# 1NC

## 1

### 1NC – P

#### Their failure to specify an agent is a voting issue – makes mechanism counterplans and agent-based disads impossible – it’s a voter for fairness because the 1AR can spike out of DAs and CPs, which kills clash and nuance.

## 2

### 1NC – DA

#### The commercial space industry is growing now but it’s on the brink.

Weinzierl and Sarang ‘21 [Matt Weinzierl; a Professor of Business Administration at the Harvard Business School; Mehak Sarang; works with the Space Exploration Initiative, a Research Associate at Harvard Business School; 02-12-2021; “The Commercial Space Age Is Here”; Harvard Business Review; https://hbr.org/2021/02/the-commercial-space-age-is-here; Accessed 12-03-2021] AK

There’s no shortage of hype surrounding the commercial space industry. But while tech leaders promise us moon bases and settlements on Mars, the space economy has thus far remained distinctly local — at least in a cosmic sense. Last year, however, we crossed an important threshold: For the first time in human history, humans accessed space via a vehicle built and owned not by any government, but by a private corporation with its sights set on affordable space settlement. It was the first significant step towards building an economy both in space and for space. The implications — for business, policy, and society at large — are hard to overstate.

In 2019, 95% of the estimated $366 billion in revenue earned in the space sector was from the space-for-earth economy: that is, goods or services produced in space for use on earth. The space-for-earth economy includes telecommunications and internet infrastructure, earth observation capabilities, national security satellites, and more. This economy is booming, and though research shows that it faces the challenges of overcrowding and monopolization that tend to arise whenever companies compete for a scarce natural resource, projections for its future are optimistic. Decreasing costs for launch and space hardware in general have enticed new entrants into this market, and companies in a variety of industries have already begun leveraging satellite technology and access to space to drive innovation and efficiency in their earthbound products and services.

In contrast, the space-for-space economy — that is, goods and services produced in space for use in space, such as mining the Moon or asteroids for material with which to construct in-space habitats or supply refueling depots — has struggled to get off the ground. As far back as the 1970s, research commissioned by NASA predicted the rise of a space-based economy that would supply the demands of hundreds, thousands, even millions of humans living in space, dwarfing the space-for-earth economy (and, eventually, the entire terrestrial economy as well). The realization of such a vision would change how all of us do business, live our lives, and govern our societies — but to date, we’ve never even had more than 13 people in space at one time, leaving that dream as little more than science fiction.

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 (in cooperation with NASA), as well as upcoming efforts by Boeing, Blue Origin, and Virgin Galactic 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.

#### Maintaining it is key to crisis response, crop monitoring, and innovation.

Joshua Hampson 17. Security Studies Fellow The Niskanen Center. “The Future of Space Commercialization.” Niskanen Center. 1/25/2017. https://republicans-science.house.gov/sites/republicans.science.house.gov/files/documents/TheFutureofSpaceCommercializationFinal.pdf

The size of the space economy is far larger than many may think. In 2015 alone, the global market amounted to $323 billion. Commercial infrastructure and systems accounted for 76 percent of that 9 total, with satellite television the largest subsection at $95 billion. The global space launch market’s 10 11 share of that total came in at $6 billion dollars. It can be hard to disaggregate how space benefits 12 particular national economies, but in 2009 (the last available report), the Federal Aviation Administration (FAA) estimated that commercial space transportation and enabled industries generated $208.3 billion in economic activity in the United States alone. Space is not just about 13 satellite television and global transportation; while not commercial, GPS satellites also underpin personal navigation, such as smartphone GPS use, and timing data used for Internet coordination.14 Without that data, there could be problems for a range of Internet and cloud-based services.15

There is also room for growth. The FAA has noted that while the commercial launch sector has not grown dramatically in the last decade, there are indications that there is latent demand. This 16 demand may catalyze an increase in launches and growth of the wider space economy in the next decade. The Satellite Industry Association’s 2015 report highlighted that their section of the space economy outgrew both the American and global economies. The FAA anticipates that growth to 17 continue, with expectations that small payload launch will be a particular industry driver.18

In the future, emerging space industries may contribute even more the American economy. Space tourism and resource recovery—e.g., mining on planets, moons , and asteroids—in particular may become large parts of that industry. Of course, their viability rests on a range of factors, including costs, future regulation, international problems, and assumptions about technological development. However, there is increasing optimism in these areas of economic production. But the space economy is not just about what happens in orbit, or how that alters life on the ground. The growth of this economy can also contribute to new innovations across all walks of life.

Technological Innovation

Innovation is generally hard to predict; some new technologies seem to come out of nowhere and others only take off when paired with a new application. It is difficult to predict the future, but it is reasonable to expect that a growing space economy would open opportunities for technological and organizational innovation.

In terms of technology, the difficult environment of outer space helps incentivize progress along the margins. Because each object launched into orbit costs a significant amount of money—at the moment between $27,000 and $43,000 per pound, though that will likely drop in the future —each 19 reduction in payload size saves money or means more can be launched. At the same time, the ability to fit more capability into a smaller satellite opens outer space to actors that previously were priced out of the market. This is one of the reasons why small, affordable satellites are increasingly pursued by companies or organizations that cannot afford to launch larger traditional satellites. These small 20 satellites also provide non-traditional launchers, such as engineering students or prototypers, the opportunity to learn about satellite production and test new technologies before working on a full-sized satellite. That expansion of developers, experimenters, and testers cannot but help increase innovation opportunities.

Technological developments from outer space have been applied to terrestrial life since the earliest days of space exploration. The National Aeronautics and Space Administration (NASA) maintains a website that lists technologies that have spun off from such research projects. Lightweight 21 nanotubes, useful in protecting astronauts during space exploration, are now being tested for applications in emergency response gear and electrical insulation. The need for certainty about the resiliency of materials used in space led to the development of an analytics tool useful across a range of industries. Temper foam, the material used in memory-foam pillows, was developed for NASA for seat covers. As more companies pursue their own space goals, more innovations will likely come from the commercial sector.

Outer space is not just a catalyst for technological development. Satellite constellations and their unique line-of-sight vantage point can provide new perspectives to old industries. Deploying satellites into low-Earth orbit, as Facebook wants to do, can connect large, previously-unreached swathes of 22 humanity to the Internet. Remote sensing technology could change how whole industries operate, such as crop monitoring, herd management, crisis response, and land evaluation, among others. 23 While satellites cannot provide all essential information for some of these industries, they can fill in some useful gaps and work as part of a wider system of tools. Space infrastructure, in helping to change how people connect and perceive Earth, could help spark innovations on the ground as well. These innovations, changes to global networks, and new opportunities could lead to wider economic growth.

