## Framing

#### The standard is maximizing expected wellbeing. Prefer

#### 1] Phenomenal introspection --- it’s the most epistemically reliable --- historical moral disagreement over internal conceptions of morality such as questions of race, gender, class, religion, etc prove the fallibility of non-observational based ethics --- introspection means we value happiness because we can determine that we each value it --- just as I can observe a lemon’s yellowness, we can make those judgements about happiness.

#### 2] Aggregation – every policy benefits some and harms others which governing bodies have a jurisdiction to consider, which also means side constraints freeze action – o/w – if they’re right that each person has equal moral value, in order to guarantee most value we should save the most people.

#### 3] Weighability – only consequentialism explains degrees of wrongness—if I break a promise to meet up for lunch, that is not as bad as breaking a promise to take a dying person to the hospital. Only the consequences of breaking the promise explain why the second one is much worse than the first. Intuitions outweigh—they’re the foundational basis for any argument and theories that contradict our intuitions are most likely false even if we can’t deductively determine why.

**Reducing the risk of extinction is always priority number one.   
Bostrom 12** [Faculty of Philosophy and Oxford Martin School, University of Oxford.], Existential Risk Prevention as Global Priority.  Forthcoming book (Global Policy). MP. [http://www.existenti...org/concept.pdf](http://www.existential-risk.org/concept.pdf)Even if we use the most conservative of these estimates, which entirely ignores the   possibility of space colonization and software minds, **we find that the expected loss of an existential   catastrophe is greater than the value of 10^16 human lives.  This implies that the expected value of   reducing existential risk by a mere one millionth of one percentage point is at least a hundred times the   value of a million human lives.** The more technologically comprehensive estimate of 10  54 humanbrain-emulation subjective life-years (or 10  52  lives of ordinary length) makes the same point even   more starkly.  Even if we give this allegedly lower bound on the cumulative output potential of a   technologically mature civilization a mere 1% chance of being correct, we find that the expected   value of reducing existential risk by a mere one billionth of one billionth of one percentage point is worth   a hundred billion times as much as a billion human lives.**One might consequently argue that even the tiniest reduction of existential risk has an   expected value greater than that of the definite provision of any ordinary good, such as the direct   benefit of saving 1 billion lives.** And, further, that the absolute value of the indirect effect of saving 1  billion lives on the total cumulative amount of existential riskâ€”positive or negativeâ€”is almost   certainly larger than the positive value of the direct benefit of such an action.

## Adv 1: Space Exploration

#### Privatization of space travel kills off public space exploration. Tradeoff—

#### Space exploration must be public-sector – entrepreneurs purposely understate the barriers to colonization, yet exploit its potential for financial gain.

**Phillips 20** [(Leigh, science writer and EU affairs journalist, author of Austerity Ecology & the Collapse-Porn Addicts.) “We Don’t Need Elon Musk to Explore the Solar System,” May 8, 2021, https://jacobinmag.com/2021/05/elon-musk-space-exploration-mars-colonization] TDI

