# India CP

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#### The Republic of India should limit the Indian Space Research Organization’s market share to 7.5%

#### Private appropriation for Indian private entities is key for investor confidence.

**Sen 20** [Nilanjan Sen, who is an experienced lawyer, specialising in International Law and Arbitration, 07-26-2020,Business Insider,https://www.businessinsider.in/science/space/news/the-fault-in-our-stars-indias-bid-at-privatizing-space/articleshow/77182064.cms, 12-7-2021 amrita]

With the creation of the Indian National Committee for Space Research (now ISRO) in 1962, India has been an active patron to mankind’s space efforts. From Aryabhata to Chandrayaan-2, India has launched 113 satellites, including the first privately built and funded satellite ExceedSat-1 which was launched from USA, as a part of Elon Musk’s Space X project Falcon-9. Up **until 2016, India’**s space activities **have been the exclusive domain of the State, however, the launch of the IRNSS-1H** in 2017 was the herald of a new era in India’s Space endeavours. The IRNSS-1H **marked the** beginning of **privatisation in this area** by being the first Indian satellite, to be designed in collaboration with the private parties. In the following year, the ExseedSat-1 was to become the first privately funded and built satellite launched in collaboration with the private Space X project. Interestingly, **up until now**, all **missions have been conducted for** purposes of research, reconnaissance as well as for augmenting communication systems since there wa**s a substantial State monopoly**. With the recent announcement ofthe creation of the Indian National Space Promotion and Authorization Centre or IN-SPACeby the Government of India as part of its atma nirbhar Bharat scheme, which aims at providing a “level playing field” and a supportive regulatory regime to allow Indian private enterprises to grow and carve their own niche in the so-called “fast-growing global space sector”**, India has** in fact **shown an inclination to capitalise** on the US strategy of opening up the avidly touted space “sector” to private participation. While the initiative **sounds exhilarating** and will definitely go a long way in defining India’s image as an emerging global technology powerhouse**, it is** extremely **difficult to fathom why private players, would** be willing to readily come forward and **invest billions,** by confining their activities for research purposes alone, **without any expectation of commercial gains** or simply, return on their investment. This is so because, matters concerning space and space exploration are subject of a special branch of customary international law, that are mainly centred around five treaties and eleven agreements. The most significant of these is the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies or the Outer Space Treaty (OST) which India ratified in 1967, and which specifically lays down under Article I that outer space and space exploration including that on the moon and other celestial bodies, are to be carried out solely for, and in the interest of all countries, and that they are the province of all mankind. **Article II restricts** claims of sovereignty and national **appropriation** by any means whatsoever, Article VI **places international responsibility on all activities carried on by** governmental or by **non-governmental entities**, as well as mandates authorization and continuing supervision by the appropriate State Party. While there is considerable debate surrounding the applicability of the OST especially Article VI to private parties, since the US Supreme Court ‘s ruling in Medellin v Texas (2008) which held that Article VI is not self-executing in nature, regard must be had to the fact that these are domestic Court rulings and the fact that Space law is part of Customary International law which is affirmed by decades of State practise, cannot be denied, and neither can the fact that it is settled principle of international law that a State cannot, under the excuse of changes in domestic law, including subsequent Court rulings, renege from treaty obligations once ratified. In effect, the OST places strict checks upon the objectives behind exploring this uncharted territory by State and Non-State actors, far less allowing the possibility of even claiming rights of any kind. Moreover, it is no secret that **private corporations operate predominantly with** the object of individual gains **and** unless driven by the zeal to serve mankind and share profits with all countries, **chances are** that the **investments** made by private parties **will have little** to nil **returns,** far less any substantive protection**.**

#### Investor confidence is necessary for strong Indian private space-tech—that spills over, boosts Indian military heg, and turns case.

**Prasad 16** [Narayan Prasad has a Master of Space & Telecommunications Law, May 2016, National Academy of Legal Studies and Research University of Law Hyderabad, https://www.researchgate.net/publication/305402089\_A\_POLICY\_REVIEW\_TOWARDS\_THE\_DEVELOPMENT\_OF\_A\_SPACE\_INDUSTRY\_ECOSYSTEM\_IN\_INDIA/link/578dbd2908ae5c86c9a65d05/download, 12-8-2021 amrita]

As India ramps up its space defence capabilities, **lack of a mature space industrial base will** potentially **hurt** its ambitions**.** **India** counts among the top nations in the world in terms of government space investment 4 , but **is far behind** when it comes to **creating successful private industry** that is globally reputed. India’s space budget has increased in size (Figure 2) and is one of the largest space budgets in the world; however, the lack of an active space industry at turnkey level might have an immense opportunity cost for India in manufacturing satellites and launch vehicles to service the global market.5 This in effect is also due to absence of a single Indian company among the top space companies in the world (which in itself is an alarming statistic) that needs to be addressed urgently through policy push under the several grand schemes announced by the current government, such as ‘Make in India’ and ‘Digital India’. Most of **the apprehensions** for private investment in space industry **come from** the **requirements** of high capital investment, **and** the long gestation periods of space projects to get substantial Return on Investment (RoI) for the investors. These trends have been put aside by a new breed of space companies calling themselves ‘NewSpace’, which thrive on new business models of low cost access to space by capitalising on the advancements made in recent years in small satellite technology, consumer electronics, and computing power. Tiny modular satellites called ‘CubeSats’, weighing 1-4 kgs and costing under $100,000 have revolutionised the way space products and services are delivered to end users. The movement began in Europe and US simultaneously as a by-product of university and space agency collaborated research, but it was the US which took the lead in successfully commercialising these technologies developed in laboratories. Figure 3 shows the forecast of nano satellites weighing between 1-50 kg, which are scheduled to be launched during 2014-16 globally.6The high number arises from the fact that such nano satellites have short development timelines, and provide the necessary agility for satellite operators to develop large constellations that can cater to a larger customer base with high service quality. These NewSpace companies have ushered in widespread changes in the traditional satellite manufacturing and launch services industry, with companies like RocketLabs and Firefly Systems building new launchers cheaply using innovative techniques like additive manufacturing, to reduce the cost to orbit for these satellites. The impact of these companies has been felt within the space industry, as practices from these ‘NewSpace’companies have been adopted to keep the costs low and have a factory type approach in building systems in order to cater to the increasing demand. The NewSpace revolution has now led to companies such as Google, Virgin, and Qualcomm investing in small satellite-based communication technologies. India, however, has remained shielded from the rapid changes that have happened in the global space industry over the past decade. **ISRO** has been **slow to respond on** both **commercial** and academic **fronts,** with only a handful of university-level small satellite missions being launched during the same period, none of which could transform into a full-fledged commercial opportunity for the people involved in these projects. Lack of clarity on space policy in India is to blame, and partly the lack of willingness of DoS to take up additional responsibility of creating an ecosystem that disrupts their own traditional one, without any visible incentives. In the following sections, the need and motivation to develop a strong private industry ecosystem is detailed with necessary arguments. 1.2 Motivations to Develop a Private Industry Ecosystem in India Presently, **India has inherent advantages** over other countries **due** the availability of **skilled workforce**, a stable and business friendly **government,** positive investor climate and low cost of operations**.** Because India was an early mover in space technology, it is **poised to become a major space power albeit** slight policy push towards **greater commercialisation** of the industry. Table 1 shows the PESTLE analysis of India, in lieu of the motivation to develop a strong private space industry. The PESTLE analysis shows high suitability for services-based business models to operate out of India. The government’s encouragement for private space industry within the country to develop capacity and capability in pursuing space activities should thereby be directed to both the spectrums across the industry value chain. A focused space policy mandate can have multiple direct and fringe benefits to the government, especially in the defence sector which has been the current government’s area of interest through its ‘Make in India’ initiative. Some of the direct and indirect benefits of space technology include: Civilian and Commercial **Space industry has the potential to emerge as the third** technological **success** front following the successes of the Information Technology (IT) and Biotechnology in the country. Space **has an important role in** the overall **economic development** of the country **and** in the success of the government initiatives such as Digital India and Make in India. The development of the private space industry shall **aid in rural connectivity, e-governance and** setting up of **manufacturing facilities** base for products of high technology in India, creating headways in the overall emergence of the country at the world stage. The success of the space industry will enhance capacities within the country and complement the government-driven programme, which has been historically proven in advanced space faring countries such as the US. Capacity building in the private industry at a turnkey level for both upstream and downstream shall assist theeconomic development of the country by keeping up to the pace of requirement of the marketplace (e.g. Direct-to-Home TV, Broadband Internet), while reducing the inherent dependence on foreign assets. For example, as per a recent Comptroller and Auditor General (CAG) report, only one among the seven DTH providers is leasing transponder from the INSAT system**. The** primary **reason for this disparity is** the **slow pace** at which **ISRO has added** satellite transponders **to the commercial market.** The net effect is that the DTH providers are incurring higher transponder costs on foreign satellites when INSAT could have been an equally reliable, and more cost efficient, alternative. Space has its bearings over the imagination of youth and a strong emerging local industry can revolutionise the mindset of the national talent pool and can potentially aid in reversal of brain drain from the country. Public outreach, awareness, and STEM education are some of the intangible impact that investment in space technology produces. The capacity built up within the industry shall foster Business-to-Business (B2B) collaborations within the country and with enterprises across the globe and create also a strong focus on Business-to-Customer (B2C) applications which moves from the traditional Government-to-Government (G2G) flow of development of capacity and application of technology. The B2B, B2C ecosystem in the space industry has immense potential of tapping the much successful IT infrastructure of the country and extending the IT knowledge base to core software based applications of spacebased information such as Geographical Information Systems (GIS).It shall create an environment of technological innovation which when supported and encouraged can sustain to create a secondary source of development of high-tech hardware, software and applications for the government. An ecosystem of technological innovation in space technology has the potential of creating the next generation Small and Medium Scale Enterprises (SMEs) in India which shall 17 leverage the frugal nature of engineering and can create products and services independently for local and global requirements. Military **In the development of space technology with several dual use capabilities, there exists a case for the building up a sustained indigenous industry ecosystem that shall support the safety and security apparatus of the country**. These range **from development of capabilities in upstream** such as satellite, launch vehicle development **to** creating specific downstream applicationssuch as Automatic Identification of Ships (AIS), Electronic Intelligence (ELINIT), Communication Intelligence (COMMINT) and other Command, Control, Communications, Computers, Intelligence, Information, Surveillance, and Reconnaissance (C4I2SR) applications. Space Situational Awareness (SSA) is **the ability to view, understand and predict the physical location of natural and man-made objects orbiting the Earth. SSA is a prominent concern for both military and commercial systems, mainly because of the increasing military reliance on space assets**. The debris created by the anti-satellite testing by China in 2007 and the Kosmos-Iridium collision in 2009 has raised additional concerns about the safety of space assets. India currently relies on NASA’s data, and will operationalise its own system of Multi Object Tracking Radar (MOTR) by 2017.7 Meanwhile in the US, commercial operators have established the Space Data Association (SDA) for providing satellite operators reliable and efficient data for increased safety of satellite operations; this is in addition to the Department of Defense’s (DoD) own surveillance network. **The changing space security environment and the rising international concerns over the rapid growth of military assets in space makes space security one of the most important issues to address.** The need to have a space security policy is being 7 increasingly debated in India **and** the IDSA Task force in 2009 produced a report which attempted to conceptualise such a policy. However, there is reluctance to talk about use of space for national security needs including its military applications. Though efforts are being made to synchronize the activities of ISRO which is responsible for India’s civilian space programme and the Defence Research and Development Organisation (DRDO) which works on the use of space for national security needs, **the lack of a strong private industry that can meet heightened needs for such sophisticated missions hampers the progress in this direction,** apart from the bureaucratic delay that is normally associated when two high security government agencies interact. Capacity building within the space industry shall not only drive commercial applications, but shall aid the government in situations of emergencies (e.g. natural disasters, intelligence gathering for fighting against terrorism) and can eventually develop into a foundation that could potentially contribute as a part of a strong foreign policy drive. Studying the impact of space technology on civilian life is a complicated task, especially when it comes to quantifying the tangible and intangible impact. **The spill-over of space technology is in sectors as varied as defence, agriculture and education.** There exist many ways to show the impact of investment in space technology; some of them illustrated above. **Thus, the technological and knowledge backbone for space technology creates opportunities in the marketplace to create and explore commercial applications on a global scale, which** traditionally might not be the fundamental focus a governmental space agency, as well as **create multiple intangible impacts** across various sectors such as defence, education, agriculture, energy, transportation and environment**.** India has made substantial investment in its government space programme over the years, but it is **a sustained policy push towards investments in the private space industry ecosystem that will create commercial space applications**, complementing the societal benefits motivation currently being pursued by the government.