#### Tech innovation solves every existential threat – cumulative extinction events outweigh the aff

Dylan Matthews 18. Co-founder of Vox, citing Nick Beckstead @ Rutgers University. 10-26-2018. "How to help people millions of years from now." Vox. https://www.vox.com/future-perfect/2018/10/26/18023366/far-future-effective-altruism-existential-risk-doing-good

If you care about improving human lives, you should overwhelmingly care about those quadrillions of lives rather than the comparatively small number of people alive today. The 7.6 billion people now living, after all, amount to less than 0.003 percent of the population that will live in the future. It’s reasonable to suggest that those quadrillions of future people have, accordingly, hundreds of thousands of times more moral weight than those of us living here today do. That’s the basic argument behind Nick Beckstead’s 2013 Rutgers philosophy dissertation, “On the overwhelming importance of shaping the far future.” It’s a glorious mindfuck of a thesis, not least because Beckstead shows very convincingly that this is a conclusion any plausible moral view would reach. It’s not just something that weird utilitarians have to deal with. And Beckstead, to his considerable credit, walks the walk on this. He works at the Open Philanthropy Project on grants relating to the far future and runs a charitable fund for donors who want to prioritize the far future. And arguments from him and others have turned “long-termism” into a very vibrant, important strand of the effective altruism community. But what does prioritizing the far future even mean? The most literal thing it could mean is preventing human extinction, to ensure that the species persists as long as possible. For the long-term-focused effective altruists I know, that typically means identifying concrete threats to humanity’s continued existence — like unfriendly artificial intelligence, or a pandemic, or global warming/out of control geoengineering — and engaging in activities to prevent that specific eventuality. But in a set of slides he made in 2013, Beckstead makes a compelling case that while that’s certainly part of what caring about the far future entails, approaches that address specific threats to humanity (which he calls “targeted” approaches to the far future) have to complement “broad” approaches, where instead of trying to predict what’s going to kill us all, you just generally try to keep civilization running as best it can, so that it is, as a whole, well-equipped to deal with potential extinction events in the future, not just in 2030 or 2040 but in 3500 or 95000 or even 37 million. In other words, caring about the far future doesn’t mean just paying attention to low-probability risks of total annihilation; it also means acting on pressing needs now. For example: We’re going to be better prepared to prevent extinction from AI or a supervirus or global warming if society as a whole makes a lot of scientific progress. And a significant bottleneck there is that the vast majority of humanity doesn’t get high-enough-quality education to engage in scientific research, if they want to, which reduces the odds that we have enough trained scientists to come up with the breakthroughs we need as a civilization to survive and thrive. So maybe one of the best things we can do for the far future is to improve school systems — here and now — to harness the group economist Raj Chetty calls “lost Einsteins” (potential innovators who are thwarted by poverty and inequality in rich countries) and, more importantly, the hundreds of millions of kids in developing countries dealing with even worse education systems than those in depressed communities in the rich world. What if living ethically for the far future means living ethically now? Beckstead mentions some other broad, or very broad, ideas (these are all his descriptions): Help make computers faster so that people everywhere can work more efficiently Change intellectual property law so that technological innovation can happen more quickly Advocate for open borders so that people from poorly governed countries can move to better-governed countries and be more productive Meta-research: improve incentives and norms in academic work to better advance human knowledge Improve education Advocate for political party X to make future people have values more like political party X ”If you look at these areas (economic growth and technological progress, access to information, individual capability, social coordination, motives) a lot of everyday good works contribute,” Beckstead writes. “An implication of this is that a lot of everyday good works are good from a broad perspective, even though hardly anyone thinks explicitly in terms of far future standards.” Look at those examples again: It’s just a list of what normal altruistically motivated people, not effective altruism folks, generally do. Charities in the US love talking about the lost opportunities for innovation that poverty creates. Lots of smart people who want to make a difference become scientists, or try to work as teachers or on improving education policy, and lord knows there are plenty of people who become political party operatives out of a conviction that the moral consequences of the party’s platform are good. All of which is to say: Maybe effective altruists aren’t that special, or at least maybe we don’t have access to that many specific and weird conclusions about how best to help the world. If the far future is what matters, and generally trying to make the world work better is among the best ways to help the far future, then effective altruism just becomes plain ol’ do-goodery.\*

## 3

### 1NC – CP

#### CP: States should fund a public-private partnership for the appropriation of outer space.

Galeon 17 [(Dom, writer for Futurism), “SpaceX Asks the U.S. To Fund a Public-Private Partnership for Deep Space Exploration,” July 14, 2017, <https://futurism.com/spacex-asks-the-u-s-to-fund-a-public-private-partnership-for-deep-space-exploration>] TDI

SpaceX Asks the U.S. To Fund a Public-Private Partnership for Deep Space Exploration The best chance of success could come from pooling our resources. / Off World/ Deep Space Exploration/ NASA/ Public Private Partnerships SpaceX/Flickr Image by SpaceX/Flickr WORKING TOGETHER Some 10 years back now, the National Aeronautics and Space Administration (NASA) decided to work with private space companies to ferry people and cargo to the International Space Station (ISS). At the time, the space agency perhaps didn’t expect that it was heralding in a new era in space exploration. Both NASA and private agencies like SpaceX and Blue Origin have benefited from the collaboration. The former is able to save on costs, while the latter get to pursue their own individual programs, such as perfecting their reusable rocket technologies for commercial use. Without this partnership, these companies would not have been able to grow and develop at the same rate. Thus far, the joint missions have been limited to just orbital and near-orbit launches, like the Commercial Orbital Transportation Services (COTS) program, but SpaceX wants that to change. At a hearing of the U.S. Senate’s Subcommittee on Space, Science, and Competitiveness on Thursday, SpaceX’s senior vice president for global business and government affairs Tim Hughes asked the U.S. government to open up deep space exploration for similar public-private partnerships. “The principles applied in past programs for low Earth orbit capability can and should be applied to deep space exploration,” he said, referencing the COTS program. ADVERTISEMENT A DEEP SPACE FUTURE In order for the U.S. and for humankind to establish a more permanent presence in space, Hughes asserts that the government should fund a COTS-like program for deep space. It won’t really be a matter of funding the competition, he argued, because the program could run parallel to NASA’s existing deep space exploration plans, such as the Space Launch System (SLS) and the Orion spacecraft. Living Off The Land: A Guide To Settling Mars [Infographic] Click to View Full Infographic “I think [these] can be readily supplemented with public-private partnerships to allow us to sustain a permanent presence in space,” said Hughes. NASA could impose “high level requirements” for this deep space partnership, just like it does with COTS, Hughes added. The partnership could prove particularly beneficial for NASA right now given the recent reports saying it doesn’t have the funding needed for its Mars mission. Of course, as with any change, push back is to be expected. For one, more established aerospace firms that already work with NASA — Lockheed Martin and Boeing, among others — might not be in favor of this idea. The important thing, however, is to realize that deep space exploration is an entirely different ballgame than missions in near-Earth orbit, and the best chance of success may come from pooling our resources.

