan, where flooding wiped out more than 110,000 homes last year. **Meanwhile, in the past 20 years the aggregated level of terrestrial water available to humanity has dropped at a rate of 1cm per year, with more than five billion people** [**expected to have an inadequate water supply within the next three decades**](https://library.wmo.int/index.php?lvl=notice_display&id=21963#.YWCmFEbMKu7). At 3C of warming, sea level rise from melting glaciers and ocean heat will also provide torrents of unwelcome water to coastal cities, with places such as Miami, Shanghai and Bangladesh in danger of [becoming](https://www.theguardian.com/cities/ng-interactive/2017/nov/03/three-degree-world-cities-drowned-global-warming) largely marine environments. The frequency of heavy precipitation events, the sort that soaked Germany and China, will start to climb, nearly doubling the historical norm once it heats up by 2C.

**Licensing and consultation cp**

**CP text: States out to introduce a licensing system and consultation system that decided using cost benefit analysis which would be decided 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)

**Mutual dependence on space infrastructure prevents war**

**Triezenberg 17** [Bonnie Triezenberg is a senior engineer at RAND, previously, she was the senior technical fellow at the Boeing Company, specializing in agile systems and software development, she received a B.S. in aerospace engineering from the University of Michigan, an M.S. in systems science from the University of California-Los Angeles, and a Ph.D. in policy analysis from the Pardee RAND Graduate School, “Deterring Space War,” 2017, https://www.rand.org/content/dam/rand/pubs/rgs\_dissertations/RGSD400/RGSD400/RAND\_RGSD400.pdf]

The above discussion suggests that a likely means to achieve **deterrence** of acts of **war in** outer **space** is to increase **civilian dependence** on space to support day-to-day life—if everyone on earth is equally dependent on space, no one has an incentive to destroy space. Largely by accident, this dependence **appears to have**, in fact, **occurred**. The space age was born in an age of affluence and rapid economic expansion; space quickly became a domain of international commerce as well as a domain of national military use. Space assets and the systems they enable have transformed social, infrastructure and information uses perhaps **more** visibly **than** they have transformed **military** uses. In fact, in the current satellite database published by the Union of Concerned Scientists, of the 1461 satellites in orbit 40% support purely commercial ventures, while only 16% have a strictly military use.46 The first commercial broadcast by a satellite in geo-synchronous orbit was of international news between Europe and the United States.47 The first telephony uniting the far flung islands of Indonesia was enabled by satellite48. Those of us who are old enough remember the 1960s “magic” of intercontinental phone calls and international “breaking news” delivered by satellite. Today, most social and infrastructure uses of space are taken for granted - even in remote locales of Africa, people expect to be able to monitor the weather, communicate seamlessly with colleagues and to find their way to new and unfamiliar locations using the GPS in their phones. All of us use space every day.49 These unrestricted economic and social uses of space may be the **best deterrent**, making everyone on all sides of combat **equally dependent** on space and **heightening** the **taboo** against **weaponizing space** or **threatening space assets** with weapons.

**Space conflicts won’t go nuclear**

**Smith 13** [M.V. “Coyote” Smith, Space Weapons Officer, former Air Force Missile Launch Officer and commander of an ICBM squadron, comment in the Michael Krepon article “Space and nuclear deterrence” posted on *The Space Review,* September 16, 2013, http://www.thespacereview.com/article/2367/1]

