# Round 2 – NC

## OFF

#### Interp: The aff must defend the banning/unjust action of private appropriation in outer space, or a specification of the above statement. To clarify, defend the resolution or a subset.

#### Violation: Public vs private – their plan text refers to all types of outer space recognition because the noun is outer space

Global Common Alliance, ND, URL: <https://globalcommonsalliance.org/global-commons/>, KR

The global commons are the resources we all need to survive, thrive and prosper. These resources, which include the ocean and freshwater, the climate and biodiversity, and forests and wetlands, are being overused. But the global commons also represents a management approach based on systems thinking, transformation and self-organisation to bring out the best in people. We want to bring out the best in people, cities, companies and countries. This is the foundation for our plan for the planet.

There are two definitions of the global commons: One is based in geopolitics. In this definition the global commons are areas – and their potential economic resources – that lie beyond national jurisdiction: the atmosphere, the high seas, Antarctica and outer space.

#### 1AC Vollmer says that “commons…shared ownership, public governance”

#### + Their ev also talks about other forms of commons that are public

#### 1AC Dardot 18 [Pierre Dardot, “What democracy for the global commons?,” The Commons and a New Global Governance, ed. Samuel Cogolati and Jan Wouters (2018). <https://d1wqtxts1xzle7.cloudfront.net/58613276/What_Democracy_-_Dardot_Leuwen_2018.pdf?1552469271=&response-content-disposition=inline%3B+filename%3DWhat_democracy_for_the_global_commons.pdf&Expires=1642726034&Signature=YJi8AG6~Y---mP0qsop4i3t~Z5bVLtQYwuDtUdXm6sdKaYwCJFFzQOL-OiY9nIH~JZsophnChwMlUMSGOCDVh7NhHmUonD28k9fU9PrfN2nYTNV2x8XnvoK2KtelSRvRyWN78eA7uC1isTAf1pO5~abPS9XQnORhjp9nPXjpIuBqLrrJhIUCKNjEorJ0u1h63DxkORBKVZfFh-TawG~PS~WdamGNqfljxjaP1G5bG-hUh1aNw0CuXhnqdd8yeH0-uT7iXVNu8cDl2zOtobIiAmD0SBKxjUXP8SYLkvNO0BETnpIzetK7gW8yksHtYjt-WasarhkMQpHeNwvJOY8QeA__&Key-Pair-Id=APKAJLOHF5GGSLRBV4ZA>]

#### Thus, we are faced with a cheap if not unfinished version of a ‘common’, which is entrusted to states, and limits state sovereignty without even calling it into question.¶ With the Competitiveness Act (US Congress, 2015), we are faced with an act of state sovereignty that manages to circumvent the prohibition of appropriation by a sovereign state without formally violating it. This represents a sort of ‘delegation’ under which the state, on the one hand, grants its citizens a legal title that it denies to itself, on the other, it does so in order to better guarantee it to those to whom it has been delegated. The imperium (state sovereignty) gives full licence for all candidates to the dominium, to privately control and appropriate any resources they are able to seize: statutory law enforces beforehand the power that technology provides. Beyond this collusion between the state and private companies, what emerges here is the powerful homology between state and private ownership: imperium and dominium appear to be based on two forms of a similar logic of ownership, which affirm one another. The primary challenge facing the heritage of mankind paradigm is that it does not fundamentally break with interstate logic and, as such, leaves leeway for private appropriation.

#### Extra-t is a voting issue:

#### 1] Limits – their model allows an infinite number of affs that can specifically sidestep offense – this aff, specifically, would allow global commons in space to pre-empt war and sidestep conflict since it might increase multilateralism

#### 2] Clash – negs can’t engage with aff’s that define a new form of managing appropriation – today it’s the commons aff, tomorrow it adds a regulation to manage appropriation

#### Voters:

#### 1] Competing interps --- a) race to the bottom – reasonability prevents norm engagements that go back and forth to set rules which oweigh on future value b) arbitrary and judge intervention – no brightline for what constitutes good enough, turns their debatability warrants c) collapses – 2 brightlines of offense and defense also check meeting or not meeting the brightline

#### 2] DTD – abuse was in the 1ac and affected all later parts of the debate

## OFF

#### CP: Space ought to be treated as a global commons except for Active Debris Removal done by private entities. Governments ought to permit the appropriation of outer space for designated safety zones and tech stationing for active debris removal by private entities.

#### Solves the aff and avoids the link to a universal global commons – their ev says it’s about “shared ownership” and the cp helps modulate space.

#### Debris removal is necessary and only private entities have the incentive and capability to do it.

**Giordano 21** (David Giordano is the Vice President of Mentorship for CBLA. Elsewhere at Columbia Law School, he serves on the Columbia Journal of Transnational Law, and is the Treasurer of Columbia OutLaws. During his 1L Summer, David was an intern at the Securities and Exchange Commission’s Division of Corporation Finance. Prior to law school, David worked as a Corporate Paralegal at the New York office of Cleary Gottlieb Steen & Hamilton LLP. David attended The George Washington University where he obtained a B.A. in psychology. “Space Debris: Another Frontier in the Commercialization of Space”. October 31, 2021.)