#### Indian space military heg checks and limits Chinese heg in the Indo-Pacific.

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Regardless of the Americans protestations about the Russian test**, there are important underlying implications for India particularly in the context of Chinas’ growing space and counterspace capabilities as well as the repercussions that are likely to ensue if New Delhi were to pursue a weak response to Chinese space military power.** India will need a whole set of additional KEW tests. This author made the case for sea-launched and air launched KEWs in an extensive analysis. However, it was focused mostly on earth to space KEW systems and Directed Energy Weapons (DEWs). Confining India to the acquisition of KEWS and Directed Energy Weapons (DEWs) or cyber and electronic weapons can be expanded to include co-orbital KEWs. The Russian test also illustrates why co-orbital KEWs are also critical. Investment in additional KEW capabilities assumes considerable importance especially for India because of the long-term defence related challenges presented by the People’s Republic of China (PRC). **The ongoing boundary crisis should only lend greater urgency to India’s space weapons programme, simply because space assets in India’s inventory are vital to the prosecution of a potential military campaign whether on land, sea or air against the People’s Republic China (PRC).** The PRC is known to have developed the accoutrements necessary to conduct co-orbital test. For instance, in 2008 the Chinese BX-1 microsatellite while orbiting in close proximity to its mother satellite, executed a maneuver within 45 kilometers of the International Space Station (ISS). While BX-1 did not definitively establish a PRC co-orbital ASAT capability, it did indicate the PRC’s latent capability to conduct co-orbital kinetic tests and mount attacks against a potential adversary’ space assets. India must avoid what one leading Indian space analyst prior to India’s March 2019 KEW test observed: “To date, India’s interests in space have been restricted to using space assets for reconnaissance, navigation and communication. However, China’s ASAT test could influence India’s policies in the field of counter-space capabilities. To address the concerns raised at the regional and global level about this Chinese bravado, the best option for India could be to follow the disarmament and arms control route.” The statement is a non-sequitur, **while India has conducted only but one direct ascent KEW test, it has not matched China** in developing and executing non-destructive earth to space KEW tests, let alone fully match Chinese KEW, DEW, electronic and cyber weapon capabilities to target space assets. **Pursuing the arms control and disarmament route by India will be premature** in response to the PRC’s extensive development of space **and** counterspace capabilities**.** Reinforcing this point is that the PRC’s current and evolving space weapons programme deserve a sustained response. Bringing closure to the development of space and counterspace capabilities **would imply surrender that is completely unwarranted in light of Beijing’s recent and ongoing aggressiveness,** which India is evidently bearing the brunt. Very likely Beijing will be emboldened even more in deducing that India’s skittish response to its space weapons programme should be treated as weakness **and India subjected to further aggression, not just terrestrially, but equally in space.** The External Affairs Minister S. Jaishankar stated there is an imperative for India and China to achieve some “equilibrium”, although he never fully elaborated what exactly it would look like. However, if equilibrium or more precisely a stable balance of power is to be achieved in the Indo-Pacific, military power is crucial. **Space military power has grown in importance** from reconnaissance, navigation and communications to space weapons **and will be crucial to generating an equilibrium.** Ignoring the eventual deployment of weapons in space would be foolhardy for a state such as India when pitted against the PRC**. Consequently, space military power is a key constituent element in India’s capacity to contribute to the Asian balance of power**. Thus, **investing in a direct ascent and co-orbital KEWs as well as DEWS and cyber and electronic weapons geared for destroying or disabling spacecraft is crucial**. If India were to deprive itself of offensive space weapons to take Chinese or other enemy spacecraft, New Delhi would be putting itself at a considerable disadvantage by leaving it at the mercy of a wide variety of Chinese counterspace capabilities and measures against its Imagery Intelligence (IMINT), Communications (COMMINT), Electronic Intelligence (ELINT) and Synthetic Aperture Radar (SAR) satellites. Indeed, it is perplexing to see arguments that call for India to restrain itself, strive for disarmament and arms control when China makes no significant effort to do so beyond rhetorical commitments. The Russian co-orbital test has underlined the importance of space borne weapons despite entreaties for the non-weaponisation of space. The Modi government must see the emerging space military competition as an opportunity to bolster India’s counterspace capabilities. **It will help cement India as a major space military power and prevent Chinese hegemony over the Indo-Pacific.** Chinese hegemony on the other hand will become a certainty, if New Delhi lapses into self-doubt and remains unduly restrained in the testing, integration and deployment of space weapons.