He opens the paper with a recognition that, at some point, if we stay on Earth, we will confront an eventual extinction event. “The alternative is to become a spacefaring civilization and a multi-planetary species.” He alights upon Mars as the obvious first option for establishing a “self-sustaining city — a city that is not merely an outpost, but which can become a planet in its own right.” He rejects Venus due to it being, as he correctly puts it, a super-high-pressure, hot acid bath. He rejects Mercury due to it being too close to the Sun, and the Moon for lack of atmosphere and its twenty-eight-day “day” (a Martian day, or “sol,” for comparison, is an Earthling-friendly 24.5 hours). And he rejects, at least for now, the moons of Jupiter or Saturn, as they are much harder to get to. Mars has more than its own share of habitability issues, but Musk does not mention them, other than to say that, while Mars is “a little cold” (in reality, -63ºC, or -81ºF, compared to Earth’s balmy 16ºC, or 57ºF), “we can warm it up.” The Martian atmosphere is “very helpful” because it’s primarily CO2, with some nitrogen and argon, meaning that “we can grow plants on Mars just by compressing the atmosphere.” Most cheery of all, Musk says it would be “quite fun” to be on Mars, because the gravity is about 38 percent that of Earth, making it easy to lift heavy things and “bound around.” Mars, as seen from space. (WikiImages via Pixabay) It’s all so simple. “We just need to change the populations because currently we have seven billion people on Earth and none on Mars.” And so the paper is primarily devoted to explaining how to solve that sole problem: how to lower the cost of a trip to Mars from the current roughly $10 billion per person down to the median cost of a house in the United States. By making rockets reusable, refilling in orbit, producing propellant on Mars, choosing the right propellant, and improving system design and performance, Musk reckons he can get the cost of a ticket down to $200,000, perhaps as little as $100,000. And Musk’s SpaceX has done a tremendous job so far of sharply reducing the cost of escaping Earth’s gravity well, primarily via deep vertical integration of the firm. It produces a whopping 70 percent of its components in-house, as opposed to the 1,200 different suppliers in the outsourced supply chain of its main competitor, the Boeing–Lockheed Martin partnership known as the United Space Alliance. Each of these suppliers extracts their own profit margin from every contract in the chain, jacking up the cost per launch to $460 million. SpaceX, by comparison, charges NASA and its other clients just $62 million per launch, and Musk says he has slashed the marginal cost of a reused Falcon 9 booster launch to a mere $15 million. Well done, Elon. Or, rather, well done to all the engineers, logistical experts, and other workers who have done most of the labor, allowing SpaceX to revolutionize the business model of getting to space. There is not really any mention of the enormous challenges of the atmosphere’s low pressure and toxic composition, the preponderance of deadly perchlorates in the soil, or the lack of magnetosphere to protect against solar and cosmic radiation. The current atmosphere of Mars is too thin to support most life: its pressure is only about 1 percent that of Earth. Only hypopiezotolerant microbes (those that live in low-pressure environments), such as ones that are lofted by winds into Earth’s stratosphere, would be able to survive. The atmosphere is also 95 percent carbon dioxide — fine for plants (if the pressure were able to be raised) but not for animals. Musk does say that once Mars is warmed up, “we would once again have a thick atmosphere and liquid oceans.” Bioremediation using bacteria to clean up perchlorates already occurs on Earth, but we are talking about an entire planet here. There is no discussion of how any of this might happen, over what time period, and who would pay for it. Same with the construction of an artificial magnetosphere. Dealing with the perchlorates alone would likely be profoundly more challenging and expensive than the relatively straightforward process of decarbonizing Earth’s economy. A 2018 NASA study found that there is insufficient CO2 and H2O from the Martian soil, polar ice caps, and minerals in the upper crust to get anywhere close to thickening the atmosphere and using it like a blanket to warm up the planet. All these sources combined would still only boost the pressure to about 7 percent of that of Earth. Carbon-bearing minerals deep in the crust might have enough CO2 to achieve the needed pressure, but nothing is known about their extent, and recovering them with current technology would be colossally energy intensive. Another idea is to direct comets or asteroids to crash into Mars and release their greenhouse gases that way. Again, these are fantastical ideas that will be impractical for many, many generations yet to come. NASA astronauts in space. (NASA) And there is likely no way of ever overcoming Mars’s low gravity. If you added all the mass of Venus to that of Mars, smashing the planets together, even then, you would still not quite achieve Earth’s gravity. It is true that we do not know what the physiological effects of 38 percent of Earth’s gravity are, either on humans or other life. We have two data points: Earth gravity, what we call 1G, and the 0G microgravity of the International Space Station (ISS). But from studies of astronauts who have spent extended periods aboard the ISS, we know that 0G is extremely bad for human health. Muscles atrophy. Tendons