As **satellites** and other projectiles blast into orbit, upon collision they **can disintegrate into** shards, sometimes just centimeters wide, that remain in orbit, risking further collision. Hollywood captured the potential perils of **fairly large pieces of space debris** in the opening minutes of the 2013 film [*Gravity*](https://www.warnerbros.com/movies/gravity), where space junk threatens the lives of astronauts on a mission. Outside the realms of fictional space-thrillers, **even the smallest pieces of space junk can present real danger**. In 2016, a tiny piece of **space junk**, believed to be a paint chip or a piece of metal no more than a few thousandths of a millimeter across, [cracked the window of the International Space Station](https://www.popsci.com/paint-chip-likely-caused-window-damage-on-space-station/). In May 2021, a piece of space **debris** [punctured](https://www.nbcnews.com/science/space/space-junk-damages-international-space-stations-robotic-arm-rcna1067) **the robotic arm of the I**nternational **S**pace **S**tation. This is seriously concerning, as, [according to the European Space Agency](https://www.esa.int/Safety_Security/Clean_Space/How_many_space_debris_objects_are_currently_in_orbit), there are 670,000 pieces of space debris larger than 1cm and 170,000,000 between 1mm and 1cm in width. Unfortunately, **public action and policy struggles to keep up with these risks**. International law affords little clarity on the problem, as its control is a novel, [emerging field](https://www.technologyreview.com/2021/08/23/1032386/space-traffic-maritime-law-ruth-stilwell/) with many technical [tracking](https://www.space.com/space-situational-awareness-house-hearing-february-2020.html) and [removal](https://www.scientificamerican.com/article/space-junk-removal-is-not-going-smoothly/#:~:text=There%20is%20no%20doubt%20that,antisatellite%20weapon%2C%E2%80%9D%20she%20says.) challenges. **None of the existing space treaties** [directly tackle the issue](https://oxfordre.com/planetaryscience/view/10.1093/acrefore/9780190647926.001.0001/acrefore-9780190647926-e-70), rendering [responsibility for it](https://scholarship.law.upenn.edu/jil/vol41/iss1/6/) ambiguous. Absent such responsibility, [legal incentives are non-existent](https://www.courthousenews.com/lack-of-space-law-complicates-growing-debris-problem/)**.** [Guidelines are occasionally issued](https://www.unoosa.org/pdf/limited/l/AC105_2014_CRP14E.pdf) by international governing bodies, but provide little legal significance and are [more targeted at the practicalities of tracking and removal](https://scholarship.law.upenn.edu/jil/vol41/iss1/6/). The nation best positioned to notify space actors of collision risks is the United States, and the burden of that task currently falls on the [Department of Defense](https://www.govexec.com/media/d1-mission-space.pdf). However, the Trump administration issued a [directive in 2018](https://www.cnbc.com/2018/06/18/national-space-council-trump-signs-space-debris-directive.html), shifting the responsibility from the DoD to the Department of Commerce, and the [transition has yet to materialize](https://www.govexec.com/media/d1-mission-space.pdf), leaving DoD struggling to keep pace [with increasing commercial activity](https://www.mckinsey.com/industries/aerospace-and-defense/our-insights/look-out-below-what-will-happen-to-the-space-debris-in-orbit). In the face of public paralysis, **addressing the problem through industry looks more and more attractive.** This has led some to call for a new legal order that still leaves room for government, but reframes who the rules exist to serve. Rather than our current, rudimentary treaty regime designed to [prevent international conflict](https://www.theverge.com/2017/1/27/14398492/outer-space-treaty-50-anniversary-exploration-guidelines), [commentators](https://space.nss.org/wp-content/uploads/NSS-Position-Paper-Space-Debris-Removal-2019.pdf) have called for an additional regime resembling [maritime law](https://www.technologyreview.com/2021/08/23/1032386/space-traffic-maritime-law-ruth-stilwell/) that preserves the interests of a more diverse set of stakeholders, including those in the future that can bring technology and interests to space that may not yet exist. These commentators shun the common conception that space regulation should resemble air-traffic control, which is suited to a narrower set of uses (transport). Under such a “maritime” regime, the light touch of central regulatory bodies, and perhaps their non-existence, is preferred, just as it has been on the seas. This way, individual nations have a degree of flexibility in instituting controls they see fit while leaving room for industry to address problems and introduce new uses for space. Furthermore, **governments seem ready and willing to construct the legal and incentive framework in concert with such private action.** [In a joint statement this summer](https://www.gov.uk/government/news/g7-nations-commit-to-the-safe-and-sustainable-use-of-space), **G7 members expressed openness to resolving** the technical aspects of the **debris** problem **with private institutions, and there is** some **promising progress**. Apple co-founder [Steve Wozniak](https://www.space.com/apple-cofounder-steve-wozniak-space-junk-company) signaled his plans to address the problem through a new company with a telling name: Privateer Space. **Astroscale**, a UK-based company, successfully **launched a pair of satellites** in the Spring of 2021 [that will remove certain space debris from orbit](https://astroscale.com/astroscale-celebrates-successful-launch-of-elsa-d/)**.** Astroscale also [stated their desire](https://astroscale.com/space-sustainability/) to work with governments and international governing bodies to craft policy with private efforts to control the problem top of mind. In light of public policy’s silence on space debris, the initiative of actors like Astroscale involving themselves in policy may be advised, as it could [promote further private investment](https://docs.google.com/document/d/1NCO5Vvjf-kgoZLNfgaOn4bDj_CAfyD1Qhz2oW3TrcHc/edit) in technology for space **debris removal**. A popular [policy recommendation](https://reason.org/policy-brief/u-s-space-traffic-management-and-orbital-debris-policy/) among experts is the establishment of public-private partnerships, and Astroscale has entered several such agreements including with [Japan](https://www.satellitetoday.com/in-space-services/2021/07/27/space-clean-up-company-astroscale-signs-partnerships-with-mhi-and-japanese-government/) and the [European Space Agency](https://spacenews.com/astroscale-clearspace-aim-to-make-a-bundle-removing-debris/). Other **actors include** [ClearSpace](https://www.space.com/esa-startup-clearspace-debris-removal-2025)**,** [OneWeb](https://www.hou.usra.edu/meetings/orbitaldebris2019/orbital2019paper/pdf/6077.pdf)**, and** [D-Orbit](https://www.satellitetoday.com/in-space-services/2021/09/10/esa-awards-d-orbit-uk-contract-for-debris-removal-demonstration/)**.** Some may want to push back against further private involvement. The congestion of space is, in part, industry’s fault, and if we conceptualize orbital space as a common resource, it might be right to fear the effects of the [Tragedy of the Commons](https://www.britannica.com/science/tragedy-of-the-commons). Critics may seek to bolster international treaties, give legal teeth to the guidelines occasionally issued by the UN, and preserve the public posture of the heavens. These may be welcome adjustments, but unlike a pond that industry overfishes or a well that industry dries up, here industry is working to add more fish and water. Moreover, governments stand to benefit from this private decluttering, as well, as [they are expected](https://astroscale.com/wp-content/uploads/2020/02/Reg-V-Development-of-Global-Policy-for-Active-Debris-Removal-Services-v2.0.pdf) to be major customers of some of these private actors. As for the public posture, space has long been a commercial place. Telecommunications companies and government contractors historically depend on space. As the number of commercial satellites set to launch skyrockets, it seems natural to craft policies that are responsive to their interests and provide incentives to remedy issues created in the course of spacefaring, such as space debris. **In light of the** long silence of international law on such issues and the demonstrated **motivation by private actors**, **space debris represents the latest frontier in the abdication of space from the public concern to the private.**

#### Collisions with high-value satellites guarantee nuclear escalation and extinction.

Egeli 21 [Sitki Egeli is an assistant professor in the Political Science and International Relations Department of Izmir University of Economics. He was previously a director for foreign affairs in Turkey’s Undersecretariat for Defense Industries (SSM) and vice president in charge of the defense and aerospace sectors of an international consulting firm.] “Space-to-Space Warfare and Proximity Operations: The Impact on Nuclear Command, Control, and Communications and Strategic Stability,” Published 25 Jun 2021, <https://www.tandfonline.com/doi/full/10.1080/25751654.2021.1942681>, VM

“Amid increased tensions, perhaps even an imminent military confrontation between **two nuclear-armed adversaries**, a high-value (for example, early-warning or strategic communication) **satellite stops functioning** or communicating **instantly and inexplicably**. SSA sensors do not pick up any anomalies. **This may be the outcome of** a technical malfunction or a natural phenomenon, such as the impact of a collision with a meteoroid or piece of **space debris small enough to have evaded detection**. Alternatively, the satellite perhaps becomes the victim of a deliberate, undetected attack. Earth-to-space kinetic, electronic, or directed energy attacks would leave behind some trails. A cyberattack, which is harder to detect and attribute, is a strong possibility. So is a stealthy attack by hostile spacecraft. In fact, the adversary is known to have experimented with ominous small spacecraft that could easily conceal or disguise themselves until conducting a final maneuver to neutralize their targets. The victim would also be aware that, especially at distant GEO and HEO altitudes, SSA is not sufficiently comprehensive to detect and give warning of all suspicious or threatening movements as they happen. As suspicions abound, decision makers are faced with hard choices. Could this perhaps be the harbinger of a wider nuclear or nonnuclear **first strike**, along with which the attacker is seeking to eliminate the **possibility of retaliation** by degrading the defender’s capacity to command, control, and communicate with its forces? Should the defender react immediately before the remaining space-enabled NC3 elements are also compromised and its control over nuclear and nonnuclear forces degrades even further? In the absence of a clear-cut picture of what actually has happened, there is a risk that impending decisions will be made on the basis of insufficient and potentially **erroneous information**, and the climate will be ripe for unfounded presumptions and predispositions. The resulting ultimatums, responses, or counteractions could **set off a dangerous cycle of escalation** and tit-for-tat actions, whereby reactions and overreactions between adversaries lead to potentially catastrophic consequences. At a minimum, heightened tension in orbit would **have the outcome of spilling down to Earth** so as to further aggravate an already tense situation.?”