As a former Air Force Missile Launch Officer and commander of an ICBM squadron, and later as a Space Weapons Officer, I need to point out that satellites are nice to have, but not required. I need to point out that **satellites are nice to have, but not required**. Our nuclear triad was created long before satellites began contributing to military operations. In some cases, some satellites have been added to speed-up attack warning or command-and-control communications, but only by a matter of a few seconds compared to other non-space systems. Redundancy upon redundancy **was built into every aspect of our nuclear operations** from start to finish–including attack detection and command-and-control. It is a system-of-systems wherein satellites make an important contribution, but we are far from dependent upon them for nuclear operations. Even **if we suffered a complete take down of our space systems our nuclear forces would be comparatively unaffected**. **Snow storms** in the Midwest **cause more disruption** to nuclear operations **than losing satellites**. That also illustrates the beauty of the redundancy of the triad; subs don’t mind the snow like ICBMs and bombers. The important point here is that taking out all of our satellites **will not force a president’s hand** to advance our nuclear posture or calculus. A president may decide to do that, but that is not driven by the loss of satellites in relation to nuclear forces. We have done all we can to ensure that a president always has options other than nuclear. A president’s hands are not tied to a nuclear escalation ladder. Next, we are already living in the age of space warfare. Satellite signals are frequently engaged and negated for political purposed...and we define warfare as the use of engagements for political purpose. One need only review the internet traffic on Libyan or Iranian jamming of satellites (not at LEO, but all the way out to GEO) to prevent Western news or entertainment programs from reaching their people and fomenting unrest. It is not that difficult. It doesn't take a national effort. For example, the Chinese dissident group, Falun Gong, has even inserted their streaming messages over Chinese satellite TV broadcasts. Note that these are not considered the most technically advanced countries or group. A few years ago the Chinese were making a hobby out of lasing our imagery satellites. These examples should suggest the level of development of such systems around the world. Ground-based jammers, lasers, and other directed energy systems are cheap and easy compared to kinetic strike ASAT weapons, conventional or nuclear. In addition, they are difficult to attribute. Moreover, targeted countries have demonstrated a **reluctance** to **publicly admit their satellites had been attacked** or to disclose the effectiveness and scope of such attacks. Based on Libyan and Iranian performance, ground-based space weapons can deliver temporary and reversible negation effects against specific signals or sensors very precisely that do not spill over to "collateral" signals. Most of the intelligence to conduct such strikes is available on the open internet--a side-effect of the growing call for transparency among the international community. Still, we should be thankful that countries have negated satellite signals in temporary and reversible ways on orbit in lieu of resorting to lethal and destructive force against people and property on Earth--in full compliance with the Law of Armed Conflict. In fact, **we should encourage the temporary and reversible negation of satellite signals whenever doing so saves peoples lives and property.**. Who would NOT want to prevent a Middle Eastern dictator from ordering the execution of chemical weapons against his own citizens if doing so required only temporary and reversible negation of a few satellite communications signals. **Doing so could prevent a war crime atrocity and buy time for diplomatic solutions**. Hence the rising rallying cry, "Negate satellites, not people!" We find the greatest threat to space systems, however, is not from weapons, but from the commercial sector. Mobile telephone towers, fiber optic cables, street cameras, and internet ubiquity continues to undermined the value of satellite sensors and data routing. Tweets and smart phones are reporting live from the scene as situations fester and stories develop around the globe. This is cutting into the overall value of spacefaring for both military and commercial purposes. In sum, **do not tie satellites to cold war models of deterrence, and certainly do not link them or their negation to a nuclear decision tree.** Instead, think of how we can enhance the value of space systems for commercial growth.

**No space war – it’s hype and systems are redundant**

**Johnson-Freese** and Hitchens **16** [Dr. Joan Johnson-Freese is a member of the Breaking Defense Board of Contributors, a Professor of National Security Affairs at the Naval War College and author of Space Warfare in the 21st Century: Arming the Heavens. Views expressed are those of the author alone. Theresa Hitchens is a Senior Research Scholar at the Center for International and Security Studies at Maryland (CISSM), and the former Director of the United Nations Institute for Disarmament Research (UNIDIR) in Geneva, Switzerland. Stop The Fearmongering Over War In Space: The Sky’s Not Falling, Part 1. December 27, 2016. https://breakingdefense.com/2016/12/stop-the-fearmongering-over-war-in-space-the-skys-not-falling-part-1/]

In the last two years, we’ve seen rising **hysteria** over a future **war in space**. **Fanning the flames** are not only dire assessments from the US military, but also **breathless coverage** from a cooperative and **credulous press**. This reporting doesn’t only **muddy public debate** over whether we really need expensive systems. It could also become a self-fulfilling prophecy. The irony is that nothing makes the currently **slim possibility** of **war in space** more likely than fearmongering over the threat of war in space.