#### The CP turns the aff and prevents stifling of innovation.

Van Burken 20 [(Rebecca, technology policy analyst at Reason Foundation) “Biden Can Utilize Space Companies and Public-Private Partnerships,” December 14, 2020 https://reason.org/commentary/biden-can-utilize-space-companies-and-public-private-partnerships/] TDI

Biden Can Utilize Space Companies and Public-Private Partnerships The commercial space industry is making NASA's operations more cost-effective and encouraging innovation. By Rebecca van Burken December 14, 2020 President-elect Joe Biden will predictably distance himself from many of the Trump administration’s policies and positions, but its openness to commercial space partnerships should not be among them. The expansion of public-private space partnerships that began during the Obama administration has continued during the Trump administration. These public-private partnerships have helped lead to many major space successes, including crewed-launches returning to American soil through SpaceX and the first-ever civilian passenger on a private suborbital spaceflight as part of Virgin Galactic’s 2019 VSS Unity SpaceShipTwo launch. These successes, and others, reflect positively on the U.S. space sector. However, they would not have happened without the entrepreneurial nature of commercial space. Unlike government engineers and scientists, commercial space operations are not constrained by government bureaucracy nor reliant on taxpayer funding. This allows commercial space companies to explore some seemingly far-fetched ideas, like 3D printing of small rockets, a concept being pioneered by the small start-up Relativity. Commercial space companies must also develop and maintain a competitive edge to survive in the market. Significant competition ultimately creates less-costly services that give NASA more bang for its buck when developing new technology. Competitive market pressures have created inspiring innovation exemplified by SpaceX’s reusable rocket technology and proposals for recycling and turning discarded orbiting tanks into space stations. Without the federal government’s continued openness to commercial space, innovation, and invention in the U.S. space industry could be stifled. Commercial space continues to show up when the government needs new services. Over the last few years, we have seen amazing new technologies developed to track environmental and climate concerns. This is, in part, because NASA has entered into deals with private companies like Planet that are able to analyze data collected by satellite imagery. Planet has stakes in defense satellite imagery but has expanded its portfolio to collect data for climate scientists and researchers to use. Its constellation of 120 satellites is at work photographing every portion of the world at least once a day, which provides constant and up-to-date environmental information. By maintaining deals like that with commercial satellite companies, NASA can avoid the costs of creating its own satellite constellation and other remote sensing technology. Additionally, NASA does not need to focus its energies on updating technologies to keep up with new software and technological capabilities. Companies that worry about competition in the market naturally reassess their services and the burden of doing this should be put on private industry, not on the government. Biden’s team should seek out the most effective private partners, hiring new talent in civil programs to use these systems. This would also free up funding for crewed space exploration. In addition to looking to develop new partnerships for space-related efforts, a Biden administration should reassess the government’s old partnerships. Prior to the election, Reuters reported that some Biden associates believe he may try to continue funding the International Space Station (ISS) beyond its planned termination in 2025. Reuters reported: …Biden, on the other hand, would likely call for a delayed moonshot and propose a funding extension for the International Space Station if he wins the White House, according to people familiar with the fledging Biden space agenda.Pushing back the moon mission could cast more doubt on the long-term fate of Boeing Co’s Space Launch System (SLS) rocket, just as Elon Musk’s SpaceX and Jeff Bezos’ Blue Origin scramble to bring rival rockets to market as soon as next year. Extending support for the space station for a decade would also be a major boost for Boeing, whose $225 million annual ISS operations contract is set to expire in 2024 and is at the depths of a financial crisis caused by the COVID-19 pandemic and the 737 MAX grounding after fatal crashes. This directly contradicts the Trump administration’s efforts to cease funding for the archaic space station by 2025. If Biden were to continue funding this aging facility via NASA it would drain funds that could be used for more important space activities, including manned missions. Commercial companies are primed and ready to take over the space station’s functions, and NASA should allow them to do so. If Biden has taxpayers and NASA continue to fund the ISS, it would most likely continue to contract with a company that famous for draining government money—Boeing. The partnerships with Boeing are the types of space policies the incoming Biden administration should be reviewing. It should ask Congress for a Government Accountability Office audit of Boeing’s work on the Space Launch System (SLS). The contract is for the development of a rocket with heavy-lift capacities that is designed to bring humans and cargo to the moon and back. Unfortunately, it has had numerous delays and cost overruns and is still not ready for a test flight, as Bloomberg reported in August: Boeing Co.’s Space Launch System, the largest rocket in NASA’s history, will carry a price tag of at least $9.1 billion — or 30% more than the previous estimate for a key element in the agency’s plan to return to the moon. Additionally, the costs for new ground infrastructure at Florida’s Kennedy Space Center to support the deep-space exploration program has jumped to $2.4 billion, Kathy Lueders, NASA’s associate administrator for human spaceflight, said in a blog post Wednesday. That’s also a 30% increase, the National Aeronautics and Space Administration said in an email Thursday. While we wait for Boeing to reuse obsolete space shuttle hardware on SLS, companies like Blue Origin and SpaceX are continually reusing entire launch boosters. Biden’s administration needs a real review of whether it would be more cost and time effective to work with companies like SpaceX or Blue Origin. SLS is estimated to cost NASA $1 billion or more for each launch, after having already consumed $18.3 billion since 2010. By contrast, SpaceX has had its self-funded heavy-lift rocket Starship in development since 2012 and has been doing successful prototype tests since 2019. Another space entity that will be a key issue for the Biden administration is the military agency, U.S. Space Force, created by President Trump. Reason magazine had detailed the numerous reasons a Space Force should not have been created. Now that it does exist, the Space Force should be viewed as an agency that does not need to spend taxpayers’ money to create its own technology for its missions. Instead, it should use the readily available market of commercial partners ready to contract services. Space News recently reported that Space Force is just now learning of the private sector’s capabilities: [Gen. John “Jay”] Raymond said in years past the only commercially viable services have been space launch and communications provided by geosynchronous satellites. But the Space Force is now becoming aware of other capabilities that are being offered commercially such as space tracking data, weather data and on-orbit satellite servicing. Raymond, chief of operations for Space Force, has previously committed to working closely with commercial satellite companies for space-related missions. Col. Michael “Hopper” Hopkins, commander of NASA’s SpaceX Crew-1 mission, was commissioned into the Space Force and began a new line of Space Force officers expected to launch to the ISS. To facilitate continued partnerships between Space Force and private enterprise, the Biden administration could back an initiative currently proposed to Congress that Space Force acquisitions be “speedy and agile.” Flexibility for Space Force would include pushing acquisition power to the lowest level of management and removing bureaucracy to make its programs more efficient. We are at a pivotal moment in the space industry’s history. The federal government has the opportunity to partner with space industry innovators like Elon Musk, Jeff Bezos, and Richard Branson, and ensure there’s the opportunity for new space startups to emerge and add value to the market. The other path, a government and NASA-centric approach to space, would likely stifle technological developments and breakthroughs by private companies, cost taxpayers a lot more money, and cause the United States to fall behind other nations in a number of key areas.