## OFF

#### CP: Space ought to be recognized as a global commons except for mining iniatives pursued by private companies.

#### Private companies are set to mine in space – new tech and profit motives make space lucrative

Gilbert 21, (Alex Gilbert is a complex systems researcher and PhD student in Space Resources at the Colorado School of Mines, “Mining in Space is Coming”), 4-26-21, Milken Institute Review, https://www.milkenreview.org/articles/mining-in-space-is-coming // MNHS NL

Space exploration is back. after decades of disappointment, a combination of better technology, falling costs and a rush of competitive energy from the private sector has put space travel front and center. indeed, many analysts (even some with their feet on the ground) believe that commercial developments in the space industry may be on the cusp of starting the largest resource rush in history: mining on the Moon, Mars and asteroids. While this may sound fantastical, some baby steps toward the goal have already been taken. Last year, NASA awarded contracts to four companies to extract small amounts of lunar regolith by 2024, effectively beginning the [era of commercial space mining](https://payneinstitute.mines.edu/wp-content/uploads/sites/149/2020/09/Payne-Institute-Commentary-The-Era-of-Commercial-Space-Mining-Begins.pdf). Whether this proves to be the dawn of a gigantic adjunct to mining on earth — and more immediately, a key to unlocking cost-effective space travel — will turn on the answers to a host of questions ranging from what resources can be efficiently. As every fan of science fiction knows, the resources of the solar system appear virtually unlimited compared to those on Earth. There are whole other planets, dozens of moons, thousands of massive asteroids and millions of small ones that doubtless contain humungous quantities of materials that are scarce and very valuable (back on Earth). Visionaries including Jeff Bezos [imagine heavy industry moving to space](https://www.fastcompany.com/90347364/jeff-bezos-wants-to-save-earth-by-moving-industry-to-space) and Earth becoming a residential area. However, as entrepreneurs look to harness the riches beyond the atmosphere, access to space resources remains tangled in the realities of economics and governance. Start with the fact that space belongs to no country, complicating traditional methods of resource allocation, property rights and trade. With limited demand for materials in space itself and the need for huge amounts of energy to return materials to Earth, creating a viable industry will turn on major advances in technology, finance and business models. That said, there’s no grass growing under potential pioneers’ feet. Potential economic, scientific and even security benefits underlie an emerging geopolitical competition to pursue space mining. The United States is rapidly emerging as a front-runner, in part due to its ambitious Artemis Program to lead a multinational consortium back to the Moon. But it is also a leader in creating a legal infrastructure for mineral exploitation. The United States has adopted the world’s first spaceresources law, recognizing the property rights of private companies and individuals to materials gathered in space. However, the United States is hardly alone. Luxembourg and the United Arab Emirates (you read those right) are racing to codify space-resources laws of their own, hoping to attract investment to their entrepot nations with business-friendly legal frameworks. China reportedly views space-resource development as a national priority, part of a strategy to challenge U.S. economic and security primacy in space. Meanwhile, Russia, Japan, India and the European Space Agency all harbor space-mining ambitions of their own. Governing these emerging interests is an outdated treaty framework from the Cold War. Sooner rather than later, we’ll need [new agreements](https://issues.org/new-policies-needed-to-advance-space-mining/) to facilitate private investment and ensure international cooperation.

Back up for a moment. For the record, space is already being heavily exploited, because space resources include non-material assets such as orbital locations and abundant sunlight that enable satellites to provide services to Earth. Indeed, satellite-based telecommunications and global positioning systems have become indispensable infrastructure underpinning the modern economy. Mining space for materials, of course, is another matter. In the past several decades, planetary science has confirmed what has long been suspected: celestial bodies are potential sources for dozens of natural materials that, in the right time and place, are incredibly valuabl**e**. Of these, water may be the most attractive in the near-term, because — with assistance from solar energy or nuclear fission — H2O can be split into hydrogen and oxygen to make rocket propellant, facilitating in-space refueling. So-called “rare earth” metals are also potential targets of asteroid miners intending to service Earth markets. Consisting of 17 elements, including lanthanum, neodymium, and yttrium, these critical materials (most of which are today mined in China at great environmental cost) are required for electronics. And they loom as bottlenecks in making the transition from fossil fuels to renewables backed up by battery storage. The Moon is a prime space mining target. Boosted by NASA’s mining solicitation, it is likely the first location for commercial mining. The Moon has several advantages. It is relatively close, requiring a journey of only several days by rocket and creating communication lags of only a couple seconds — a delay small enough to allow remote operation of robots from Earth. Its low gravity implies that relatively little energy expenditure will be needed to deliver mined resources to Earth orbit. The Moon may look parched — and by comparison to Earth, it is. But recent probes have confirmed substantial amounts of water ice lurking in [permanently shadowed craters](http://lroc.sese.asu.edu/posts/1105) at the lunar poles. Further, it seems that solar winds have implanted significant deposits of helium-3 (a light stable isotope of helium) across the equatorial regions of the Moon. Helium-3 is a potential fuel source for second and third-generation fusion reactors that one hopes will be in service later in the century. The isotope is packed with energy (admittedly hard to unleash in a controlled manner) that might augment sunlight as a source of clean, safe energy on Earth or to power fast spaceships in this century. Between its water and helium-3 deposits, the Moon could be the resource stepping-stone for further solar system exploration. Asteroids are another near-term [mining target](https://foreignpolicy.com/2016/04/28/the-asteroid-miners-guide-to-the-galaxy-space-race-mining-asteroids-planetary-research-deep-space-industries/). There are all sorts of space rocks hurtling through the solar system, with varying amounts of water, rare earth metals and other materials on board. The asteroid belt between the orbits of Mars and Jupiter contains most of them, many of which are greater than a kilometer in diameter. Although the potential water and mineral wealth of the asteroid belt is vast, the long distance from Earth and requisite travel times and energy consumption rule them out as targets in the near term. The prospects for space mining are being driven by technological advances across the space industry. The rise of reusable rocket components and the now-widespread use of off-the-shelf parts are lowering both launch and operations costs. Once limited to government contract missions and the delivery of telecom satellites to orbit, private firms are now emerging as leaders in developing “NewSpace” activities — a catch-all term for endeavors including orbital tourism, orbital manufacturing and mini-satellites providing specialized services. The space sector, with a market capitalization of $400 billion, could grow to as much as $1 trillion by 2040 as private investment soars.