#### China heg is revisionist and offensive-- in the Indo-Pacific that causes draw-in.

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The responsible-stakeholder paradigm offered a coherent “theory of victory”: It identified a desired outcome and employed all elements of American power to bring about that outcome. Over time, the strategy produced greater Sino-American cooperation on a range of issues, from counter-piracy to climate change. **It is increasingly clear, however, that the responsible-stakeholder strategy failed. Two of its core assumptions now appear misplaced: the idea that China’s intentions would become more benign over time, and the belief that Washington had the power to keep Chinese ambitions in check until that shift occurred.** What happened instead was that, as China rose, the Chinese Communist Party became more willing to use its newfound power in coercive and disruptive ways.3 Confounding Western hopes that China would liberalize, **the Chinese Communist Party embraced more repressive policies**, especially after Xi Jinping became general secretary in 2012. **Meanwhile, Beijing sought to control the Indo-Pacific region by** coercing its neighbors, undermining U.S. alliances, practicing mercantilist policies, steadily **increasing its presence** and influence in the South China Sea**, and modernizing its military. In the Indo-Pacific and beyond, moreover, China has engaged in a range of behaviors that challenge American interests: supporting authoritarian regimes, engaging in widespread corruption, pursuing predatory trade practices and major geo-economic projects meant to project Chinese influence further afield,** seeking to stifle international criticism of its human rights abuses, practicing massive intellectual property theft, and striving for technological dominance in critical emerging fields such as artificial intelligence.Recently, China’s confidence has been on display, with Xi stating in 2018 that “no one is in a position to dictate to the Chinese people,” after declaring in 2017 that China is ready to “take center stage in the world.”4 Rather than becoming a responsible stakeholder in a U.S.-led system, **China appears increasingly determined to compete with Washington for primacy in the Indo-Pacific and beyond.** These more assertive policies have been made possible by China’s surprisingly rapid growth**.** Between 1990 and 2016, China’s constant-dollar gross domestic product increased roughly twelve-fold and its military spending grew tenfold.5 The People’s Liberation Army rapidly developed the tools — anti-ship missiles, quiet submarines, advanced fighter aircraft, and integrated air defenses — needed to contest American supremacy in the Western Pacific and give China greater ability to shape events in its region and beyond. Surging national wealth also led to an explosion of Chinese trade, lending, and investment abroad, which enabled far more ambitious geo-economic statecraft**.** All told, **this expansion of Chinese national power is unprecedented in modern history.** It has dramatically narrowed the gap between China and the United States and made it far more difficult for Washington to shape Beijing’s behavior. No strategy can survive the invalidation of its central premises: By the end of the Obama presidency, the responsible-stakeholder concept was living on borrowed time. The Trump administration drove the final stake through the concept in its 2017 National Security Strategy. The document slammed Beijing for attempting to “shape a world antithetical to U.S. values and interests” and declared the failure of China’s “integration into the post-war international order.”6 In particular, **China’s behavior increasingly threatens three enduring U.S. interests. First, the United States seeks to maintain a favorable balance of power in the Indo-Pacific region** and to deter a military conflict — over Taiwan, Korea, or maritime Asia — that could undermine the regional order and cost American or allied lives. Second, **U.S. leaders have an interest in ensuring an open international economy conducive to American prosperity and competitiveness.** Third, **the United States seeks to preserve an international environment in which democracy, human rights, and the rule of law can** flourish, and it seeks to **strengthen** — where possible — the prevalence of those practices abroad. As Chinese power has grown and Chinese behavior has become more assertive, U.S. policymakers have come to see all three of these interests as being imperiled.

#### That goes nuclear-- extinction

**Hayes 18** [Peter John Hayes is the Executive Director of the Nautilus Institute for Security and Sustainability, a non-governmental policy-oriented research and advocacy group. He graduated from the University of Melbourne with a degree in History, and from University of California, Berkeley with a Ph.D. in energy and resources. #gobears, Trump and the Interregnum of American Nuclear Hegemony, November 8, 2018. [https://www.tandfonline.com/doi/full/10.1080/25751654.2018.1532525 recut 12-10-2021](https://www.tandfonline.com/doi/full/10.1080/25751654.2018.1532525%20recut%2012-10-2021) amrita]

During a post-hegemonic era, long-standing **nuclear alliances are** likely to be **replaced by** ad hoc nuclear **coalitions**, aligning and realigning around different congeries of threat and even actual nuclear wars, **with** much **higher levels of** uncertainty and **unpredictability** than was the case in the nuclear hegemonic system. There are a number of ways that this dynamic could play out during the interregnum, and these dynamics are likely to be inconsistent and contradictory. In some instances, the sheer momentum of past policy combined with bureaucratic inertia and the potency of political, military service and corporate interests, may ensure that residual aspects of the formerly hegemonic postures are adhered to even as formal nuclear alliances rupture. Even as they reach for the old anchors, these **states may be forced to adjust** and retrench **strategically, or start** to take their own nuclear risks by **making** increasingly explicit **nuclear threats** and deployments **against nuclear-armed adversaries** – as Japan has begun to do with reference to its “technological deterrent” since about 2012.9 This period could last for many years until and **when** nuclear **war breaks out** and leads to a post-nuclear war disorder; or **a** new, post-hegemonic strategic **framework is established** to manage and/or abolish nuclear threat. Under full-blown American nuclear hegemony, fewer states had nuclear weapons, the major nuclear weapons states entered into legally binding restraints on force levels and they learned from nuclear near-misses to promulgate rules of the road and tacit understandings. The lines drawn during full-blown collisions involving nuclear weapons were stark and concentrated the minds of leaders greatly. In a nuclear duel, it was clear that only one of two sides could fire first; the only question was which one. **Now, with nine** nuclear weapons **states, and conflicts** conceivably **involving** three, four or **more of them**, no matter how much leaders concentrate, **it will not be evident** who is aiming at who, **who may fire** first, and during a volley, who fired first and even who hit whom. In a highly proliferated world, **nuclear-armed states** may **feel driven to obtain larger** nuclear **forces** able **to deter multiple adversaries** at the same time, sufficient to conduct not only a few nuclear attacks but **configured to fight more than one** protracted **nuclear war at a time, especially in** nuclear **states torn apart by civil war** and post-nuclear attack reconstruction. The first time nuclear weapons are used since 1945 will be shocking, the second time, less so, the third time, the new normal

# Space Mining DA

#### Private sector mining is coming now – new tech and precious resources create concrete incentives.

Davenport 20 Davenport, Christian. [Reporter covering NASA and the space industry, Education: Colby College, B.A., American Studies]“A Dollar Can't Buy You a Cup of Coffee but That's What NASA Intends to Pay for Some Moon Rocks.” *The Washington Post*, WP Company, 3 Dec. 2020, https://www.washingtonpost.com/technology/2020/12/03/moon-mining-contracts-named/. //Debatedrills AS

NASA announced Thursday that several companies had won contracts to mine the moon and turn over small samples to the space agency for a small fee. In one case, a company called Lunar Outpost bid $1 for the work, a price NASA jumped at after deciding the Colorado-based robotics firm had the technical ability to deliver.

“You’d be surprised at what a dollar can buy you in space,” Mike Gold, NASA’s acting associate administrator for international and interagency relations, said in a call with reporters.

But the modest financial incentives are not the [driver of the program](https://www.washingtonpost.com/technology/2020/09/10/moon-mining-nasa-search/?itid=lk_inline_manual_6). Nor to a large extent is the actual lunar soil. NASA is asking for only small amounts — between 50 and 500 grams (or 1.8 ounces to about 18 ounces). While there would be scientific benefits to the mission, it’s really a technology development program, allowing companies to practice extracting resources from the lunar surface and then selling them.

It would also establish a legal precedent that would pave the way for companies to mine celestial bodies in an effort blessed by the U.S. government to help build a sustainable presence on the moon and elsewhere.

To do that, NASA says it needs its astronauts, like the western pioneers, to “live off the land,” using the resources in space instead of hauling them from Earth. The moon, for example, has plenty of water in the form of ice. That’s not only key to sustaining human life, but the hydrogen and oxygen in water could also be used as rocket fuel, making the moon a potential gas station in space that could help explorers reach farther into the solar system.

Asteroids also have significant resources, particularly precious metals that could be used for in-space manufacturing. While the prospect of large mining and manufacturing facilities in orbit is still many years away, NASA wants to use the mining program as a small step toward that goal.

NASA is now trying to return astronauts to the moon under its Artemis program for the first time since 1972. Unlike its predecessor, Apollo, where the astronauts visited the lunar surface for a short while before coming home, the Artemis program would create a permanent presence on and around the moon.

“The ability to extract and utilize space resources is the key to achieving this objective of sustainability,” Gold said. “We must learn to generate our own water, air and even fuel. Living off the land will enable ambitious exploration activities that will result in awe-inspiring science and unprecedented discoveries.”

In 2015, then-President Barack Obama signed a law that allowed private companies the right to own the resources they mined in space. Under the program announced Thursday, NASA said the materials would be transferred from the private companies to NASA.

The effort would not violate the 1967 Outer Space Treaty, NASA officials have said, which prohibits nations from claiming sovereignty over a celestial body. NASA Administrator Jim Bridenstine previously likened the policy to the rules governing the seas.

**“We do believe we can extract and utilize the resources of the moon, just as we can extract and utilize tuna from the ocean,” he said earlier this year.**

As part of its lunar exploration mission, NASA has been working to get countries around the world to adopt what it calls the Artemis Accords, a legal framework that would govern behavior in space and on celestial bodies such as the moon.

The rules would allow private companies to extract lunar resources and create safety zones to prevent conflict and ensure that countries act transparently about their plans in space, while sharing their scientific discoveries.

The mining announcement came during the same week that China landed a spacecraft on the moon, extracted resources and then lifted off from the lunar surface in an effort to return the sample to Earth.

Instead of developing and sustaining a big government sample-return mission, NASA is taking another approach by partnering with the private sector. “If you step back and think about how really amazing it is that NASA can essentially piggyback on the private-sector space capabilities to perform this mission, it would not have been possible 10 years ago,” said Phil McAlister, the director of NASA’s commercial spaceflight division.

In addition to Lunar Outpost, the other companies chosen for NASA’s program are: ispace Japan and Europe, which would each charge $5,000 for the material; and Masten Space Systems of California, would charge $15,000.