## 4

### 1NC – CP

#### CP: States should ban the appropriation of outer space by private entities except for space mining.

#### It competes – “appropriation” includes claims to natural resources.

Amanda M. Leon, Associate\*, Caplin & Drysdale, Chtd., ’18, Virginia Law Review [“MINING FOR MEANING: AN EXAMINATION OF THE LEGALITY OF PROPERTY RIGHTS IN SPACE RESOURCES” Vol. 104:497 2018] TDI

Appropriation. The term “appropriation” also remains ambiguous. Webster’s defines the verb “appropriate” as “to take to oneself in exclusion of others; to claim or use as by an exclusive or pre-eminent right; as, let no man appropriate a common benefit.”165 Similarly, Black’s Law Dictionary describes “appropriate” as an act “[t]o make a thing one’s own; to make a thing the subject of property; to exercise dominion over an object to the extent, and for the purpose, of making it subserve one’s own proper use or pleasure.”166 Oftentimes, appropriation refers to the setting aside of government funds, the taking of land for public purposes, or a tort of wrongfully taking another’s property as one’s own. The term appropriation is often used not only with respect to real property but also with water. According to U.S. case law, a person completes an appropriation of water by diversion of the water and an application of the water to beneficial use.167 This common use of the term “appropriation” with respect to water illustrates two key points: (1) the term applies to natural resources—e.g., water or minerals—not just real property, and (2) mining space resources and putting them to beneficial use—e.g., selling or manufacturing the mined resources— could reasonably be interpreted as an “appropriation” of outer space. While the ordinary meaning of “appropriation” reasonably includes the taking of natural resources as well as land, whether the drafters and parties to the OST envisioned such a broad meaning of the term remains difficult to determine with any certainty. The prohibition against appropriation “by any other means” supports such a reading, though, by expanding the prohibition to other types not explicitly described.168 As illustrated by this analysis, considerable ambiguity remains after this ordinary-meaning analysis and thus, the question of Treaty obligations and property rights remains unresolved. In order to resolve these ambiguities, an analysis of preparatory materials, historical context, and state practice follows.

#### Space mining releases less emissions than Earth-based mining by a *LOT*

Emerging Technology 18, 10-19-2018, "Asteroid mining might actually be better for the environment," MIT Technology Review, <https://www.technologyreview.com/2018/10/19/139664/asteroid-mining-might-actually-be-better-for-the-environment/>]//pranav

But profit margins are only part of the picture. A potentially more significant aspect of these missions is the impact they will have on Earth’s environment. But nobody has assessed this environmental impact in detail. Today, that changes thanks to the work of Andreas Hein and colleagues at the University of Paris-Saclay in France. These guys have calculated the greenhouse-gas emissions from asteroid-mining operations and compared them with the emissions from similar Earth-based activities. Their results provide some eyebrow-raising insights into the benefits that asteroid mining might provide. The calculations are relatively straightforward. Rocket launches release significant amounts of greenhouse gases into the atmosphere. The fuel on board the first stage of a rocket burns in Earth’s atmosphere to form carbon dioxide. For kerosene-burning rockets, one kilogram of fuel creates three kilograms of CO2. (The second and third stages operate outside the Earth’s atmosphere and so can be ignored.) Reentries are just as damaging. That’s because a significant mass of a re-entering vehicle ablates in the upper atmosphere, producing NOx such as nitrous oxide (N2O), a greenhouse gas that is about 300 times more potent than CO2. By one estimate, the space shuttle released about 20% of its mass in the form of N2O every time it returned to Earth. Hein and co use these numbers to calculate that a kilogram of platinum mined from an asteroid would release some 150 kilograms of CO2 into Earth’s atmosphere. However, economies of scale from large asteroid-mining operations could lower this to about 60 kilograms of CO2 per kilogram of platinum. That needs to be compared with the emission from Earth-based mining. Here, platinum mining generates significant greenhouse gases, mostly from the energy it takes to remove this stuff from the ground. Indeed, the numbers are huge. The mining industry estimates that producing one kilogram of platinum on Earth releases around 40,000 kilograms of carbon dioxide. “The global warming effect of Earth-based mining is several orders of magnitude larger,” say Hein and co. The figures for water are also encouraging. In this case, the authors calculate the greenhouse-gas emissions from an asteroid-mining operation that returns water to anywhere within the moon’s orbit, a so-called cis-lunar orbit. They compare this to the emissions from sending the same volume of water from Earth into orbit. The big difference is that a water-carrying vehicle from Earth can haul only a small percentage of its mass as water. But an asteroid-mining spacecraft can transport a significant multiple of its mass as water to cis-lunar orbit. “Substantial savings in greenhouse gas emissions can be achieved,” say Hein and co. This interesting work should help to focus minds on the environmental impacts of mining, which are rapidly increasing in profile. But it is only a first step. There is significant uncertainty in the numbers here, so these will need to be better understood.

**Warming causes extinction & turns every impact – no adaptation & each degree is worse**

**Krosofsky ’21** [Andrew, Green Matters Journalist, “How Global Warming May Eventually Lead to Global Extinction”, Green Matters, 03-11-2021, https://www.greenmatters.com/p/will-global-warming-cause-extinction]//pranav

Eventually, yes. **Global warming will invariably result in the mass extinction of millions of different species,** humankind included. In fact, **the Center for Biological Diversity says that global warming is currently the greatest threat to life on this planet**. **Global warming causes a number of detrimental effects on the environment that many species won’t be able to handle long-term**. Extreme weather patterns are shifting climates across the globe, eliminating habitats and altering the landscape. **As a result, food and fresh water sources are being drastically reduced**. Then, of course, **there are the rising global temperatures themselves, which many species are physically unable to contend with**. Formerly frozen arctic and antarctic regions are melting, increasing sea levels and temperatures. Eventually, **these effects will create a perfect storm of extinction conditions**. The melting glaciers of the arctic and the searing, **unmanageable heat indexes being seen along the Equator are just the tip of the iceberg, so to speak.** **The species that live in these climate zones have already been affected by the changes caused by global warming.** Take polar bears for example, whose habitats and food sources have been so greatly diminished that they have been forced to range further and further south. **Increased carbon dioxide levels in the atmosphere and oceans have already led to ocean acidification**. **This has caused many species of crustaceans to either adapt or perish and has led to the mass bleaching of more than 50 percent of Australia’s Great Barrier Reef**, according to National Geographic. According to the Center for Biological Diversity, the current trajectory of global warming predicts that more than 30 percent of Earth’s plant and animal species will face extinction by 2050. By the end of the century, that number could be as high as 70 percent. We won’t try and sugarcoat things, humanity’s own prospects aren’t looking that great either. According to The Conversation, **our species has just under a decade left to get our CO₂ emissions under control. If we don’t cut those emissions by half before 2030, temperatures will rise to potentially catastrophic levels. It may only seem like a degree or so, but the worldwide ramifications are immense.** The human species is resilient. We will survive for a while longer, even if these grim global warming predictions come to pass, **but it will mean less food, less water, and increased hardship across the world — especially in low-income areas and developing countries. This increase will also mean more pandemics, devastating storms, and uncontrollable wildfires**.

#### Commercial mining solves extinction from scarcity, climate, terror, war, and disease.

Pelton 17—(Director Emeritus of the Space and Advanced Communications Research Institute at George Washington University, PHD in IR from Georgetown).. Pelton, Joseph N. 2017. The New Gold Rush: The Riches of Space Beckon! Springer. Accessed 8/30/19.