#### Squo private companies are willing to invest, but the plan crosses a perception barrier which destroys investment

Shaw 13 - Lauren E, J.D. from Chapman University School of Law, ”Asteroids, the New Western Frontier: Applying Principles of the General Mining Law of 1872 to Incentive Asteroid Mining”, JOURNAL OF AIR LAW AND COMMERCE, Volume 78, Issue 1, Article 2, <https://scholar.smu.edu/cgi/viewcontent.cgi?article=1307&context=jalc> // recut MNHS NL

To some, the mining of asteroids might sound like the premise of a science fiction novel' or the solution to the heartwrenching, fictional scenario depicted in the film Armageddon.2 To others, it evokes a fantastical idea that may come to fruition in a distant reality. However, impressively funded companies have plans to send spacecraft to begin prospecting on asteroids within the next two years.' The issues associated with the mining of asteroids should be addressed before these plans are set in motion. Much has been written about the issues that might arise from allowing nations to own these space bodies and the minerals they contain; one such issue is the impact on international treaties.4 However, little has been written about the applicability of preexisting mining laws-which provide a basic property right scheme for the private sector-such as the General Mining Law of 1872 (Mining Law) to the management of asteroid mining.' The literature to date on how to legally address asteroid mining is minimal.' The articles that do address it propose the creation of different systems, such as a "property rights-based system that relies on the doctrine of first possession"7 or an international authority that would regulate mining operations.' Implementing a scheme that offers ownership of extracted resources without bestowing complete sovereignty is necessary to avoid an impending legal limbo-that is, an outer space "Wild West" equivalent where there is neither certainty nor security in who owns what.9 If private sector miners of asteroids know this right already exists, they will have more incentive to extract resources.' 0 This, in turn, would increase the chances of successful missions, resulting in numerous scientific and explorative benefits, along with the potential replenishment of key elements that are becoming increasingly depleted on Earth yet are still needed for modern industry. Scientists speculate that key elements needed for modern industry, including platinum, zinc, copper, phosphorus, lead, gold, and indium, could become depleted on Earth within the next fifty to sixty years." Many of these metals, such as platinum, are chemical elements that, unlike oil or diamonds, have no synthetic alternative.12 Once the reserves on Earth are mined to complete depletion, industries will be forced to recycle the existing supply of minerals, which will result in increased costs due to increased scarcity.' 3 However, evidence is accumulating that asteroids only a few hundred thousand miles away from Earth may be composed of an abundance of natural resources-including many of the minerals being mined to depletion on Earth-that could lead to vast profits." Most of the minerals being mined on Earth, including gold, iron, platinum, and palladium, originally came from the many asteroids that hit the Earth after the crust cooled during the planet's formation.'

#### Space mining is the only way to solve climate change

Duran 21, (Paloma Duran is a journalist and industry analyst at Mexico Business News, “Is Space Mining the Best Option to Face Climate Change?”), 11-03-21, Mexico Business News, https://mexicobusiness.news/mining/news/space-mining-best-option-face-climate-change // MNHS NL

Going to net zero means that more mining is needed. Experts have said that the current supply cannot support the necessary metals demand for the green transition. As a result, new mining alternatives have gained greater relevance, among them is space mining. Several countries, including Mexico, have shown their interest in this alternative, creating a new space race. “The solar system can support a billion times greater industry than we have on Earth. When you go to vastly larger scales of civilization, beyond the scale that a planet can support, then the types of things that civilization can do are incomprehensible to us … We would be able to promote healthy societies all over the world at the same time that we would be reducing the environmental burden on the Earth,” said Dr. Phil Metzger, Planetary Scientist at the University of Central Florida. Currently, there are several attempts to address global warming and transition to a net zero carbon economy. There has been an increasing interest in renewable energy and infrastructure, which has increased demand for various minerals, especially lithium, cobalt, nickel, copper and rare earth elements. However, according to experts, the world is close to entering a metals supercycle, where demand will exceed available supply, causing prices to skyrocket. Consequently, the mining industry has sought alternatives to achieve the required supply. Options include recycling and improved mine waste management, sea mining and space mining. The latter is considered one of the alternatives with the greatest potential. However, a regulatory framework is still lacking and there is almost no experience in this regard. Despite the lack of knowledge regarding space mining, it has become a very attractive option since the planet is running out of resources. While some people believe that land-based mining is cheaper than space mining, experts believe this may change in the long term. Furthermore, within the solar system there are countless bodies rich in minerals, ores and elements that will accelerate the fight against climate change. “There will come a point when there is nothing left to mine on the surface, prompting mines to reach even further below. But even those resources are destined to run out and so we will aim toward ocean mining, which already has specific technologies that are being developed. Nevertheless, even those mines are limited as well. The mine of the future, which today may seem unlikely, will no longer be on our planet. There will be a time when space mining will be as common as an open leach mine,” Eder Lugo, Minerals Head at Siemens, told MBN. More than 150 million asteroids measuring approximately 100m are believed to be in the inner solar system alone. In addition, astronomers have also identified abundant minerals near the Earth’s space and the Main Asteroid Belt. There are three main groups into which asteroids are divided: C- type, S- type, and M- type. The last two groups are the most abundant in minerals such as gold, platinum, cobalt, zinc, tin, lead, indium, silver, copper and rare earth metals. "Energy is limited here. Within just a few hundred years, you will have to cover all of the landmass of Earth in solar cells. So, what are you going to do? Well, what I think you are going to do is you are going to move out in space … all of our heavy industry will be moved off-planet and Earth will be zoned residential and light-industrial,” said Jeff Bezos, Founder of Amazon and the Space Launch Provider Blue Origin.

#### Anthropogenic warming causes extinction --- mitigation efforts now are key

Griffin, 2015 (David, Professor of Philosophy at Claremont, “The climate is ruined. So can civilization even survive?”, CNN, 4/14/2015, <http://www.cnn.com/2015/01/14/opinion/co2-crisis-griffin/> )

Although most of us worry about other things, climate scientists have become increasingly worried about the survival of civilization. For example, Lonnie Thompson, who received the U.S. National Medal of Science in 2010, said that virtually all climatologists "are now convinced that global warming poses a clear and present danger to civilization." Informed journalists share this concern. The climate crisis "threatens the survival of our civilization," said Pulitzer Prize-winner Ross Gelbspan. Mark Hertsgaard agrees, saying that the continuation of global warming "would create planetary conditions all but certain to end civilization as we know it." These scientists and journalists, moreover, are worried not only about the distant future but about the condition of the planet for their own children and grandchildren. James Hansen, often considered the world's leading climate scientist, entitled his book "Storms of My Grandchildren." The threat to civilization comes primarily from the increase of the level of carbon dioxide (CO2) in the atmosphere, due largely to the burning of fossil fuels. Before the rise of the industrial age, CO2 constituted only 275 ppm (parts per million) of the atmosphere. But it is now above 400 and rising about 2.5 ppm per year. Because of the CO2 increase, the planet's average temperature has increased 0.85 degrees Celsius (1.5 degrees Fahrenheit). Although this increase may not seem much, it has already brought about serious changes. The idea that we will be safe from "dangerous climate change" if we do not exceed a temperature rise of 2C (3.6F) has been widely accepted. But many informed people have rejected this assumption. In the opinion of journalist-turned-activist Bill McKibben, "the one degree we've raised the temperature already has melted the Arctic, so we're fools to find out what two will do." His warning is supported by James Hansen, who declared that "a target of two degrees (Celsius) is actually a prescription for long-term disaster." The burning of coal, oil, and natural gas has made the planet warmer than it had been since the rise of civilization 10,000 years ago. Civilization was made possible by the emergence about 12,000 years ago of the "Holocene" epoch, which turned out to be the Goldilocks zone - not too hot, not too cold. But now, says physicist Stefan Rahmstorf, "We are catapulting ourselves way out of the Holocene." This catapult is dangerous, because we have no evidence civilization can long survive with significantly higher temperatures. And yet, the world is on a trajectory that would lead to an increase of 4C (7F) in this century. In the opinion of many scientists and the World Bank, this could happen as early as the 2060s. What would "a 4C world" be like? According to Kevin Anderson of the Tyndall Centre for Climate Change Research (at the University of East Anglia), "during New York's summer heat waves the warmest days would be around 10-12C (18-21.6F) hotter [than today's]." Moreover, he has said, above an increase of 4C only about 10% of the human population will survive. Believe it or not, some scientists consider Anderson overly optimistic. The main reason for pessimism is the fear that the planet's temperature may be close to a tipping point that would initiate a "low-end runaway greenhouse," involving "out-of-control amplifying feedbacks." This condition would result, says Hansen, if all fossil fuels are burned (which is the intention of all fossil-fuel corporations and many governments). This result "would make most of the planet uninhabitable by humans." Moreover, many scientists believe that runaway global warming could occur much more quickly, because the rising temperature caused by CO2 could release massive amounts of methane (CH4), which is, during its first 20 years, 86 times more powerful than CO2. Warmer weather induces this release from carbon that has been stored in methane hydrates, in which enormous amounts of carbon -- four times as much as that emitted from fossil fuels since 1850 -- has been frozen in the Arctic's permafrost. And yet now the Arctic's temperature is warmer than it had been for 120,000 years -- in other words, more than 10 times longer than civilization has existed. According to Joe Romm, a physicist who created the Climate Progress website, methane release from thawing permafrost in the Arctic "is the most dangerous amplifying feedback in the entire carbon cycle." The amplifying feedback works like this: The warmer temperature releases millions of tons of methane, which then further raise the temperature, which in turn releases more methane. The resulting threat of runaway global warming may not be merely theoretical. Scientists have long been convinced that methane was central to the fastest period of global warming in geological history, which occurred 55 million years ago. Now a group of scientists have accumulated evidence that methane was also central to the greatest extinction of life thus far: the end-Permian extinction about 252 million years ago. Worse yet, whereas it was previously thought that significant amounts of permafrost would not melt, releasing its methane, until the planet's temperature has risen several degrees Celsius, recent studies indicate that a rise of 1.5 degrees would be enough to start the melting. What can be done then? Given the failure of political leaders to deal with the CO2 problem, it is now too late to prevent terrible developments. But it may -- just may -- be possible to keep global warming from bringing about the destruction of civilization. To have a chance, we must, as Hansen says, do everything possible to "keep climate close to the Holocene range" -- which means, mobilize the whole world to replace dirty energy with clean as soon as possible.