All of the companies would already be on the moon, according to NASA, conducting other missions. McAlister said Lunar Outpost would be ferried to the moon by the lunar lander known as Blue Moon being developed by Jeff Bezos’s Blue Origin. (Bezos owns The Washington Post.) The company later clarified that it was looking at a number of landers to get it to the lunar surface, and not just Blue Origin’s. The ispace companies would fly on a Japanese lander, McAlister said, and Masten, already part of another NASA lunar contract, would use its own Masten XL-1 lander.

#### \*The word “appropriation” means to take as property which includes minerals – prefer our definition because it’s specific to space.

Leon 18 (Amanda M., Associate, Caplin & Drysdale, JD UVA Law) "Mining for Meaning: An Examination of the Legality of Property Rights in Space Resources." Virginia Law Review, vol. 104, no. 3, May 2018, p. 497-547. HeinOnline. EE

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."16 5 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.

2. Preparatory Materials

A review of meeting reports of the Committee on the Peaceful Uses of Outer Space and its Legal Sub-Committee regarding the Treaty reveals little to clear up the ambiguities of Articles I and II of the OST. In fact, the reports indicate that, despite several negotiating states expressing concern about the lack of clarity with respect to the meaning of "use" and the scope of the non-appropriation principle, no meaningful discussion occurred and no consensus was reached.16 9 Some commentators still conclude that the preparatory work does in fact confirm the drafters' intent for "use" to include exploitation. 170 These commentators do admit, however, that discussions of the term "exploitation" supporting their conclusion focused on remote sensing and communications satellites rather than on resource extraction.17 1 Further skepticism about such an intent for "use" to include "exploitation" also arises given the uncertainty amongst negotiating states about the meaning of these terms. A mere few months before the Treaty opened for signature in January 1967, negotiators were still asking questions about the meaning of "use" during the last few Legal Sub-Committee meetings. For example, in July 1966, the representative of France inquired: "Did the latter term ["use"] imply use for exploration purposes, such as the launching of satellites, or did it mean use in the sense of exploitation, which would involve far more complex issues?" 172 The representative noted that while some activities such as extraction of minerals were difficult to imagine presently, "[i]t was important for all States, and not only those engaged in space exploration, to know exactly what was meant by the term 'use.'173 In the same meeting, the representative from the USSR offered an interesting response to the question posed by the representative of France:

[A]dequate clarification was to be found in article II of the USSR draft, which specified that outer space and celestial bodies should not be subject to national appropriation by means of use or occupation, or by any other means. In other words no human activity on the moon or any other celestial body could be taken as justification for national appropriation. 174

This response implies that Article II acts as a qualification on Article I's broad provision for free exploration and use of outer space by all. Activity such as resource extraction would be viewed as national appropriation and such activity cannot be justified given Article II's prohibition, not even by falling within the ordinary meaning of "use." Despite this clarification, uncertainty appears to have remained, as lingering concerns were communicated in subsequent meetings by several other states, including Australia, Austria, and France."' Nevertheless, the committee put the Treaty in front of the General Assembly two months later without final resolution of the ambiguities regarding property rights arising from Articles I and II176 The preparatory materials ultimately fail to fully clarify the ambiguities of the meanings of "use" and "appropriation." The statement of the representative of the Soviet Union, one of the two main drafting parties, does, however, help push back on the interpretation of some academics that the nonappropriation principle fails to overcome the presumption of freedom of use.7

3. Historical Context

Two interrelated, major historical events cannot be ignored when considering the meaning of the OST: (1) the Cold War and (2) the Space Race. The success of Sputnik I in 1957 showed space travel and exploration no longer to be a dream, but a reality.7 While exciting, this news also brought fear in light of the world's fragile balance of power and tensions between the United States and the Soviet Union. 17 9 What if the Soviet Union managed to launch a nuclear weapon into space? What if the United States greedily claimed the Moon as the fifty-first state? To many, the combination of the Cold War and Space Race made the late 1950s and the 1960s a perilous time.so When viewed as a response to this perilous era, the OST begins to look much more like a nuclear arms treaty and an attempt to ease Cold War tensions than a treaty concerned with the issue of property rights in space."' The Treaty's emphasis on "peaceful purposes" supports this contextual interpretation. 1 82

On the one hand, as many suggest, this context leads to the conclusion that the vague nonappropriation principle of Article II does not prevent private property rights in space resources and the presumption of broad "use" prevails.1 83 Private property rights were simply not a concern of the Treaty drafters and therefore, the Treaty does not address-nor prohibit-such claims. On the other hand, the context surrounding the treaty's drafting does not necessarily lead to this conclusion. In fact, the emphasis on "peaceful purposes" and reducing international tension might instead suggest a stricter reading of Articles I and II. If things were so unstable and tense on Earth, the drafters may have instead intended Article II as a qualification on the general right to explore and use outer space in Article I, recognizing the simple fact that disputes over property, both land and minerals, have sparked some of history's bloodiest conflicts.

The Antarctic treaty experience evidences Cold War concern over potential resource rights disputes. Leading up to the finalization of the Antarctic Treaty of 1959,184 seven nations had already made official territorial claims over varying portions of the frozen landscape in hopes of laying claim to the plethora of resources thought to be located within the subsurface."' Although the Treaty itself did not directly address rights to mineral resources in the Antarctic,186 the treaty is interpreted to have frozen these claims in the interest of "[f]reedom of scientific investigation in Antarctica and cooperation toward that end.""' In a manner notably similar to the terms of Articles XI and XII of the OST, the Treaty promotes scientific exploration by encouraging information sharing of scientific program plans, personnel, and observations' and inspection of stations on a reciprocal basis.189 This Treaty along with several later treaties and protocols constitute the "Antarctic Treaty System," which as a whole manages the governance of Antarctica.1 9 0 In 1991, the Protocol on Environmental Protection to the Antarctic Treaty 91 ("Madrid Protocol") settled the question of property rights for the fifty years following the Protocol's entry into force. 192 The Madrid Protocol provides for "the comprehensive protection of the Antarctic environment ... [and] designate[s] Antarctica as a natural reserve, devoted to peace and science."193 Article 7 explicitly-and simplystates "[a]ny activity relating to mineral resources, other than scientific research, shall be prohibited."1 94 Though Article 25 allows for the creation of a binding legal regime to determine whether and under what conditions mineral resource activity be allowed, no such international legal regime has been created to date. 195 The ban on mineral resource exploitation may only be amended by unanimous consent of the parties. 19 6 The United States signed and ratified both the Antarctic Treaty of 1959 and the Madrid Protocol. 197

The freezing of territorial claims in the Antarctic 98 by the Antarctica Treaty of 1959199 illustrates the existence of true concern over potential resource dispute and conflict during the Cold War, in addition to the major concerns posed by nuclear weapons.2 00 The drafting states also recognized the potential for conflict over property in outer space and drew on the language of the Antarctic Treaty of 1959 to draft the OST.2 01 Given these driving concerns, Article II could be reasonably read as qualifying Article I's general rule. Under this reading, Article II serves the same qualifying purpose as Article IV regarding military and nuclear weapon use in space. Some might push back on this interpretation by claiming that the drafters could have used language such as that in the Madrid Protocol to explicitly prohibit mining in space. However, this argument is flawed. The Madrid Protocol was not written until well after both the original Antarctic Treaty of 1959 and the OST. Furthermore, the timing of the Madrid Protocol perhaps provides further evidence that resources in space are not to be harvested until a subsequent agreement regarding rights over them can be agreed upon internationally. While the historical context does leave some ambiguity as to whether the OST permits property rights over space resources, the Antarctic experience provides a compelling analogy and suggests that the OST does not allow for property rights in space resources.

4. State Practice

In its Frequently Asked Questions released about the SREU Act, the House Committee on Science, Space, and Technology forcefully asserted that the Act does not violate international law.20 2 in fact, according to the committee, the Act's provision of property rights "is affirmed by State practice and by the U.S. State Department in [c]ongressional testimony and written correspondence."2 03 Proponents of this view base their beliefs on several examples. One, "no serious objection" arose to the United States and the Soviet Union bringing samples of rocks and other materials from the Moon back by manned and robotic missions in the late 1960s, nor to Japan successfully collecting a small asteroid sample in 2010.204 Two, a practice of respecting ownership over such retrieved samples and a terrestrial market for such items exists, as illustrated by the fact that no one doubts that the American Museum of Natural History "owns" three asteroids found in Greenland by arctic explorer Robert E. Peary that are now part of the museum's Arthur Ross Hall of Meteorites. 205 Three, Congressmen also cite to a federal district court case, United States v. One Lucite Ball Containing Lunar Material,2 06 to illustrate state practice in favor of ownership over spaces resources. The case involved an Apollo lunar sample gifted to Honduras by the United States. The sample was stolen and sold to an individual in the United States.2 07 When caught during a sting operation intended to uncover illegal sales of imposter samples, the buyer was forced to forfeit the lunar sample after the court concluded the moon rocks had in fact been stolen, basing its decision in part on its recognition of Honduras having national property ownership over the sample. 208