Are We Humans Doomed to Extinction? What will we do when Earth’s resources are used up by humanity? The world is now hugely over populated, with billions and billions crammed into our overcrowded cities. By 2050, we may be 9 billion strong, and by 2100 well over 11 billion people on Planet Earth. Some at the United Nations say we might even be an amazing 12 billion crawling around this small globe. And over 80 % of us will be living in congested cities. These cities will be ever more vulnerable to terrorist attack, natural disaster, and other plights that come with overcrowding and a dearth of jobs that will be fueled by rapid automation and the rise of artifi cial intelligence across the global economy. We are already rapidly running out of water and minerals. Climate change is threatening our very existence. Political leaders and even the Pope have cautioned us against inaction. Perhaps the naysayers are right. All humanity is at tremendous risk. Is there no hope for the future? This book is about hope. We think that there is literally heavenly hope for humanity. But we are not talking here about divine intervention. We are envisioning a new space economy that recognizes that there is more water in the skies that all our oceans. Th ere is a new wealth of natural resources and clean energy in the reaches of outer space—more than most of us could ever dream possible. There are those that say why waste money on outer space when we have severe problems here at home? Going into space is not a waste of money. It is our future. It is our hope for new jobs and resources. The great challenge of our times is to reverse public thinking to see space not as a resource drain but as the doorway to opportunity. The new space frontier can literally open up a “gold rush in the skies.” In brief, we think there is new hope for humanity. We see a new a pathway to the future via new ventures in space. For too long, space programs have been seen as a money pit. In the process, we have overlooked the great abundance available to us in the skies above. It is important to recognize there is already the beginning of a new gold rush in space—a pathway to astral abundance. “New Space” is a term increasingly used to describe radical new commercial space initiatives—many of which have come from Silicon Valley and often with backing from the group of entrepreneurs known popularly as the “space billionaires.” New space is revolutionizing the space industry with lower cost space transportation and space systems that represent significant cost savings and new technological breakthroughs. “New Commercial Space” and the “New Space Economy” represent more than a new way of looking at outer space. These new pathways to the stars could prove vital to human survival. If one does not believe in spending money to probe the mysteries of the universe then perhaps we can try what might be called “calibrated greed” on for size. One only needs to go to a cubesat workshop, or to Silicon Valley or one of many conferences like the “Disrupt Space” event in Bremen, Germany, held in April 2016 to recognize that entrepreneurial New Space initiatives are changing everything [ 1 ]. In fact, the very nature and dimensions of what outer space activities are today have changed forever. It is no longer your grandfather’s concept of outer space that was once dominated by the big national space agencies. The entrepreneurs are taking over. The hopeful statements in this book and the hard economic and technical data that backs them up are more than a minority opinion. It is a topic of growing interest at the World Economic Forum, where business and political heavyweights meet in Davos, Switzerland, to discuss how to stimulate new patterns of global economic growth. It is even the growing view of a group that call themselves “space ethicists.” Here is how Christopher J. Newman, at the University of Sunderland in the United Kingdom has put it: Space ethicists have offered the view that space exploration is not only desirable; it is a duty that we, as a species, must undertake in order to secure the survival of humanity over the longer term. Expanding both the resource base and, eventually, the habitats available for humanity means that any expenditure on space exploration, far from being viewed as frivolous, can legitimately be rationalized as an ethical investment choice. (Newman) On the other hand there are space ethicists and space exobiologists who argue that humans have created ecological ruin on the planet—and now space debris is starting to pollute space. Th ese countervailing thoughts by the “no growth” camp of space ethicists say we have no right to colonize other planets or to mine the Moon and asteroids—or at least no right to do so until we can prove we can sustain life here on Earth for the longer term. However, for most who are planning for the new space economy the opinion of space philosophers doesn’t really fl oat their boat. Legislators, bankers, and aspiring space entrepreneurs are far more interested in the views of the super-rich capitalists called the space billionaires. A number of these billionaires and space executives have already put some very serious money into enterprises intent on creating a new pathway to the stars. No less than five billionaires with established space ventures—Elon Musk, Paul Allen, Jeff Bezos, Sir Richard Branson, and Robert Bigelow—have invested millions if not billions of dollars into commercializing space. They are developing new technologies and establishing space enterprises that can bring the wealth of outer space down to Earth. This is not a pipe dream, but will increasingly be the economic reality of the 2020s. These wealthy space entrepreneurs see major new economic opportunities. To them space represents the last great frontier for enterprising pioneers. Th us they see an ever-expanding space frontier that offers opportunities in low-cost space transportation, satellite solar power satellites to produce clean energy 24h a day, space mining, space manufacturing and production, and eventually space habitats and colonies as a trajectory to a better human future. Some even more visionary thinkers envision the possibility of terraforming Mars, or creating new structures in space to protect our planet from cosmic hazards and even raising Earth’s orbit to escape the rising heat levels of the Sun in millennia to come. Some, of course, will say this is sci-fi hogwash. It can’t be done. We say that this is what people would have said in 1900 about airplanes, rocket ships, cell phones and nuclear devices. The skeptics laughed at Columbus and his plan to sail across the oceans to discover new worlds. When Thomas Jefferson bought the Louisiana Purchase from France or Seward bought Alaska, there were plenty of naysayers that said such investment in the unknown was an extravagant waste of money. A healthy skepticism is useful and can play a role in economic and business success. Before one dismisses the idea of an impending major new space economy and a new gold rush, it might useful to see what has already transpired in space development in just the past five decades. The world’s first geosynchronous communications satellite had a throughput capability of about 500 kb / s. In contrast, today’s state of the art Viasat 2 —a half century later— has an impressive throughput of some 140 Gb/s. Th is means that the relative throughput is nearly 300,000 greater, while its lifetime is some ten times longer (Figs. 1.1 and 1.2 ). Each new generation of communications satellite has had more power, better antenna systems, improved pointing and stabilization, and an extended lifetime. And the capabilities represented by remote sensing satellites , meteorological satellites , and navigation and timing satellites have also expanded their capabilities and performance in an impressive manner. When satellite applications first started, the market was measured in millions of dollars. Today commercial satellite services exceed a quarter of a billion dollars. Vital services such as the Internet, aircraft traffi c control and management, international banking, search and rescue and much, much more depend on application satellites. Th ose that would doubt the importance of satellites to the global economy might wish to view on You Tube the video “If Th ere Were a Day Without Satellites?” [ 2 ]. Let’s check in on what some of those very rich and smart guys think about the new space economy and its potential. (We are sorry to say that so far there are no female space billionaires, but surely this, too, will come someday soon.) Of course this twenty-fi rst century breakthrough that we call the New Space economy will not come just from new space commerce. It will also come from the amazing new technologies here on Earth. Vital new terrestrial technologies will accompany this cosmic journey into tomorrow. Information technology, robotics, artificial intelligence and commercial space travel systems have now set us on a course to allow us humans to harvest the amazing riches in the skies—new natural resources, new energy, and even totally new ways of looking at the purpose of human existence. If we pursue this course steadfastly, it can be the beginning of a New Space renaissance. But if we don’t seek to realize our ultimate destiny in space, Homo sapiens can end up in the dustbin of history—just like literally millions of already failed species. In each and every one of the five mass extinction events that have occurred over the last 1.5 billion years on Earth, some 50–80 % of all species have gone the way of the T. Rex, the woolly mammoth, and the Dodo bird along with extinct ferns, grasses and cacti. On the other hand, the best days of the human race could be just beginning. If we are smart about how we go about discovering and using these riches in the skies and applying the best of our new technologies, it could be the start of a new beginning for humanity. Konstantin Tsiokovsky, the Russian astronautics pioneer, who fi rst conceived of practical designs for spaceships, famously said: “A planet is the cradle of mankind, but one cannot live in a cradle forever.” Well before Tsiokovsky another genius, Leonardo da Vinci, said, quite poetically: “Once you have tasted flight, you will forever walk the earth with your eyes turned skyward, for there you have been, and there you will always long to return.” The founder of the X-Prize and of Planetary Resources, Inc., Dr. Peter Diamandis, has much more brashly said much the same thing in quite diff erent words when he said: “The meek shall inherit the Earth. The rest of us will go to Mars.” The New Space Billionaires Peter Diamandis is not alone in his thinking. From the list of “visionaries” quoted earlier, Elon Musk, the founder of SpaceX; Sir Richard Branson, the founder of Virgin Galactic; and Paul Allen, the co-founder of Microsoft and the man who financed SpaceShipOne, the world’s first successful spaceplane have all said the future will include a vibrant new space economy. Th ey, and others, have said that we can, we should and we soon shall go into space and realize the bounty that it can offer to us. Th e New Space enterprise is today indeed being led by those so-called space billionaires , who have an exciting vision of the future. They and others in the commercial space economy believe that the exploitation of outer space may open up a new golden age of astral abundance. They see outer space as a new frontier that can be a great source of new materials, energy and various forms of new wealth that might even save us from excesses of the past. Th is gold rush in the skies represents a new beginning. We are not talking about expensive new space ventures funded by NASA or other space agencies in Europe, Japan, China or India. No, these eff orts which we and others call New Space are today being forged by imaginative and resourceful commercial entrepreneurs. Th ese twenty-fi rst century visionaries have the fortitude and zeal to look to the abundance above. New breakthroughs in technology and New Space enterprises may be able to create an “astral life raft” for humanity. Just as Columbus and the Vikings had the imaginative drive that led them to discover the riches of a new world, we now have a cadre of space billionaires that are now leading us into this New Space era of tomorrow. These bold leaders, such as Paul Allen and Sir Richard Branson, plus other space entrepreneurs including Jeff Bezos of Amazon and Blue Origin, and Robert Bigelow, Chairman of Budget Suites and Bigelow Aerospace, not only dream of their future in the space industry but also have billions of dollars in assets. These are the bright stars of an entirely new industry that are leading us into the age of New Space commerce. These space billionaires, each in their own way, are proponents of a new age of astral abundance. Each of them is launching new commercial space industries. They are literally transforming our vision of tomorrow. These new types of entrepreneurial aerospace companies—the New Space enterprises—give new hope and new promise of transforming our world as we know it today. The New Space Frontier What happens in space in the next few decades, plus corresponding new information technologies and advanced robotics, will change our world forever. These changes will redefi ne wealth, change our views of work and employment and upend almost everything we think we know about economics, wealth, jobs, and politics. Th ese changes are about truly disruptive technologies of the most fundamental kinds. If you thought the Internet, smart phones, and spandex were disruptive technologies, just hang on. You have not seen anything yet. In short, if you want to understand a transition more fundamental than the changes brought to the twentieth century world by computers, communications and the Internet, then read this book. There are truly riches in the skies. Near-Earth asteroids largely composed of platinum and rare earth metals have an incredible value. Helium-3 isotopes accessible in outer space could provide clean and abundant energy. There is far more water in outer space than is in our oceans. In the pages that follow we will explain the potential for a cosmic shift in our global economy, our ecology, and our commercial and legal systems. These can take place by the end of this century. And if these changes do not take place we will be in trouble. Our conventional petro-chemical energy systems will fail us economically and eventually blanket us with a hydrocarbon haze of smog that will threaten our health and our very survival. Our rare precious metals that we need for modern electronic appliances will skyrocket in price, and the struggle between “haves” and “have nots” will grow increasingly ugly. A lack of affordable and readily available water, natural resources, food, health care and medical supplies, plus systematic threats to urban security and systemic warfare are the alternatives to astral abundance. The choices between astral abundance and a downward spiral in global standards of living are stark. Within the next few decades these problems will be increasingly real. By then the world may almost be begging for new, out of- the-box thinking. International peace and security will be an indispensable prerequisite for exploitation of astral abundance, as will good government for all. No one nation can be rich and secure when everyone else is poor and insecure. In short, global space security and strategic space defense, mediated by global space agreements, are part of this new pathway to the future.