## OFF

#### Private sector innovation in the commercial space industry is high now.

**Smith 18** [Matthew Smith, 6-11-2018, "Commercialized Space and You," Science in the News, https://sitn.hms.harvard.edu/flash/2018/commercialized-space-and-you/]//DDPT

Step aside, NASA. The 20th century model of space exploration is running out of fuel, and private companies are now leading the race for human expansion across the galaxy. Elon Musk, Richard Branson, and Jeff Bezos are three of the billionaires leading this extraterrestrial adventure with their respective companies, SpaceX, Virgin Galactic, and Blue Origin. Bezos, the founder of Amazon and currently the wealthiest person in the world, has a vision of sending autonomous rovers to the Moon and helping to eventually create a Moon Village. He has explained that collaborations with the National Aeronautics and Space Administration (NASA) and other government agencies are encouraged and appreciated, but are no longer essential to achieve his goal. [Musk](https://www.geekwire.com/2018/jeff-bezos-blue-origin-space-venture-go-moon-settlements/), who co-founded Tesla, has already launched nine rockets within the first five months of 2018, one of which was the most powerful private spacecraft [ever sent into orbit](http://sitn.hms.harvard.edu/flash/2018/spacex-launches-falcon-heavy-rocket-successfully/). Looking forward, SpaceX aims to complete its first manned mission to Mars in 2024, almost a decade earlier than NASA’s projections. Even the current US president is encouraging this shift to private companies driving [innovation in space](https://www.washingtonpost.com/news/the-switch/wp/2018/02/11/the-trump-administration-wants-to-turn-the-international-space-station-into-a-commercially-run-venture/?noredirect=on&utm_term=.d2c1eccab4ca). With almost [$1 billion](https://www.forbes.com/sites/alexknapp/2018/04/10/nearly-1-billion-was-invested-in-space-startups-in-1q2018-new-report-says/#5fdd019b285c) invested in space-focused startups in the first quarter of 2018, the commercialized space industry shows no sign of slowing down.

#### Private space appropriation is uniquely key to ensuring ongoing innovation towards space exploration and colonization.

**Cheng 20** [Dean Cheng, 09-16-2020, "Outer Space and Private Property," Heritage Foundation, https://www.heritage.org/space-policy/commentary/outer-space-and-private-property]//DDPT

Fully 53 years after the Outer Space Treaty, however, this has begun to change. The success of SpaceX, Blue Origin, Virgin Galactic, and other private companies has led to what has been termed Space 2.0.

The Obama administration’s decision to rely on commercial space-launch services to resupply the International Space Station opened the door to expanding private enterprise’s role in space.

The innovation exhibited in the various Falcon launches, including the ability to reuse the booster rockets, has seen a significant drop in the cost of placing payloads into orbit. As a result, a real opportunity exists for companies to begin thinking about how to use space not simply to improve terrestrial operations, but to make money from space and its physical resources.

The uncertainty associated with private property rights, however, has had a constraining effect on the ability to exploit space more extensively. Companies are unlikely to be willing to risk capital and assets if they are not sure that they will be able to profit from their investments.

#### Space exploration solves extinction and endless resource wars.

Collins 10 [Patrick Collins, professor of economics at Azabu University in Japan, and a Collaborating Researcher with the Institute for Space & Astronautical Science, as well as adviser to a number of companies, Adriano V. Autino is President of the Space Renaissance International; Manager, CEO/CTO, Systems Engineering Consultant / Trainer at Andromeda Systems Engineering LLC; and Supplier of methodological tools and consultancy at Intermarine S.p.A, Acta Astronautica, Volume 66, Issues 11–12, June–July 2010, “What the growth of a space tourism industry could contribute to employment, economic growth, environmental protection, education, culture and world peace”, Pages 1553–1562]

7. World peace and preservation of human civilisation

The major source of social friction, including international friction, has surely always been unequal access to resources. People fight to control the valuable resources on and under the land, and in and under the sea. The natural resources of Earth are limited in quantity, and economically accessible resources even more so. As the population grows, and demand grows for a higher material standard of living, industrial activity grows exponentially. The threat of resources becoming scarce has led to the concept of “Resource Wars”. Having begun long ago with wars to control the gold and diamonds of Africa and South America, and oil in the Middle East, the current phase is at centre stage of world events today [37]. A particular danger of “resource wars” is that, if the general public can be persuaded to support them, they may become impossible to stop as resources become increasingly scarce. Many commentators have noted the similarity of the language of US and UK government advocates of “war on terror” to the language of the novel “1984” which describes a dystopian future of endless, fraudulent war in which citizens are reduced to slaves.

7.1. Expansion into near-Earth space is the only alternative to endless “resource wars”

As an alternative to the “resource wars” already devastating many countries today, opening access to the unlimited resources of near-Earth space could clearly facilitate world peace and security. The US National Security Space Office, at the start of its report on the potential of space-based solar power (SSP) published in early 2007, stated: “Expanding human populations and declining natural resources are potential sources of local and strategic conflict in the 21st Century, and many see energy as the foremost threat to national security” [38]. The report ended by encouraging urgent research on the feasibility of SSP: “Considering the timescales that are involved, and the exponential growth of population and resource pressures within that same strategic period, it is imperative that this work for “drilling up” vs. drilling down for energy security begins immediately” [38].