These examples appear overwhelming, but they are not actually examples of activities of the same "form and content" that the SREU Act approves. 2 09 These examples all involve collection of samples in limited amounts and for scientific purposes, while the SREU Act approves large-scale collection and for commercial exploitation. The OST explicitly emphasizes a "freedom of scientific investigation in outer space," and the collection of scientific samples reasonably fall under this enumerated right. 2 10 Alternatively, the OST says nothing with respect to commercial exploitation, only discussing "benefits" of space in terms of sharing those benefits with all mankind.211 Furthermore, the American Museum of Natural History and Lucite Ball examples relied upon are misleading because they suggest that types of celestial artifacts found or gifted on Earth are subject to the same legal regime as resources mined or collected in space, which may not necessarily be true. The analogy of ownership over fish extracted from the high seas is also often cited in response to this pushback. Much like outer space, the high seas are open to all participants, yet the law of the seas still recognizes the right to title over fish extracted on the high seas by fishermen, who can then sell the fish.212 But again, this analogy has limited import because both the 1958 Geneva Convention on the High Seas and the United Nations Convention on the Law of the Sea ("UNCLOS") explicitly recognize the right to fish, while the OST grants no such right to exploit space resources. 2 1 3

Furthermore, state practice relevant to the question of property rights under the OST goes beyond these examples and analogies of ownership of resources taken from commons. State practice regarding property rights in general must be considered. For example, Professor Fabio Tronchetti disagrees with the oft-cited notion that state practice affirms the SREU Act.2 14 According to the professor, "under international law, property rights require a superior authority, a State, entitled to attribute and enforce them." 2 15 By granting property rights in the SREU Act, the United States impliedly claims that it has the authority to confer property rights over space resources-an authority traditionally reserved for the owner of a resource. This notion clashes with the nonappropriation principles of the OST. Though there is no consensus regarding whether the nonappropriation principle prohibits claims of sovereignty over resources, a strong consensus at least exists that the principle prohibits states from claiming sovereignty over real property in space.216 In some traditional systems of mineral ownership, however, ownership over resources ran with ownership over land.217 For example, under Roman law, property rights over subsurface minerals belonged to the landowner. 2 18 Thus, if the United States cannot have title in space lands under the nonappropriation principle, it cannot have title to the space resources in those lands either. Without title to the resources, the United States cannot bestow such title to its citizens under traditional international property law; by claiming that it can bestow such title, the United States is abrogating Article II of the OST. One could also argue that the in situ resources the Act grants rights in are actually still part of the celestial bodies; thus, the resources are real property prior to their removal, and are off limits under the Treaty.2 19 Given the limited import of the cited examples of state practice (limited quantity and scientific versus large-scale and commercial), the traditional practice of property rights being conferred from a sovereign to a citizen become incredibly compelling and suggest the SREU Act may abrogate the United States' treaty obligations.

A final piece of evidence, however, again inserts ambiguity into the interpretation: the sweeping rejection of the Moon Agreement and its limitations on property rights by the international community discussed supra Part JJJ.A.2. On the one hand, the rejection may imply that the international community approved of property rights. On the other hand, however, there were other reasons for the sweeping rejection. For example, Professors Francis Lyall and Paul B. Larsen claim the "main area of controversy"2 2 0 actually surrounded the Agreement's proclamation of the Moon and celestial bodies and their natural resources as the "common heritage of mankind" in Article 11.1,221 rather than the Agreement's general property-right provisions. Many believed the invocation of the "common heritage of mankind" language would impart actual obligations upon parties to share extracted resources, whereas the "province of all mankind" and "for the benefit and interest of all" language of the OST did not.222 As with ordinary meaning, preparatory materials, and historical context, state practice leaves some ambiguities and state interpretations should also be considered.

5. State Interpretations

Much like the preparatory materials discussed supra Part IV.A.1, subsequent state interpretation of the OST fails to fully address the question of the legality of property rights in space resources. On the one hand, the Senate Committee on Foreign Relations found that the drafters intended Articles I, II, and III of the Treaty to be general in nature when reviewing the Treaty,223 which perhaps suggests Article II's nonappropriation principle does not qualify Article I's general right to use or act as an exception. Yet, the committee also found the Treaty to be in response to the "potential for international competition and conflict in outer space." 2 24 To the committee, Articles I, II, and III stressed the importance of free scientific investigation, guaranteed free access to all areas of celestial bodies, and prohibited claims of sovereignty.225 Not only would property rights in natural resources potentially ignite and exacerbate conflict in space, but they also seemed somewhat incompatible with scientific investigation, free access, and the prohibition on sovereignty. During its hearing on the Treaty, the Senate Committee on Foreign Relations focused a majority of its discussion of Article I on whether or not the language "province of all mankind" imparted strict obligations, while devoting little to no time to the issue of the meaning of "use." 22 6 Former Justice Arthur Goldberg, then U.S. ambassador to the United Nations, did note the goal of the article was to "cnot subject space to exclusive appropriation by any particular power." 227 Nevertheless, this statement fails to resolve whether natural resources may be exploited, as such exploitation could be carried out in an inclusive manner.

The committee's review of Article II consumes only eight lines of the hearing transcript, merely adding that the Article is complementary to Article I and that space cannot be claimed for the country (likely referring to land rather than resources).2 28 A different exchange between Ambassador Goldberg, Senator Lausche, and the Chairman leaves further ambiguity regarding the use of natural resources in space: Mr. Goldberg: We wanted to establish our right to explore and use outer space. Senator Lausche: Yes. That is, any one of the signatory nations shall have the right to the use of whatever might be found in one of the space bodies. Mr. Goldberg: No, no. It doesn't mean that. It means that they shall be free on their own to explore outer space. The Chairman: Or to use it. Mr. Goldberg: To use it. The Chairman: But not on an exclusive basis. Mr. Goldberg: Everyone is free.229

At first, Ambassador Goldberg appears to have refuted the notion that a signatory could simply "use" anything found in one of the space bodies, such as a mineral, implying Senator Lausche's example exceeded the scope of Article I. He then went on to emphasize exploratory activities. But then, Ambassador Goldberg backtracked and reasserted the right to use without clarifying his initial qualification.

This sense of ambiguity remains today despite Congress signing off on the SREU Act. While sponsors of the bill and statements from resource extraction companies emphasized the broad scope of the right to "use" outer space and state practice in support of the legality of 230 property rights, several expert witnesses expressed genuine concern that obligations under the Treaty remain unclear and require additional analysis.231

B. Compatibility

Employing the treaty interpretation tools of ordinary meaning, preparatory materials, historical context, state practice, and state interpretation offers many possible understandings of the obligations imparted by Articles I and II of the OST. For example, while the ordinary meaning of "use" could reasonably include the exploitation of materials, the meeting summaries of the Fifth Session of the U.N. Committee on the Peaceful Uses of Outer Space Legal Sub-Committee make clear that no consensus was ever reached regarding whether "use" includes large-scale exploitation of space resources, let alone fee-simple ownership and the ability to sell commercially. State practice dealing with extraterrestrial samples also sheds little light on the confusion, as the examples cited all deal instead with scientific samples of limited quantity. The international community's rejection of the Moon Agreement also fails to bring clarity. While on the one hand the rejection could be read as a rejection of the idea that the OST prohibits private property rights, it could also be read as a rejection of the common heritage of mankind doctrine. Finally, the prospect of privateventure space mining and extraterrestrial resource extraction remained far off and futuristic at the time of the Treaty's negotiation, making drawing legal conclusions about the legality of these revolutionary activities extremely difficult.

Overall, however, the Treaty's structure and its purposes (preserving peace and avoiding international conflict in outer space) ultimately indicate that private property rights in space resources are prohibited by Article II's non-appropriation principle, at least until future international delegation determines otherwise (like in the Antarctic). The Treaty's structure confirms this interpretation. Article I lays down a general rule for activity in space. Subsequent articles of the Treaty then lay out more specific requirements of and qualifications to this general rule. Much like Article IV restricts the use of nuclear weapons in space, Article II restricts the use of space in ways that might result in potentially controversial property claims. Historically, claims to mineral rights have resulted in just as contentious conflict as those over sovereign lands. Treaty efforts to avoid conflicts in Antarctica and the high seas reflect similar sentiments. The Soviet Union's representative even hinted at this structural relationship between Articles I and II during Treaty S1 232 negotiations.22 In light of the imminent need to ease Cold War tensions, the potential for conflict over property, and the final structure of the Treaty, this Note concludes that the large-scale extraction of space resources is incompatible with the non-appropriation principle of Article II of the OST.23 3 As a result, the United States' provision of property rights to its citizens to possess, own, transport, use, and sell space and asteroid resources extracted through the SREU Act contravenes its international obligations established by the OST.

#### Reject the link turn – private sector space competition decreases costs and increases investment into space exploration and mining.