## 5

### 1NC – T

#### Extra-topicality is a voting issue – wrecks clash, fairness, shift out of offense

Violation: promoting regionalism

## Case

### Solvency

#### Russia and China say no, or the plan gets watered down.

**Bahney and Pearl 19** [Benjamin Bahney and Jonathan Pearl, 3-26-2019, "Why Creating a Space Force Changes Nothing," BENJAMIN BAHNEY and JONATHAN PEARL are Senior Fellows at the Lawrence Livermore National Laboratory’s Center for Global Security Research and contributing authors to [Cross Domain Deterrence: Strategy in an Era of Complexity](https://archive.md/o/Hlbi1/https:/www.amazon.com/Cross-Domain-Deterrence-Strategy-Era-Complexity/dp/0190908653). Foreign Affairs, [https://www.foreignaffairs.com/articles/space/2019-03-26/why-creating-space-force-changes-nothing accessed 12/10/21](https://www.foreignaffairs.com/articles/space/2019-03-26/why-creating-space-force-changes-nothing%20accessed%2012/10/21)] Adam

As Russia and China continue to push forward, U.S. policymakers may be tempted to use treaties and diplomacy to head off their efforts entirely. This option, although alluring on paper, is simply not feasible. Existing treaties designed to limit military competition in space have had little success in actually doing so. The 1967 Outer Space Treaty bans parties from placing nuclear weapons or other weapons of mass destruction in space, on the moon, or on other celestial bodies, but it has no formal mechanism for verifying compliance, and places no restrictions on the development or deployment in space of conventional antisatellite weapons. Even if it were possible to convince Moscow and Beijing of the benefits of comprehensive space arms control, existing technology makes it extremely difficult to verify compliance with the necessary treaty provisions—and without comprehensive and reliable verification, treaties are toothless. Moreover, regulating the development and deployment of antisatellite weapons is extremely difficult, both because they include such a broad and diverse range of technologies and because many types of antisatellite weapons can be concealed or explained away as having some other use. Unsurprisingly, Russia and China’s draft Treaty on the Prevention of Placement of Weapons in Space, which they have been pushing for several years now, has an unenforceable definition of what constitutes a “weapon” and does nothing at all to address ground-based antisatellite weapons development.