Although the use of extra-terrestrial resources on a substantial scale may still be some decades away, it is important to recognise that simply acknowledging its feasibility using known technology is the surest way of ending the threat of resource wars. That is, if it is assumed that the resources available for human use are limited to those on Earth, then it can be argued that resource wars are inescapable [22] and [37]. If, by contrast, it is assumed that the resources of space are economically accessible, this not only eliminates the need for resource wars, it can also preserve the benefits of civilisation which are being eroded today by “resource war-mongers”, most notably the governments of the “Anglo-Saxon” countries and their “neo-con” advisers. It is also worth noting that the $1 trillion that these have already committed to wars in the Middle-East in the 21st century is orders of magnitude more than the public investment needed to aid companies sufficiently to start the commercial use of space resources.

Industrial and financial groups which profit from monopolistic control of terrestrial supplies of various natural resources, like those which profit from wars, have an economic interest in protecting their profitable situation. However, these groups’ continuing profits are justified neither by capitalism nor by democracy: they could be preserved only by maintaining the pretence that use of space resources is not feasible, and by preventing the development of low-cost space travel. Once the feasibility of low-cost space travel is understood, “resource wars” are clearly foolish as well as tragic. A visiting extra-terrestrial would be pityingly amused at the foolish antics of homo sapiens using long-range rockets to fight each other over dwindling terrestrial resources—rather than using the same rockets to travel in space and have the use of all the resources they need!

7.2. High return in safety from extra-terrestrial settlement

Investment in low-cost orbital access and other space infrastructure will facilitate the establishment of settlements on the Moon, Mars, asteroids and in man[/woman]-made space structures. In the first phase, development of new regulatory infrastructure in various Earth orbits, including property/usufruct rights, real estate, mortgage financing and insurance, traffic management, pilotage, policing and other services will enable the population living in Earth orbits to grow very large. Such activities aimed at making near-Earth space habitable are the logical extension of humans’ historical spread over the surface of the Earth. As trade spreads through near-Earth space, settlements are likely to follow, of which the inhabitants will add to the wealth of different cultures which humans have created in the many different environments in which they live.

Success of such extra-terrestrial settlements will have the additional benefit of reducing the danger of human extinction due to planet-wide or cosmic accidents [27]. These horrors include both man-made disasters such as nuclear war, plagues or growing pollution, and natural disasters such as super-volcanoes or asteroid impact. It is hard to think of any objective that is more important than preserving peace. Weapons developed in recent decades are so destructive, and have such horrific, long-term side-effects that their use should be discouraged as strongly as possible by the international community. Hence, reducing the incentive to use these weapons by rapidly developing the ability to use space-based resources on a large scale is surely equally important [11] and [16]. The achievement of this depends on low space travel costs which, at the present time, appear to be achievable only through the development of a vigorous space tourism industry.

## CASE

### Circumvention

#### Commercial clout means that regs cannot force compliance—BUT, self-interest means the industry will self-police

Hampson 17

Joshua Hampson, Security Studies Fellow at The Niskanen Center, Niskanen Center, January 25, 2017, “The Future of Space Commercialization”, https://niskanencenter.org/wp-content/uploads/2017/01/TheFutureofSpaceCommercializationFinal.pdf

NASA and the U.S. military have contracts with some of these companies for launches. In the future, 155 however, the military and government agencies may be more heavily relying on commercial companies for launches, equipment, and services. If the commercial sector becomes a more influential part of the market than the government, as has happened in other areas of technological development, government priorities may take a lower priority to space companies than commercial priorities. In the long-run, this may have two effects: (1) commercial companies could become large enough to push back on policies they disagree with, similar to the Apple vs FBI encryption debate; and (2) as a result of this reliance, the U.S. government may shift from an open, innovation-fostering approach to space to a more controlled and regulated approach.

Complex national security issues could directly hinder commercial development of space. The national security apparatus in the United States, which can wield significant influence over the licensing process, may restrict actions in space to reduce some of these concerns. If conflict breaks out over space satellites and infrastructures, the actions the U.S. military may take could be purely based on military/intelligence strategy. This could directly damage commercial space assets, or indirectly make the space environment unviable for commercial launches or assets. It would be in the best interest of companies seeking to operate in outer space to pay close attention to the increasing tensions in outer space. Industry may be able to encourage de-escalatory action by the United States or avoid undertaking actions that may increase tensions themselves.

### Space Debris

#### There’s no space debris impact

Park 18

Ye Joo Park, citing NASA studies on orbital debris, How Dangerous is Space Debris?, Research Association for Interdisciplinary Studies, RAIS Conference Proceedings, November 19-20, 2018, DOI: 10.5281/zenodo.1572516, <https://ssrn.com/abstract=3303541>

Other factors to consider concerning collisions in Space

While it’s true that there are thousands of space objects directly above Earth in an 800-kilometer band, space is so vast that it’s helpful to pause for a moment and reflect... in the area directly above the entire continental U.S., there are typically only three or four items orbiting above 3.1 million square miles. Therefore, the likelihood of collisions between satellites, spacecraft and orbiting objects is very small (NASA 2018).

In fact, in 2013 it was reported that the probability of a collision between an orbiting asset and space debris larger than 1 cm (0.4in.) will be once every 1.5-2 years, according to the Head of the Russian Hall/ History of Space Debris 8 Figure 5 [NASA] Space Agency. This compares with a 2010 estimate giving the likelihood of once every 5 years (Sorokin 2013).

The Feasibility of Practically Reducing Space Debris

Reducing orbital debris is incredibly difficult. Therefore, the most important action that space experts and policy makers currently recommend is to prevent the unnecessary creation of additional orbital debris. This can be done through prudent vehicle design and operations ((UNOOSA 2014).

The International Academy of Astronautics or IAA is a significant, global organization of scientists and space experts from many countries who meet regularly to discuss the importance of space debris as a policy issue. The subject-matter experts of the IAA published their fifth update Situation Report on Space Debris in August 2017 (Bonnal and McKnight 2017). In the executive summary, the IAA reported that if an orbiting satellite impacts with small bits of debris - even as small as 5 mm - the result will be grave, e.g. the collision would likely disrupt or terminate a satellite’s operations (Bonnal and McKnight 2017, 5).

The serious warnings expressed in this conclusion are offset by the positive findings of the IAA that there has been a reduction of the space debris created from the two extraordinary satellite destruction events (2007 and 2009) cited earlier in this paper. According to the IAF report, a large amount of debris from the satellite explosions were frictionally burned when reaching the Earth’s atmosphere after gradually sinking due to the scientific principle of atmospheric drag (in the science of Physics), which is a deterioration in the strength of an orbit because of an object hitting gas molecules in space. Small bits of space junk sink as the orbit gets weaker... then they burn. This is a positive trend “for keeping the short-term collision hazard under control at the lower altitudes (i.e., less than 650 km)” (Bonnal and McKnight 2017, 7).