Grady 21 Grady , Monica. [Professor of Planetary and Space Sciences]“Private Companies Are Launching a New Space Race – Here's What to Expect.” *The Conversation*, 6 Oct. 2021, https://theconversation.com/private-companies-are-launching-a-new-space-race-heres-what-to-expect-80697. //Debatedrills AS

A benefit of the entry of the private sector into space exploration has been recognition of the high-tech companies that contribute to the growth of the economy as valuable targets for investment. Indeed, [a recent presentation](http://www.goldmansachs.com/our-thinking/podcasts/episodes/05-22-2017-noah-poponak.html?mediaIndex=1&autoPlay=true&cid=sch-pd-google-poponakpodcast64-searchad-201705--&mkwid=8cazG4Ns) at an international investment bank – under a heading of “Space; the next investment frontier” – declared that “investment interest has helped reduce launch costs and spur innovation across related industries, opening up a new chapter in the history of the space economy”.

#### The plan removes the economic incentives for space exploration and asteroid mining—the mere threat is sufficient to kill investment.

Basulto 21 Basulto, Dominic. “How Property Rights in Outer Space May Lead to a Scramble to Exploit the Moon's Resources.” *The Washington Post*, WP Company, 5 Dec. 2021, https://www.washingtonpost.com/news/innovations/wp/2015/11/18/how-property-rights-in-outer-space-may-lead-to-a-scramble-to-exploit-the-moons-resources/.

What’s happening now, in essence, is a sea change in how we think about outer space. To convince private commercial space exploration companies to invest millions of dollars, there have to be economic incentives involved. In short, financial backers of these companies have to be able to realize a profit from their investments if innovation is going to happen. That’s the reality.

Richards cites the rights of fishing boats in international waters as an economic template for the SPACE Act, “The ships are owned by companies flying flags of nations under which laws they are bound: they have a right to peacefully fish in international waters that they don’t own; but they have a right of ownership of the fish once obtained.”

The fishing analogy is a useful one. It suggests that we’re simply extending the same economic principles used on Earth to the moon and beyond, not creating new principles. Seafaring nations are now spacefaring nations. Moon Express even refers to the moon as “the eighth continent,” suggesting that people should think about the moon the same way they think about the other seven continents on the planet. And Planetary Resources, an asteroid mining company, refers to the “off-planet economy.”

Throughout the annals of exploration, there have always been commercial incentives. Would the untapped economic potential of America have been possible without similar types of incentives? One example cited by backers of the SPACE Act is the Homestead Act of 1862, which paved the way for Americans to search for gold and timber. Governments they say, have an important role to play here by passing legislation that catalyzes, rather than stifles, growth and innovation.

For supporters of the SPACE Act, the year 2017 looms large. That’s exactly 50 years since the passage of the 1967 Outer Space Treaty. And it’s also the deadline for winning the $30 million Google Lunar X-PRIZE. If privately owned companies are going to be landing on the surface of the moon within the next 24 months, they are going to want assurances that their innovative efforts now are going to have an economic payoff later.

#### Space mining solves warming.

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 // Debatedrills AS

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.**

#### \*Warming causes extinction

Kareiva 18, Peter, and Valerie Carranza. "Existential risk due to ecosystem collapse: Nature strikes back." Futures 102 (2018): 39-50. (Ph.D. in ecology and applied mathematics from Cornell University, director of the Institute of the Environment and Sustainability at UCLA, Pritzker Distinguished Professor in Environment & Sustainability at UCLA)

In summary, six of the nine proposed planetary boundaries (phosphorous, nitrogen, biodiversity, land use, atmospheric aerosol loading, and chemical pollution) are unlikely to be associated with existential risks. They all correspond to a degraded environment, but in our assessment do not represent existential risks. However, the three remaining boundaries (**climate change**, global **freshwater** cycle, **and** ocean **acidification**) do **pose existential risks**. This is **because of** intrinsic **positive feedback loops**, substantial lag times between system change and experiencing the consequences of that change, and the fact these different boundaries interact with one another in ways that yield surprises. In addition, climate, freshwater, and ocean acidification are all **directly connected to** the provision of **food and water**, and **shortages** of food and water can **create conflict** and social unrest. Climate change has a long history of disrupting civilizations and sometimes precipitating the collapse of cultures or mass emigrations (McMichael, 2017). For example, the 12th century drought in the North American Southwest is held responsible for the collapse of the Anasazi pueblo culture. More recently, the infamous potato famine of 1846–1849 and the large migration of Irish to the U.S. can be traced to a combination of factors, one of which was climate. Specifically, 1846 was an unusually warm and moist year in Ireland, providing the climatic conditions favorable to the fungus that caused the potato blight. As is so often the case, poor government had a role as well—as the British government forbade the import of grains from outside Britain (imports that could have helped to redress the ravaged potato yields). Climate change intersects with freshwater resources because it is expected to exacerbate drought and water scarcity, as well as flooding. Climate change can even impair water quality because it is associated with heavy rains that overwhelm sewage treatment facilities, or because it results in higher concentrations of pollutants in groundwater as a result of enhanced evaporation and reduced groundwater recharge. **Ample clean water** is not a luxury—it **is essential for human survival**. Consequently, cities, regions and nations that lack clean freshwater are vulnerable to social disruption and disease. Finally, ocean acidification is linked to climate change because it is driven by CO2 emissions just as global warming is. With close to 20% of the world’s protein coming from oceans (FAO, 2016), the potential for severe impacts due to acidification is obvious. Less obvious, but perhaps more insidious, is the interaction between climate change and the loss of oyster and coral reefs due to acidification. Acidification is known to interfere with oyster reef building and coral reefs. Climate change also increases storm frequency and severity. Coral reefs and oyster reefs provide protection from storm surge because they reduce wave energy (Spalding et al., 2014). If these reefs are lost due to acidification at the same time as storms become more severe and sea level rises, coastal communities will be exposed to unprecedented storm surge—and may be ravaged by recurrent storms. A key feature of the risk associated with climate change is that mean annual temperature and mean annual rainfall are not the variables of interest. Rather it is extreme episodic events that place nations and entire regions of the world at risk. These extreme events are by definition “rare” (once every hundred years), and changes in their likelihood are challenging to detect because of their rarity, but are exactly the manifestations of climate change that we must get better at anticipating (Diffenbaugh et al., 2017). Society will have a hard time responding to shorter intervals between rare extreme events because in the lifespan of an individual human, a person might experience as few as two or three extreme events. How likely is it that you would notice a change in the interval between events that are separated by decades, especially given that the interval is not regular but varies stochastically? A concrete example of this dilemma can be found in the past and expected future changes in storm-related flooding of New York City. The highly disruptive flooding of New York City associated with Hurricane Sandy represented a flood height that occurred once every 500 years in the 18th century, and that occurs now once every 25 years, but is expected to occur once every 5 years by 2050 (Garner et al., 2017). This change in frequency of extreme floods has profound implications for the measures New York City should take to protect its infrastructure and its population, yet because of the stochastic nature of such events, this shift in flood frequency is an elevated risk that will go unnoticed by most people. 4. The combination of positive feedback loops and societal inertia is fertile ground for global environmental catastrophes **Humans** are remarkably ingenious, and **have adapted** to crises **throughout** their **history**. Our doom has been repeatedly predicted, only to be averted by innovation (Ridley, 2011). **However**, the many **stories** **of** human ingenuity **successfully** **addressing** **existential risks** such as global famine or extreme air pollution **represent** environmental c**hallenges that are** largely **linear**, have immediate consequences, **and operate without positive feedbacks**. For example, the fact that food is in short supply does not increase the rate at which humans consume food—thereby increasing the shortage. Similarly, massive air pollution episodes such as the London fog of 1952 that killed 12,000 people did not make future air pollution events more likely. In fact it was just the opposite—the London fog sent such a clear message that Britain quickly enacted pollution control measures (Stradling, 2016). Food shortages, air pollution, water pollution, etc. send immediate signals to society of harm, which then trigger a negative feedback of society seeking to reduce the harm. In contrast, today’s great environmental crisis of climate change may cause some harm but there are generally long time delays between rising CO2 concentrations and damage to humans. The consequence of these delays are an absence of urgency; thus although 70% of Americans believe global warming is happening, only 40% think it will harm them (http://climatecommunication.yale.edu/visualizations-data/ycom-us-2016/). Secondly, unlike past environmental challenges, **the Earth’s climate system is rife with positive feedback loops**. In particular, as CO2 increases and the climate warms, that **very warming can cause more CO2 release** which further increases global warming, and then more CO2, and so on. Table 2 summarizes the best documented positive feedback loops for the Earth’s climate system. These feedbacks can be neatly categorized into carbon cycle, biogeochemical, biogeophysical, cloud, ice-albedo, and water vapor feedbacks. As important as it is to understand these feedbacks individually, it is even more essential to study the interactive nature of these feedbacks. Modeling studies show that when interactions among feedback loops are included, uncertainty increases dramatically and there is a heightened potential for perturbations to be magnified (e.g., Cox, Betts, Jones, Spall, & Totterdell, 2000; Hajima, Tachiiri, Ito, & Kawamiya, 2014; Knutti & Rugenstein, 2015; Rosenfeld, Sherwood, Wood, & Donner, 2014). This produces a wide range of future scenarios. Positive feedbacks in the carbon cycle involves the enhancement of future carbon contributions to the atmosphere due to some initial increase in atmospheric CO2. This happens because as CO2 accumulates, it reduces the efficiency in which oceans and terrestrial ecosystems sequester carbon, which in return feeds back to exacerbate climate change (Friedlingstein et al., 2001). Warming can also increase the rate at which organic matter decays and carbon is released into the atmosphere, thereby causing more warming (Melillo et al., 2017). Increases in food shortages and lack of water is also of major concern when biogeophysical feedback mechanisms perpetuate drought conditions. The underlying mechanism here is that losses in vegetation increases the surface albedo, which suppresses rainfall, and thus enhances future vegetation loss and more suppression of rainfall—thereby initiating or prolonging a drought (Chamey, Stone, & Quirk, 1975). To top it off, overgrazing depletes the soil, leading to augmented vegetation loss (Anderies, Janssen, & Walker, 2002). Climate change often also increases the risk of forest fires, as a result of higher temperatures and persistent drought conditions. The expectation is that **forest fires will become more frequent** and severe with climate warming and drought (Scholze, Knorr, Arnell, & Prentice, 2006), a trend for which we have already seen evidence (Allen et al., 2010). Tragically, the increased severity and risk of Southern California wildfires recently predicted by climate scientists (Jin et al., 2015), was realized in December 2017, with the largest fire in the history of California (the “Thomas fire” that burned 282,000 acres, https://www.vox.com/2017/12/27/16822180/thomas-fire-california-largest-wildfire). This **catastrophic fire** embodies the sorts of positive feedbacks and interacting factors that **could catch humanity off-guard and produce a** true **apocalyptic event.** Record-breaking rains produced an extraordinary flush of new vegetation, that then dried out as record heat waves and dry conditions took hold, coupled with stronger than normal winds, and ignition. Of course the record-fire released CO2 into the atmosphere, thereby contributing to future warming. Out of all types of feedbacks, water vapor and the ice-albedo feedbacks are the most clearly understood mechanisms. Losses in reflective snow and ice cover drive up surface temperatures, leading to even more melting of snow and ice cover—this is known as the ice-albedo feedback (Curry, Schramm, & Ebert, 1995). As snow and ice continue to melt at a more rapid pace, millions of people may be displaced by flooding risks as a consequence of sea level rise near coastal communities (Biermann & Boas, 2010; Myers, 2002; Nicholls et al., 2011). The water vapor feedback operates when warmer atmospheric conditions strengthen the saturation vapor pressure, which creates a warming effect given water vapor’s strong greenhouse gas properties (Manabe & Wetherald, 1967). Global warming tends to increase cloud formation because warmer temperatures lead to more evaporation of water into the atmosphere, and warmer temperature also allows the atmosphere to hold more water. The key question is whether this increase in clouds associated with global warming will result in a positive feedback loop (more warming) or a negative feedback loop (less warming). For decades, scientists have sought to answer this question and understand the net role clouds play in future climate projections (Schneider et al., 2017). Clouds are complex because they both have a cooling (reflecting incoming solar radiation) and warming (absorbing incoming solar radiation) effect (Lashof, DeAngelo, Saleska, & Harte, 1997). The type of cloud, altitude, and optical properties combine to determine how these countervailing effects balance out. Although still under debate, it appears that in most circumstances the cloud feedback is likely positive (Boucher et al., 2013). For example, models and observations show that increasing greenhouse gas concentrations reduces the low-level cloud fraction in the Northeast Pacific at decadal time scales. This then has a positive feedback effect and enhances climate warming since less solar radiation is reflected by the atmosphere (Clement, Burgman, & Norris, 2009). The key lesson from the long list of potentially positive feedbacks and their interactions is that **runaway climate change,** and runaway perturbations have to be taken as a serious possibility. Table 2 is just a snapshot of the type of feedbacks that have been identified (see Supplementary material for a more thorough explanation of positive feedback loops). However, this list is not exhaustive and the possibility of undiscovered positive feedbacks **portends** even greater **existential risks**. The many environmental crises humankind has previously averted (famine, ozone depletion, London fog, water pollution, etc.) were averted because of political will based on solid scientific understanding. We cannot count on complete scientific understanding when it comes to positive feedback loops and climate change.