Two television programs in the past two years show how egregious this fearmongering can get. In April 2015, the CBS show 60 Minutes ran a segment called “The Battle Above.” In an interview with General John Hyten, the then-chief of U.S. Air Force Space Command, it came across loud and clear that the United States was being forced to prepare for a battle in space — specifically against China — that it really didn’t want.

It was explained by Hyten and other guests that China is building a considerable amount of hardware and accumulating significant know-how regarding space, all threatening to space assets Americans depend on every day. If viewers weren’t frightened after watching the segment, it wasn’t for lack of trying on the part of CBS.

Using terms like “offensive counterspace” as a 1984 NewSpeak euphemism for “weapons,” it was made clear that the United States had no choice but to spend billions of dollars on offensive counterspace technology to not just thwart the Chinese threat, but control and dominate space. While it didn’t actually distort facts — just omit facts about current U.S. space capabilities — the segment was basically a cost-free commercial for the military-industrial complex.

In retrospect though, “The Battle Above” was pretty good compared to CNN’s recent special, War in Space: The Next Battlefield. The latter might as well have been called **Sharknado in Space** – because the only far-out weapons technology our potential adversaries don’t have, according to the broadcast, seems to be “sharks with frickin’ laser beams attached to their heads!”

First, CNN needs to hire some **fact checkers**. Saying “unlike its adversaries, the U.S. has not yet weaponized space” is deeply misleading, like saying “unlike his political opponents, President-Elect Donald Trump has not sprouted wings and flown away”: A few (admittedly alarming) weapons tests aside, **no country** in the world has yet **weaponized space**. Contrary to CNN, **stock** market **transactions** are **not** timed nor synchronized through **GPS**, but a **closed system**. Cruise **missiles** can find their targets even **without GPS**, because they have both GPS and precision inertial measurement units onboard, and **IMUs don’t rely** on **sat**ellite **data**. Oh, and the British rock group Pink Floyd holds the only claim to the Dark Side of the Moon: There is a “far side” of the Moon — the side always turned away from the Earth — but not a “dark side” — which would be a side always turned away from the Sun.

More nefariously, the segment sensationalized nuggets of truth within a barrage of half-truths, backed by a heavy bass, dramatic soundtrack (and gravelly-voiced reporter Jim Sciutto) and accompanied by sexy and scary visuals.

Make no mistake there are dangers in space, and the United States has the most to lose if space assets are lost. The question is how best to protect them. Here are a few facts CNN omitted.

The Reality

The U.S. has all of the technologies described on the CNN segment and deemed potentially offensive: maneuverable satellites, nano-satellites, lasers, jamming capabilities, robotic arms, ballistic missiles that can be used as anti-satellite weapons, etc. In fact, the United States is more technologically advanced than other countries in both military and commercial space.

That technological superiority scares other countries; just as the U.S. military space community is scared of other countries obtaining those technologies in the future. The U.S. military space budget is more than 10 times greater than that of all the countries in the world combined. That also causes other countries concern.

More unsettling still, the United States has long been leery of treaty-based efforts to constrain a potential arms race in outer space, as supported by nearly every other country in the world for decades. Indeed, under the administration of George W. Bush, the U.S. talking points centered on the mantra “there is no arms race in outer space,” so there is no need for diplomat instruments to constrain one. Now, a decade later, the U.S. military – backed by the Intelligence Community which operates the nation’s spy satellites – seems to be shouting to the rooftops that the United States is in danger of losing the space arms race already begun by its potential adversaries. The underlying assumption — a convenient one for advocates of more military spending — is that now there is nothing that diplomacy can do.