#### Squo solves, NASA is taking careful measures to avoid collision.

NASA 21 (Garcia, Mark. “Space Debris and Human Spacecraft.” NASA, NASA, 14 Apr. 2015, www.nasa.gov/mission\_pages/station/news/orbital\_debris.html.)//DD AY

NASA has a set of long-standing guidelines that are used to assess whether the threat of such a close pass is sufficient to warrant evasive action or other precautions to ensure the safety of the International Space Station and its crew. These guidelines essentially draw an imaginary box, known as the “pizza box" because of its flat, rectangular shape, around the space vehicle. This box is about 2.5 miles deep by 30 miles across by 30 miles long (4 x 50 x 50 kilometers), with the International Space Station in the center. When predictions indicate that any tracked object will pass close enough for concern and the quality of the tracking data is deemed sufficiently accurate, Mission Control centers in Houston and Moscow work together to develop a prudent course of action. Sometimes these encounters are known well in advance and there is time to move the International Space Station slightly, known as a “debris avoidance maneuver” to keep the object outside of the box. Other times, the tracking data isn’t precise enough to warrant such a maneuver or the close pass isn’t identified in time to make the maneuver. In those cases, the control centers may agree that the best course of action is to move the crew into the Russian Soyuz or U.S. commercial crew spacecraft that are used to transport humans to and from the station. This allows enough time to isolate those spaceships from the station by closing hatches in the event of a damaging collision. The crew would be able to leave the station if the collision caused a loss of pressure in the life-supporting module or damaged critical components. The spacecraft act as lifeboats for crew members in the event of an emergency. Mission Control also has the option of taking additional precautions, such as having the crew close hatches between some of the station’s modules, if the likelihood of a collision is great enough. Maneuvering Spacecraft to Avoid Orbital Debris Debris avoidance maneuvers are planned when the probability of collision from a conjunction reaches limits set in the flight rules used to operate the space station and the spacecraft used to transport humans and cargo to and from the station. For the space station, if the probability of collision is greater than 1 in 100,000, a maneuver will be conducted if it will not result in significant impact to mission objectives. If it is greater than 1 in 10,000, a maneuver will be conducted unless it will result in additional risk to the crew. Debris avoidance maneuvers are usually small and occur from one to several hours before the time of the conjunction. Such maneuvers with the space station require about 5 hours to plan and execute using the station’s Russian thrusters, or the propulsion systems on one of the docked spacecraft. The International Space Station has conducted 29 debris avoidance maneuvers since 1999, including three in 2020. NASA implemented the conjunction assessment and collision avoidance process for human spaceflight beginning with shuttle mission STS-26 in 1988. Before launch of the first element of the International Space Station in 1998, NASA and DoD jointly developed and implemented a more sophisticated and higher fidelity conjunction assessment process for human spaceflight missions. In 2005, NASA implemented a similar process for selected robotic assets such as the Earth Observation System satellites in low-Earth orbit, and the Tracking and Data Relay Satellite System in geosynchronous orbit. In 2007, NASA extended the conjunction assessment process to all NASA maneuverable satellites within low-Earth orbit and within 124 miles (200 kilometers) of geosynchronous orbit. The U.S. Space Force’s 18th Space Control Squadron (18 SPCS) is responsible for performing conjunction assessments for all designated NASA space assets in accordance with an established schedule (every eight hours for human spaceflight vehicles and daily Monday through Friday for robotic vehicles). The 18 SPCS notifies NASA (Johnson Space Center for human spaceflight, and Goddard Space Flight Center for robotic missions) of conjunctions that meet established criteria. The Space Force tasks the Space Surveillance Network to collect additional tracking data on a threat object to improve conjunction assessment accuracy. NASA computes the probability of collision, based upon miss distance and uncertainty provided by the Space Force.Based upon specific flight rules and detailed risk analysis, NASA decides if a collision avoidance maneuver is necessary. If a maneuver is required, NASA provides planned post-maneuver orbital data to the Space Force for screening of near-term conjunctions. This process can be repeated if the planned new orbit puts the NASA vehicle at risk of future collision with the same or another space object.Additional information on orbital debris is available at NASA Orbital Debris Program Office’s website... <https://www.orbitaldebris.jsc.nasa.gov/>

#### Current efforts to remove space debris check.

Weiner 21 (Weiner, Chloee. “New Effort to Clean up Space Junk Reaches Orbit.” NPR, NPR, 22 Mar. 2021, [www.npr.org/2021/03/21/979815691/new-effort-to-clean-up-space-junk-prepares-to-launch.)// DebateDrills](http://www.npr.org/2021/03/21/979815691/new-effort-to-clean-up-space-junk-prepares-to-launch.)//DD)  AY

A demonstration mission to test an idea to clean up space debris launched Monday morning local time from the Baikonur Cosmodrome in Kazakhstan. Known as ELSA-d, the mission will exhibit technology that could help capture space junk, the millions of pieces of orbital debris that float above Earth. The more than 8,000 metric tons of debris threaten the loss of services we rely on for Earth-bound life, including weather forecasting, telecommunications and GPS systems. The spacecraft works by attempting to attach itself to dead satellites and pushing them toward Earth to burn up in the atmosphere. ELSA-d, which stands for End-of-Life Services by Astroscale, will be carried out by a "servicer satellite" and a "client satellite" that launched together, according to Astroscale, the Japan-based company behind the mission. Using a magnetic docking technology, the servicer will release and try to "rendezvous" with the client, which will act as a mock piece of space junk. The mission, which will be run from the U.K., will carry out this catch and release process repeatedly over the course of six months. The goal is to prove the servicer satellite's ability to track down and dock with its target in varying levels of complexity. The spacecraft is not designed to capture dead satellites already in orbit, but rather future satellites that would be launched with compatible docking plates on them. Space junk has been a growing problem for years as human-made objects such as old satellites and spacecraft parts build up in low Earth orbit until they decay, deorbit, explode or collide with other objects, fragmenting into smaller pieces of waste. In 2019, for example, India blew apart one of its satellites orbiting Earth, creating hundreds of pieces of debris that threatened to collide with the International Space Station. According to a recent report by NASA, at least 26,000 of the millions of pieces of space junk are the size of a softball. Orbiting along at 17,500 mph, they could "destroy a satellite on impact." More than 500,000 pieces are a "mission-ending threat" because of their ability to impact protective systems, fuel tanks and spacecraft cabins. And the most common debris, more than 100 million pieces, is the size of a grain of salt and could puncture a spacesuit, "amplifying the risk of catastrophic collisions to spacecraft and crew," the report said. According to NASA, cleaning up space — and addressing the risks associated with debris — depend on preventing the accumulation of more waste and actively removing it. The development of other cleanup technologies has been underway for years. In 2016, Japan's space agency sent a 700-meter tether into space to try to slow down and redirect space junk. In 2018, a device called RemoveDebris successfully cast a net around a dummy satellite. The European Space Agency also plans to send a self-destructing robot into orbit in 2025, which the organization's former director general has referred to as a space "vacuum cleaner." These efforts could prove increasingly important as private space ventures like SpaceX continue to clutter low Earth orbit with a "mega-constellation" of satellites.

### Corporate Col

#### Capitalism is key for CCS

Gregory F. Nemet et al. 16, Associate Professor, La Follette School of Public Affairs, University of Wisconsin–Madison, Martina Kraus, German Institute for Economic Research Vera Zipperer, German Institute for Economic Research, November, 2016, The Valley of Death, the Technology Pork Barrel, and Public Support for Large Demonstration Projects, La Follette School Working Paper No. 2016-007

Because the ultimate (but not immediate) goal of supporting demonstrations is to facilitate widespread adoption, demand a6nd thus markets are of course key (Kingsley et al., 1996). In climate change, policies are central to those markets (Taylor et al., 2003; Zhou et al., 2015), thus credibility in those policies is also central (Rai et al., 2010; Finon, 2012). But it is striking how many demonstration programs confronted markets that involved negative shocks around the time that projects came on-line—we see it in synfuels, biofuels, and solar thermal electricity (Figure 9), and CCS (Figure 10). The 1.9 year average lag from project initiation to time on-line is crucial. It would be a mistake to assume a Hotelling price path in which prices of an exhaustible resource (e.g. oil, atmospheric storage of CO2) rise at a constant pure rate of time preference. In this case the relevant price is the level at which avoided CO2 emissions are remunerated. Rather the experience of the past suggests we are more likely to see shocks and boom–bust cycles (Krautkraemer, 1998; Zaklan et al., 2011). We see it in our data in the prices related to each demonstration program (Figure 8). Lupion and Herzog (2013) attribute the failure of the NER300 program to stimulate the construction of any CCS projects to 4 factors: competition with renewables, project complexity, low carbon prices, and a combination of fiscal austerity and weak climate policy around the global financial crisis. Note that three of the four problems involved future demand, not the funding structure itself. Demonstrations need markets that pay off innovation investments not just under a steadily increasing Hotelling-style market, but under a broad range of market conditions. Features of robust demand pull include niche markets (Kemp et al., 1998), hedging across jurisdictions (Nemet, 2010), and flexible production (Sanchez and Kammen, 2016). Government price guarantees have played an important role as we have seen on synfuels, solar thermal electricity, and on a smaller scale, photovoltaics.