# Case

#### The moon treaty sucks- only 6 states have ratified the treaty

**Listner 11**, Michael Listner, 10-24-2011, "The Space Review: The Moon Treaty: failed international law or waiting in the shadows?," The space review, https://www.thespacereview.com/article/1954/1 Livingston RB

The Moon Treaty is the fourth child of the Outer Space Treaty. It was deliberated and developed by the Legal Subcommittee for the Committee on the Peaceful Uses of Outer Space (COPUOS) from 1972 to 1979. It was adopted by the United Nations General Assembly in Resolution 34/68 and opened for signature in 1979, but was not placed in force until June 1984 when the fifth country, Austria, ratified it. Presently, **the Moon Treaty has been ratified by six countries**. Four countries, including France and India, are signatories, and seven countries have acceded to the Moon Treaty, including Australia. **The United States, the Russian Federation (former Soviet Union), and the People’s Republic of China have neither signed**, acceded, nor ratified the Moon Treaty, which has led to **the conclusion that it is a failure from the standpoint of international law.**2

#### The moon is in earth’s atmosphere anyway, and outer space means outside the atmposphere

**Ratner 19**, Paul Ratner, 02-24-2019, "The Moon is inside Earth's atmosphere, European researchers say," Big Think,<https://bigthink.com/hard-science/the-moon-is-inside-earths-atmosphere-claims-study/> Livingston RB

We are more linked to the Moon than we’ve realized. It turns out **that the outer part of the Earth’s atmosphere** stretches considerably past the lunar orbit. In fact, it **goes as far as twice the distance to the Moon**. This discovery is a product of observations by the [Solar and Heliospheric Observatory](https://sohowww.nascom.nasa.gov/) (SOHO) — a spacecraft launched in 1995 to study the sun, operated by the European Space Agency (ESA) and NASA. Measurements taken over 20 years ago by SOHO got a fresh look in a new study, which came to remarkable conclusions. What the data showed is that the geocorona, a hydrogen envelope which wraps around our planet, extends up to 630,000 km (391,464 miles) away from it. This distance is 50 times the Earth’s diameter.

## Adv 1

#### No debris cascades, but even a worst case is confined to low LEO with no impact

Daniel Von Fange 17, Web Application Engineer, Founder and Owner of LeanCoder, Full Stack, Polyglot Web Developer, “Kessler Syndrome is Over Hyped”, 5/21/2017, http://braino.org/essays/kessler\_syndrome\_is\_over\_hyped/

Kessler Syndrome is overhyped. A chorus of online commenters great any news of upcoming low earth orbit satellites with worry that humanity will to lose access to space. I now think they are wrong.

What is Kessler Syndrome?

Here’s the popular view on Kessler Syndrome. Every once in a while, a piece of junk in space hits a satellite. This single impact destroys the satellite, and breaks off several thousand additional pieces. These new pieces now fly around space looking for other satellites to hit, and so exponentially multiply themselves over time, like a nuclear reaction, until a sphere of man-made debris surrounds the earth, and humanity no longer has access to space nor the benefits of satellites.

It is a dark picture.

Is Kessler Syndrome likely to happen?

I had to stop everything and spend an afternoon doing back-of-the-napkin math to know how big the threat is. To estimate, we need to know where the stuff in space is, how much mass is there, and how long it would take to deorbit.

The orbital area around earth can be broken down into four regions.

Low LEO - Up to about 400km. Things that orbit here burn up in the earth’s atmosphere quickly - between a few months to two years. The space station operates at the high end of this range. It loses about a kilometer of altitude a month and if not pushed higher every few months, would soon burn up. For all practical purposes, Low LEO doesn’t matter for Kessler Syndrome. If Low LEO was ever full of space junk, we’d just wait a year and a half, and the problem would be over.

High LEO - 400km to 2000km. This where most heavy satellites and most space junk orbits. The air is thin enough here that satellites only go down slowly, and they have a much farther distance to fall. It can take 50 years for stuff here to get down. This is where Kessler Syndrome could be an issue.

Mid Orbit - GPS satellites and other navigation satellites travel here in lonely, long lives. The volume of space is so huge, and the number of satellites so few, that we don’t need to worry about Kessler here.

GEO - If you put a satellite far enough out from earth, the speed that the satellite travels around the earth will match the speed of the surface of the earth rotating under it. From the ground, the satellite will appear to hang motionless. Usually the geostationary orbit is used by big weather satellites and big TV broadcasting satellites. (This apparent motionlessness is why satellite TV dishes can be mounted pointing in a fixed direction. You can find approximate south just by looking around at the dishes in your northern hemisphere neighborhood.) For Kessler purposes, GEO orbit is roughly a ring 384,400 km around. However, all the satellites here are moving the same direction at the same speed - debris doesn’t get free velocity from the speed of the satellites. Also, it’s quite expensive to get a satellite here, and so there aren’t many, only about one satellite per 1000km of the ring. Kessler is not a problem here.

How bad could Kessler Syndrome in High LEO be?

Let’s imagine a worst case scenario.

An evil alien intelligence chops up everything in High LEO, turning it into 1cm cubes of death orbiting at 1000km, spread as evenly across the surface of this sphere as orbital mechanics would allow. Is humanity cut off from space?