However, it must be remembered that most space-related technologies – with the exception of ballistic missiles and dedicated jammers – have both military and civil/commercial uses; both benign — indeed, helpful — and nefarious uses. For example, giving satellites the ability to maneuver on orbit can allow useful inspections of ailing satellites and possibly even repairs.

Further, the **U**nited **S**tates is **not unable** to **protect** its **sat**ellite**s**, as repeated during the CNN broadcast by various interviewees and the host. Many U.S. government-owned satellites, including precious spy **sat**ellite**s**, have **capabilities to maneuver**. Many are **hardened** against **e**lectro-**m**agnetic **p**ulse, sport **“shutters”** to protect optical “eyes” from solar **flares and lasers**, and use radio **frequency hop**ping to **resist jamming**.

Offensive weapons, deployed on the ground to attack satellites, or in space, are not a silver bullet. To the contrary, U.S. deployment of such weapons may actually be detrimental to U.S. and international security in space (as we argued in a recent Atlantic Council publication, Towards a New National Security Space Strategy). Further, there are benefits to efforts started by the Obama Administration to find diplomatic tools to restrain and constrain dangerous military activities in space.

These diplomatic efforts, however, would be undercut by a full-out U.S. pursuit of “space dominance.” This includes dialogue with China, the lack of which Gen. William Shelton, retired commander of Air Force Space Command, lamented in the CNN report.

Given CNN’s “cast,” the spin was not surprising. Starting with Ghost Fleet author Peter Singer set the sensationalist tone, which never altered. The apocalyptic opening, inspired by Ghost Fleet, posited a scenario where all U.S. satellites are taken off-line in nearly one fell swoop. Unless we are talking about an alien invasion, that scenario is nigh on impossible. **No** potential **adversary** has such capabilities, nor will they **ever** likely do so. There is just **too much redundancy** in the system.

**Intervening actors check space debris – action is already happening worldwide from NASA, The UN, STSC, etc. while still allowing space exploration**

**Mirmina, Steven A.** (“Reducing the Proliferation of Orbital Debris: Alternatives to a Legally Binding Instrument.” The American Journal of International Law, vol. 99, no. 3, American Society of International Law, 2005, pp. 649–62, <https://doi.org/10.2307/1602296>. Professor Mirmina has worked as an attorney at NASA since 1999 in the International Law division of the Office of the General Counsel. Professor Mirmina has helped negotiate and conclude more than one thousand international agreements for missions across all NASA Mission Directorates)//ear

**It is in the enlightened self-interest of all entities active in outer space to reduce the proliferation of orbital debris**. **Entities such as NASA, which stands to lose human lives in the ISS and the shuttle, and the U.S. Department of Defense, whose military operations depend on the integrity of the Global Positioning System and other space-based assets, are acting in their self-interest by taking the lead and imposing orbital debris measures on themselves without waiting to be obliged to do so by an international treaty.** Nevertheless, **unilateral action will not suffice to remedy the proliferation of debris**. The three approaches suggested here-the voluntary adherence regime, the U.N.-based option, and the code of conduct-can all be taken multilaterally and on a voluntary basis. Self-imposed voluntary guidelines in the form of a code of conduct could be an appropriate first step in implementing measures aimed at reducing the orbital debris population. **The adherents to the code of conduct could later decide to make their commitments legally binding, which would foster a level playing field by requiring compliance as a condition for the award of contracts or for cooperation in joint scientific missions**. State practice would begin to develop, leading over time to the emergence of custom. Simultaneously, **cooperating space entities** (which share an interest in a safely operating space environment) **could find that they are increasingly complying with a certain standard of conduct**, leading noncomplying players to face greater pressure and embarrassment for not having lived up to the standard of a responsible space operator. **The resulting political pressure on the hold-out space operators, combined with their exclusion from major space-faring opportunities, could function as leverage to persuade them to adopt measures aimed at preserving the space environment, even at the expense of a short- term increase in cost**.