#### Try or die for CCS to solve warming

Moniz 9/23/19 - 13th Secretary of Energy (2013 to 2017) and is the founder and CEO of the Energy Futures Initiative

Fredd Krupp is president of the Environmental Defense Fund, Ernest Moniz, “Cutting Climate Pollution Isn’t Enough — We Also Need Carbon Removal,” Text, TheHill, September 23, 2019, <https://thehill.com/opinion/energy-environment/462609-cutting-climate-pollution-isnt-enough-we-also-need-carbon-removal>.

It has been almost four years since the Paris climate agreement was signed. But as leaders gather in New York this week for the United Nations Climate Change Summit, the world remains far off track from meeting the Paris objective of limiting global warming to well below 2 degrees Celsius -- and pursuing efforts at 1.5 degrees.

To meet that target, the world must achieve a 100 percent clean economy — one that produces net zero emissions, or no more climate pollution than can be removed from the atmosphere — soon after mid-century, with the United States and other advanced economies reaching that milestone no later than 2050. It’s a daunting but doable task.

The consequences of falling short are enormous. This year, the U.S. government’s fourth National Climate Assessment documented the huge economic and social impacts of unchecked warming. The Pentagon has repeatedly warned of the impacts on national security and our troops.

Achieving a 100 percent clean economy will require a swift transition to renewables and other zero-carbon energy sources. But we also need to face the reality that meeting the Paris target will require taking carbon out of the atmosphere at massive scale. In part, that’s because eliminating emissions will be very challenging for some sectors, especially the transportation industry and agriculture. Removing carbon from the atmosphere would also bring concentrations down, helping to stabilize the climate at safer levels. So, the push for clean energy must be supplemented by a suite of technologies known as carbon dioxide removal (CDR).

It is not a question of what we’d prefer. It’s a question of insurmountable math.

The crucial role carbon removal must play is becoming more widely recognized. The 2018 Intergovernmental Panel on Climate Change report stressed the importance of carbon removal, and the U.S. National Academies of Sciences, Engineering and Medicine late last year estimated that ten billion tons of CO2 will need to be pulled from the atmosphere annually by 2050, and double that by 2100. For context, today’s global emissions are less than 40 billion tons per year. If the 10 billion tons of CO2 from CDR were stored underground, that would be roughly double the world’s annual oil production.

The good news is that there are a surprisingly large number of promising pathways for carbon dioxide removal. Nature-based approaches include reforestation and forest management as well as agricultural practices that increase carbon stored in soils. Some of the attendant challenges include competition for land and permanence of the carbon sequestration.

Technological approaches include direct air capture — machines that actually suck carbon from the air — and technologically-enhanced natural processes, such as plants genetically modified with deep roots to fix carbon in the soil; enhanced mineralization, which uses certain reactive rocks to bind with carbon from the air; and accelerated ocean uptake in phytoplankton. These technologies are immature and require considerable research, development and demonstration to ensure viability and affordability at very large scale.

Despite the urgency, there is no dedicated federal effort to develop these crucial technologies; existing programs are piecemeal and largely focused on sequestering emissions from industrial and electricity generating sources.

The National Academies recommended the rapid establishment of a robust, focused, scalable and accelerated federal research program spanning the Departments of Energy and Agriculture, the National Oceanic and Atmospheric Administration and the National Science Foundation, among others. Such a program would encompass the full range of technological pathways that can remove CO2 from the environment. ‘’Clearing the Air,’’ an analysis of CDR’s value and a proposed plan to deploy it, has been completed by the Energy Futures Initiative. Over the next decade, the program scale would be about a billion dollars a year.

Carbon dioxide removal is not a magic bullet. We must do everything we can to deploy innovative low- and zero-carbon methods to generate electricity, heat homes, fuel vehicles, and power industry, creating new economic opportunities in the process. Tackling the climate crisis also requires placing a declining limit and a price on carbon pollution, as well as a significant increase in energy technology innovation and deployment across the board.

But CDR is also not a “Plan B.” It is a critical part of any “Plan A” for climate, a necessary complement to emission reduction. It can provide more flexibility and optionality in policy planning, which could ease the transition to a carbon-neutral economy while minimizing transition costs and providing greater assurance that science-based climate goals can be met in a timely manner. It would eventually enable a net negative global economy that could bring the atmospheric carbon concentrations down — and global temperatures with it.

We have delayed meaningful action for far too long. As a result, the scale and urgency of the challenge is such that we cannot simply work on doing better in the future. We need to correct what we did in the past. Carbon removal is the enabler.

#### Space privatization and capitalism is uniquely key to saving lives.

**Sharma 21** [Maanas, “The privatized frontier: the ethical implications and role of private companies in space exploration”, The Space Review. 7 September 2021. https://www.thespacereview.com/article/4238/1] //DebateDrills LC

Another key matter to note is restricted **capitalism in space “could also be our salvation.”[**11] **Private space exploration could reap increased access to resources and other benefits that can be used to solve the very problems on Earth that critics of capitalism identify**. Since governments offset some of their projects to private companies, **government agencies can focus on altruistic projects that otherwise would not fit in the budget before and do not have the immediate commercial use that private companies look for**. Scott Hubbard, an adjunct professor of aeronautics and astronautics at Stanford University, discusses how “this strategy allows the space agency to continue ‘exploring the fringe where there really is no business case’” but still has important impacts on people down on Earth.[12]

Indeed, **this idea is a particularly powerful one when considering the ideal future of private companies in space exploration**. Though there is no one set way governments will interact with companies, the consensus is that they must radically reimagine their main purpose as the role of private space exploration continues to grow. **As governments utilize services from private space companies,** “[i]nstead of being bogged down by the routine application of old research, **NASA can prioritize their limited budget to work more on research of other unknowns and development of new long-term space travel technologies**.”[13] According to the Council on Foreign Relations, **such technologies have far-reaching benefits on Earth as well.** Past **developments obviously include communications satellites**, by themselves a massive benefit to society, but also “**refinements in artificial hearts; improved mammograms; and laser eye surgery**… thermoelectric coolers for microchips; high-temperature lubricants; and a means for mass-producing carbon nanotubes, a material with significant engineering potential; [and h]ousehold products.”[2] **Agencies like NASA are the only actors able to pursue the next game-changing missions**, “where the profit motive is not as evident and where the barriers to entry are still too high for the private sector to really make a compelling business case.”[8] **These technologies have revolutionized millions, if not billions, of lives, demonstrating the remarkable benefits of space exploration.** It follows then that it is net ethical to prioritize these benefits.

#### Space privatization just isn’t unique enough to trigger new impacts of capitalism- it’s just a continuation of what’s already happening on earth.