I’m guessing the world has launched about 10,000 tons of satellites total. For guessing purposes, I’ll assume 2,500 tons of satellites and junk currently in High LEO. If satellites are made of aluminum, with a density of 2.70 g/cm3, then that’s 839,985,870 1cm cubes. A sphere for an orbit of 1,000km has a surface area of 682,752,000 square KM. So there would be one cube of junk per .81 square KM. If a rocket traveled through that, its odds of hitting that cube are tiny - less than 1 in 10,000.

So even in the worst case, we don’t lose access to space.

Now though you can travel through the debris, you couldn’t keep a satellite alive for long in this orbit of death. Kessler Syndrome at its worst just prevents us from putting satellites in certain orbits.

In real life, there’s a lot of factors that make Kessler syndrome even less of a problem than our worst case though experiment.

* Debris would be spread over a volume of space, not a single orbital surface, making collisions orders of magnitudes less likely.
* Most impact debris will have a slower orbital velocity than either of its original pieces - this makes it deorbit much sooner.
* Any collision will create large and small objects. Small objects are much more affected by atmospheric drag and deorbit faster, even in a few months from high LEO. Larger objects can be tracked by earth based radar and avoided.
* The planned big new constellations are not in High LEO, but in Low LEO for faster communications with the earth. They aren’t an issue for Kessler.
* Most importantly, all new satellite launches since the 1990’s are required to include a plan to get rid of the satellite at the end of its useful life (usually by deorbiting)

So the realistic worst case is that insurance premiums on satellites go up a bit. Given the current trend toward much smaller, cheaper micro satellites, this wouldn’t even have a huge effect.

I’m removing Kessler Syndrome from my list of things to worry about.

#### \*Squo tracking, shielding, and removal plans solve

Dr. Brian Koberlein 16, Professor of Physics at the Rochester Institute of Technology and PhD in Astrophysics from the University of Connecticut, “Cascade Effect”, 5-4, https://archive.briankoberlein.com/2016/05/04/cascade-effect/index.html

In the movie Gravity the driving force of the plot is a catastrophic cascade of space debris. An exploding satellite sends high speed debris into the path of other satellites, and the resulting collisions create more space debris until everything from a space shuttle to the International Space Station faces an eminent threat of destruction. Not unexpectedly, the movie portrayal of such a situation is not particularly accurate, but the risk of a debris cascade is very real.

It’s known as the Kessler syndrome, after Donald Kessler, who first imagined the scenario in the 1970s. The problem comes down to the fact that small objects in Earth orbit can stay in orbit for a very long time. If an astronaut drops a bolt, it can stay in orbit for decades or centuries. Because the relative speed of two objects in orbit can be quite large, it doesn’t take a big object to pose a real threat to your spacecraft. On the highway a small pebble can chip your car windshield. In space it can be done by a chip of paint traveling at thousands of kilometers per hour. In the history of the space shuttle missions, there were more than 1,600 debris strikes. Because of such strikes, more than 90 space shuttle windows had to be replaced over the lifetime of shuttle missions.

While that might sound alarming, it’s actually quite manageable. Upgrades and maintenance were quite common on the shuttle missions, and we tend to err on the side of caution when it comes to replacing parts. Modern spacecraft also have ways to mitigate the risk of small impacts, such as Whipple shields made of thin layers of material spaced apart so that objects disintegrate when hitting the shield rather than the spacecraft itself. We also have a tracking system that currently tracks more than 300,000 objects bigger than 1 cm, so we can make sure that most spacecraft avoid these objects.

But the risk of big collisions isn’t negligible. In 2009 the Iridium 33 and Kosmos-2251 satellites collided at high speed, destroying both spacecraft and creating more dangerous debris. It wouldn’t take many collisions like this for the debris numbers to rise dramatically, and more debris means a greater risk of collisions. In Gravity the cascade happens very quickly, triggered by a single event. The reality is not quite so grave. Instead of happening overnight, Kessler syndrome would occur gradually, raising collision risks to the point where certain orbits become logistically impractical. It could occur so gradually that we might not notice it early on, and there are some that argue it’s already underway.

The good news is that we’re aware of the threat. And, as the old saying goes, knowing is half the battle. Already we take steps to limit the amount of debris created. New spacecraft include end of life plans to remove them from orbit, either by sending them into Earths atmosphere to burn up, or sending them to a “graveyard orbit” that poses little risk to other spacecraft. There are also plans on the drawing board to clear orbits of debris, particularly in low-Earth orbit where the risk is greatest. The cascade effect is a real risk, but it’s also one we can likely manage with a bit of ingenuity.

## Adv 2

#### \*Mining Industry destroying itself.

David Oni, Space analyst at Space in Africa, writes in 2019:

David Oni 19 (David Oni, Space industry and technology analyst at Space in Africa, Graduate of Mining Engineering from the Federal University of Technology Akure.) The Effect of Asteroid Mining On Mining Activities in Africa 9-24-2019 Space in Africa https://africanews.space/the-effect-of-asteroid-mining-on-mining-activities-in-africa/ //DebateDrills TJ

The earth, as we have come to know, is enriched with a vast array of mineral resources. But these resources are nonrenewable and hence, constant growing consumption in developing and developed countries, with the rising need for more resources to keep driving the fourth industrial revolution, will ultimately lead to a depletion in a couple of years to come. Experts say that elements needed for modern industry and food production could be exhausted on Earth within 50–60 years.

In terms of mineral resources, Africa has the most abundant of reserves. Currently, Africa hosts 30% of the world’s mineral reserve, 55% of the world’s diamond comes from Botswana and Congo, 60% of the mining in Africa is gold mining but to mention a few.

Given that the mining industry is consistently rising across sub-Saharan Africa, it is good news for the African mining sector as mining companies are beginning to expand operations, countries are already looking into improving regulatory frameworks that will enhance activities and also attract more investors.

But recent breakthroughs in space technology have led to many space scientists and engineers looking to explore alternatives to sustaining the earth while generating massive revenue and improving life generally. Currently, there are various comprehensive research documents on the Space Mining market, with detailed insights on growth factors and strategies. With the current advances and cutting edge technologies developed in preparation for the first stages of asteroid mining, one might want to ask if it is indeed good news for the African continent.

Apart from the environmental impacts, major mining activities are largely hindered in Africa by a handful of other factors such as access to energy, health and safety volatility of commodity prices, etc. Other issues such as political uncertainty, economic instability, religious and tribal wars, industrial unrest, and the fickle nature of regulatory bodies have also rendered foreign direct investment increasingly unattractive to global investors. Furthermore, most African countries have a relatively undeveloped infrastructure for exploiting resources effectively.

At the moment, Asteroid mining poses no threat to terrestrial mining; however, this will not hold for long. The space industry is progressing at such a rapid pace, and the prospects are unequivocally mouth-watering. The big question is, will asteroid mining lure away investors in Africa? The planetary resources company estimates that a single 30-m asteroid may contain 30 billion dollars in platinum alone and a 500m rock could contain half the entire world resources of PGM. Considering the abundance of minerals in asteroids, once asteroid mining materialises, it will severely affect the precious metals market, usurp the prices of rare earth minerals, and a whole lot more because minerals that are usually somewhat scarce on earth will be easily accessible on asteroids.

While foreign investors run the majority of the large-scale mining activities in the region, reports say that many African countries are dangerously dependent on mining activities. For some African countries, despite massive mineral wealth, their mining sectors are underdeveloped, and this is as a result of much focus on oil resources and a couple of other challenges. The million-dollar question is, what will become of the mining activities in Africa?

1. Nuclear weapons are banned in space by the OST. There can’t be nuclear wars.

#### \*Space exploration by private corporations is key to preserving human life –outweighs their extinction impact in the long-term.

**Clifford 18** [Katherine, “Elon Musk: This is why we have to build civilizations in space”, CNBC. 26 June 2018. https://www.cnbc.com/2018/06/26/elon-musk-on-twitter-why-we-have-to-build-civilizations-in-space.html] //DebateDrills LC

**Human civilization is likely the only advanced civilization** in the “observable Universe,” finds a study from the the [Future of Humanity Institute](https://www.fhi.ox.ac.uk/) (FHI) at Oxford University — and that’s why **it’s so important that humans build civilizations in space**, says [Elon Musk](https://www.cnbc.com/elon-musk/).

“This is why **we must preserve the light of consciousness by becoming a spacefaring civilization** [and] extending life to other planets,” the Tesla and SpaceX boss tweeted Sunday in response to a story about the study on science news blog [Universal-Sci](https://www.universal-sci.com/about).

“It is unknown whether we are the only civilization currently alive in the observable universe, but **any chance that we are is added impetus for extending life beyond Earth**,” Musk tweeted Sunday.

“**Humanity is not perfect, but it’s all we’ve got**,” the SpaceX and [Tesla](https://www.cnbc.com/quotes/TSLA) boss said.

**To safeguard human life requires moving beyond the blue planet**, in Musk’s view, because **earth is likely to become uninhabitable.**

“There will be some ” if humans stay on earth forever, Musk said in an article published in academic [journal New Space](http://online.liebertpub.com/doi/full/10.1089/space.2017.29009.emu), which was published online in June 2017. Musk’s aeronautics company **SpaceX is working to build reusable rockets that travel to Mars, ultimately enabling life on the Red Planet.**