#### China cheats by creating domestic laws that contradict agreements

McDevitt 19 [Michael McDevitt is a Senior Fellow at CNA, a Washington DC area non-profit research and analysis company. During his 21 years at CNA he served as a Vice President responsible for strategic analyses, especially in East Asia and the Middle East. He has been involved in US security policy and strategy in the Asia-Pacific for the last 28 years, in both government policy positions and, following his retirement from the US Navy, as an analyst and commentator. He also attended the National War College and spent a year as a Chief of Naval Operations Fellow on the Strategic Study Group at the Naval War College. April 2019. <https://www.uscc.gov/sites/default/files/transcripts/April%2025%2C%202019%20Hearing%20Transcript%20%282%29.pdf>

But there one huge caveat to that statement, which is international law is fine as long as it moves their ball forward on what they hope to achieve. If it doesn't, suddenly, domestic law takes priority, and domestic law coming out of the National People's Congress can be cooked up pretty quickly. And so, they decide which law, which approach they want to use in the South China Sea or East China Sea, whichever one moves the ball most effectively.

And so, one would have to worry about — now this may be a bridge too far but — a Chinese domestic space law. In fact, one may exist. I have no idea if it does or doesn't. But it would counteract any agreements that are either in place or that could be made.

### Advantage

#### Satellites are not appropriation. Williams 95:

Christopher D. Williams, Space: The Cluttered Frontier, 60 J. Air L. & Com. 1139 (1995) https://scholar.smu.edu/cgi/viewcontent.cgi?referer=&httpsredir=1&article=1384&context=jalc

Article II of the treaty allows for a more interesting argument. This article states, "[o] uter space.., is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means." 68 In a sense, space debris may constitute a form of appropriation of outer space. Because two objects cannot occupy the same space (orbit) at the same time, placing debris in space removes the possibility of another object using that location.69 This approach is related to the view of outer space as a commons. Some argue that Articles I and II of the Outer Space Treaty provide a structure for use of outer space similar to a terrestrial commons, thus encouraging spacefaring nations to take maximum advantage of the resource of space in the shortest time possible. 70 As with a terrestrial commons, the use or consumption of the resource by one party necessarily precludes that use by another member of the commons. Thus, the placement of debris in orbit may in fact constitute an appropriation. However, as in the case of accidental fragmentary debris, this appropriation may be entirely out of the control of any party. In addition, if the premise of the argument is valid, then any space object, not just space debris, would constitute an appropriation of outer space in violation of Article II. This clearly was not intended by the drafters of the treaty.

#### Satellites ≠ ownership

#### Ton of alt causes – BRI, investment, etc – no reason why satellites are specifically key

#### You can’t ban the BRI

#### No terrorism.

Piombo ‘7 [Jessica, “Terrorism and U.S. Counter-Terrorism Programs in Africa: An Overview”, Center for Contemporary Conflict, Jan, http://www.gees.org/documentos/Documen-01928.pdf//GBS-JV]

A casual reading of major newspapers would leave one with the impression that terrorists are running rampant across Africa. Terrorists are said to hide out in the multiple lawless and stateless areas that litter the continent; they supposedly gain recruits from among the starving and displaced masses who have been victimized by powerful warlords and governments that are fighting over the continent’s spoils. Militant Islamic recruiters are thought to prey on vulnerable communities, building militant organizations and recruiting the next generation of suicide bombers from the ranks of the poor Africans. This is, to state it mildly, a vast oversimplification of both the nature of terrorist recruitment and the terrorist threat in Africa. First of all, organized terrorist groups do not rampantly proliferate across the continent. Prior to 2001, there were no designated “foreign terrorist organizations” in Sub-Saharan Africa. There have been a number of organizations that area governments label as “terrorists,” yet the United States has been hesitant to recognize the groups as such, for the understandable reason that in many cases, area governments are labeling opposition groups terrorists in order to gain support to combat their opponents. Second, these sentiments are an overstatement of the influence of militant Islam across the continent, and a misunderstanding of the nature of “terrorism.” Terrorism in Africa is not confined to the realm of the radical Islamists, though those are the groups that receive the most attention. Of the three Sub-Saharan groups that have found their way onto the “other designated organizations” lists maintained by the State Department, only one (Al Ittihad Al Islamiyya, AIAI, of Somalia), was Islamist.[1] The other two included the former military of Rwanda (the ex-FAR) and a Christian terrorist group in Uganda, the Lords Resistance Army (LRA). al-Qaeda, obviously on the list of designated FTOs, operates in Africa, but is not from Africa. Third, the common mantra that “failed states lead to terrorism” is, in fact, belied by geography: the designated terrorist organization that do exist and which have attacked Western targets tend to organize and operate in the countries with a modicum of law and order, such as South Africa and Kenya. Indigenous terrorist organizations (not designated by the United States) have originated and continue to operate in both unstable countries such as Somalia and Liberia, but the group are more prolific in states that have more advanced infrastructures, such as South Africa, Nigeria and Kenya. Without a reliable and secure commercial infrastructure, it becomes difficult to move commodities and illicit goods to fund terrorist activities. The largest al-Qaeda network in East Africa was uncovered in Kenya, one of the most politically stable countries in the region. In fact, to date this cell has been the only direct al-Qaeda group that has been turned up since the GWOT began in 2001. Terrorist groups tend to use the “failed” states like Somalia more as staging grounds and transit points, rather than places where the groups build long-term organizational and financial networks. Even in West Africa, while Hezbollah obtains diamonds from conflict zones and stateless areas, terrorists find it necessary to transport them via the Lebanese diaspora community that lives in the more politically stable countries.

#### Nuclear war is not an existential risk – damage-limitation and contemporary science rules out every extinction internal link – Cribb is exaggerating.

Scouras ‘19 (James Scouras, Fellow at the Johns Hopkins Applied Physics Laboratory, PhD in Physics from the University of Maryland, creator of the Scouras model which uses an Excel spreadsheet to calculate the outcomes of nuclear force exchanges to create tabular outputs and graphs and incorporate the notion of “sensitivity” into nuclear security, Summer 2019, “Nuclear War as a Global Catastrophic Risk,” *Journal of Benefit-Cost Analysis* Volume 10 Issue 2, footnotes 2 and 4 included in curly braces) gz

One needs to only view the pictures of Hiroshima and Nagasaki shown in figure 1 and imagine such devastation visited on thousands of cities across warring nations in both hemispheres to recognize that nuclear war is truly a global catastrophic risk. Moreover, many of today’s nuclear weapons are an order of magnitude more destructive than Little Boy and Fat Man, and there are many other significant consequences – prompt radiation, fallout, etc. – not visible in such photographs. Yet, it is also true that not all nuclear wars would be so catastrophic; some, perhaps involving electromagnetic pulse (EMP) attacks2 using only a few high-altitude detonations or demonstration strikes of various kinds, could result in few casualties. {2 Many mistakenly believe that the congressionally established Commission to Assess the Threat to the United States from Electromagnetic Pulse (EMP) Attack concluded that an EMP attack would, indeed, be catastrophic to electronic systems and consequently to people and societies that vitally depend on those systems. However, the conclusion of the commission, on whose staff I served, was only that such a catastrophe could, not would, result from an EMP attack. Its executive report states, for example, that “the damage level could be sufficient to be catastrophic to the Nation.” See www.empcommision.org for publicly available reports from the EMP Commission. See also Frankel et al., (2015).} Others, such as a war between Israel and one of its potential future nuclear neighbors, might be regionally devastating but have limited global impact, at least if we limit our consideration to direct and immediate physical consequences. Nevertheless, smaller nuclear wars need to be included in any analysis of nuclear war as a global catastrophic risk because they increase the likelihood of larger nuclear wars. This is precisely why the nuclear taboo is so precious and crossing the nuclear threshold into uncharted territory is so dangerous (Schelling, 2005; see also Tannenwald, 2007). While it is clear that nuclear war is a global catastrophic risk, it is also clear that it is not an existential risk. Yet over the course of the nuclear age, a series of mechanisms have been proposed that, it has been erroneously argued, could lead to human extinction. The first concern3 arose among physicists on the Manhattan Project during a 1942 seminar at Berkeley some three years before the first test of an atomic weapon. Chaired by Robert Oppenheimer, it was attended by Edward Teller, Hans Bethe, Emil Konopinski, and other theoretical physicists (Rhodes, 1995). They considered the possibility that detonation of an atomic bomb could ignite a self-sustaining nitrogen fusion reaction that might propagate through earth’s atmosphere, thereby extinguishing all air-breathing life on earth. Konopinski, Cloyd Margin, and Teller eventually published the calculations that led to the conclusion that the nitrogen-nitrogen reaction was virtually impossible from atomic bomb explosions – calculations that had previously been used to justify going forward with Trinity, the first atomic bomb test (Konopinski et al., 1946). Of course, the Trinity test was conducted, as well as over 1000 subsequent atomic and thermonuclear tests, and we are fortunately still here. After the bomb was used, extinction fear focused on invisible and deadly fallout, unanticipated as a significant consequence of the bombings of Japan that would spread by global air currents to poison the entire planet. Public dread was reinforced by the depressing, but influential, 1957 novel *On the Beach* by Nevil Shute (1957) and the subsequent 1959 movie version (Kramer, 1959). The story describes survivors in Melbourne, Australia, one of a few remaining human outposts in the Southern Hemisphere, as fallout clouds approached to bring the final blow to humanity. In the 1970s, after fallout was better understood to be limited in space, time, and magnitude, depletion of the ozone layer, which would cause increased ultraviolet radiation to fry all humans who dared to venture outside, became the extinction mechanism of concern. Again, one popular book, *The Fate of the Earth* by Jonathan Schell (1982), which described the nuclear destruction of the ozone layer leaving the earth “a republic of insects and grass,” promoted this fear. Schell did at times try to cover all bases, however: “To say that human extinction is a certainty would, of course, be a misrepresentation – just as it would be a misrepresentation to say that extinction can be ruled out” (Schell, 1982). Finally, the current mechanism of concern for extinction is nuclear winter, the phenomenon by which dust and soot created primarily by the burning of cities would rise to the stratosphere and attenuate sunlight such that surface temperatures would decline dramatically, agriculture would fail, and humans and other animals would perish from famine. The public first learned of the possibility of nuclear winter in a *Parade* article by Sagan (1983), published a month or so before its scientific counterpart by Turco et al. (1983). While some nuclear disarmament advocates promote the idea that nuclear winter is an extinction threat, and the general public is probably confused to the extent it is not disinterested, few scientists seem to consider it an extinction threat. It is understandable that some of these extinction fears were created by ignorance or uncertainty and treated seriously by worst-case thinking, as seems appropriate for threats of extinction. But nuclear doom mongering also seems to be at play for some of these episodes. For some reason, portions of the public active in nuclear issues, as well as some scientists, appear to think that arguments for nuclear arms reductions or elimination will be more persuasive if nuclear war is believed to threaten extinction, rather than merely the horrific cataclysm that it would be in reality (Martin, 1982).4 {4 As summarized by Martin, “The idea that global nuclear war could kill most or all of the world’s population is critically examined and found to have little or no scientific basis.”

Martin also critiques possible reasons for beliefs or professed beliefs about nuclear extinction, including exaggeration to stimulate action.} To summarize, nuclear war is a global catastrophic risk. Such wars may cause billions of deaths and unfathomable suffering, as well set civilization back centuries. Smaller nuclear wars pose regional catastrophic risks and also national risks in that the continued functioning of, for example, the United States as a constitutional republic is highly dubious after even a relatively limited nuclear attack. But what nuclear war is not is an existential risk to the human race. There is simply no credible scenario in which humans do not survive to repopulate the earth.

#### Bio-d loss isn’t existential

Kareiva and Carranza, 18—Institute of the Environment and Sustainability, University of California, Los Angeles (Peter and Valerie, “Existential risk due to ecosystem collapse: Nature strikes back,” Futures, available online January 5, 2018, ScienceDirect, dml)

The interesting question is whether any of the planetary thresholds other than CO2 could also portend existential risks. Here the answer is not clear. One boundary often mentioned as a concern for the fate of global civilization is biodiversity (Ehrlich & Ehrlich, 2012), with the proposed safety threshold being a loss of greater than 0.001% per year (Rockström et al., 2009). There is little evidence that this particular 0.001% annual loss is a threshold—and it is hard to imagine any data that would allow one to identify where the threshold was (Brook, Ellis, Perring, Mackay, & Blomqvist, 2013; Lenton & Williams, 2013). A better question is whether one can imagine any scenario by which the loss of too many species leads to the collapse of societies and environmental disasters, even though one cannot know the absolute number of extinctions that would be required to create this dystopia.

While there are data that relate local reductions in species richness to altered ecosystem function, these results do not point to substantial existential risks. The data are small-scale experiments in which plant productivity, or nutrient retention is reduced as species numbers decline locally (Vellend, 2017), or are local observations of increased variability in fisheries yield when stock diversity is lost (Schindler et al., 2010). Those are not existential risks. To make the link even more tenuous, there is little evidence that biodiversity is even declining at local scales (Vellend et al., 2013, 2017). Total planetary biodiversity may be in decline, but local and regional biodiversity is often staying the same because species from elsewhere replace local losses, albeit homogenizing the world in the process. Although the majority of conservation scientists are likely to flinch at this conclusion, there is growing skepticism regarding the strength of evidence linking trends in biodiversity loss to an existential risk for humans (Maier, 2012; Vellend, 2014). Obviously if all biodiversity disappeared civilization would end—but no one is forecasting the loss of all species. It seems plausible that the loss of 90% of the world’s species could also be apocalyptic, but not one is predicting that degree of biodiversity loss either. Tragic, but plausible is the possibility of our planet suffering a loss of as many as half of its species. If global biodiversity were halved, but at the same time locally the number of species stayed relatively stable, what would be the mechanism for an end-of-civilization or even end of human prosperity scenario? Extinctions and biodiversity loss are ethical and spiritual losses, but perhaps not an existential risk.