and ligaments begin to fail. Facial and finger muscles, which cannot be worked out via onboard gyms or treadmills, weaken. The spine lengthens, with astronauts gaining an inch or two in height and suffering from back pain. Bones demineralize, losing density at a rate of 1 percent per month. As Christopher Wanjek, a former NASA science writer and author of 2020 book Spacefarers — which is an optimistic volume on the viability of manned space travel — notes: “To visualize how bad that bone loss is, consider the fact that the major obstacle to fully recycling urine into drinking water on the ISS is that the filters get clogged daily with calcium deposits.” Wanjek writes how the rate of vision loss is such that a crew to Mars would need to pack eyeglasses with various prescriptions for “each phase of their gradual, inevitable, and permanent vision loss.” Kidneys get confused by blood not being where it’s supposed to be and think there is an excess, so they start to remove what they believe to be excess water. The blood thickens, driving a reduced production of red blood cells, which in turn drives anemia, shortness of breath, lethargy, and greater likelihood of infection. Perhaps worst of all, brain compression resulting from microgravity negatively impacts regions responsible for fine motor movement and executive function — deteriorations that could be permanent. A range of interventions, including exercise, drugs, and compression clothing can shave the sharp edges off some of these effects, but ultimately, the solution on a spacecraft is the simulation of gravity via centrifugal force — a spinning ship. This is not something that you can do with a whole planet. It is for this reason that Venus, with its gravity not too far off that of Earth, may actually be a better terraforming candidate than Mars — one day — despite its currently inhospitable atmosphere. The Real Business of SpaceX Isn’t Mars One has to suspect that Musk knows all this. We have a hint of this when, at one point in his paper, Musk concedes that it will be difficult to fund his vision just by slashing the cost of getting to space. He admits that SpaceX expects to generate substantial cash flow from launching lots of satellites and servicing the International Space Station for NASA. Additional help for bankrolling the Mars project might come from the emergence of a market for really fast transportation of things or people around the world by rocket: cargo could be transported anywhere on Earth in forty-five minutes, and a trip from New York to Tokyo could take a mere twenty-five minutes (so long as takeoff and landing takes place where the tremendous noise, as he puts it in hip-CEO-speak, “is not a super-big deal”). As a result, one gets the impression by reading between the lines that a self-sustaining Martian city is all just an impressive marketing maneuver taking advantage of most people’s sense of adventure and wonder; of our species’ ancient need to wander and explore. The real business of SpaceX was never a Martian colony but rather servicing a mature satellite market, stealing government space contracts from the likes of Boeing, and kicking off a terrestrial rocket transport sector. The dream of Mars is, in this case, not really any different from the adman’s fiction of romance and aspiration that sells a can of Pepsi or a Jeep. The dream of Mars is, in this case, not really any different from the adman’s fiction of romance and aspiration that sells a can of Pepsi or a Jeep. None of this is to suggest that establishing an outpost on Mars for the purposes of scientific exploration should not be attempted, even in the next couple of decades. But an outpost, as Musk himself makes clear, does not approach a self-sustaining city, and still less a multi-planetary species. Because humans do need to exit Earth at some point in order to maintain the species, if we are to establish genuinely self-sustaining colonies, then terraforming will likely be necessary one day, as well as interstellar generation ships that take us to habitable exoplanets far beyond the solar system. For all of this, we will have to figure out how to take our ecology with us. We are not really the collection of individuals we thought we were, but rather are deeply embedded within our ecosystems. Indeed, each of us is a microbial ecosystem whose edges are vague. Where does the bacterial, fungal, and viral multitude that is “me” stop and my equally microbiological environment begin? This does not mean that Earth will be the only home we ever have, but it does mean that the antiseptic, forestless, riverless Starship Enterprise would leave its inhabitants very sick before too long. How much of our ecology do we need to take with us, though? We just don’t know yet. The science of ecology is very much still a young discipline. This is where fantastical science-fiction conceptions of vast ships made from hollowed out asteroids and packed with different biomes fills the gap of what we do not know. Likewise for novels like Becky Chambers’s To be Taught, if Fortunate, in which, instead of terraforming other worlds, adapting them to our needs, we genetically alter our bodies via “somaforming” to adapt ourselves to their conditions. Plainly, then, there is no rush for any of this, even as there is a moral imperative for us, one day in the distant future, to permanently exit Earth. Our colonization of other worlds is akin to the building of the grandest cathedral we have ever envisaged: a project that will take centuries, or more likely millennia, many millennia. This is nothing that a private company can deliver. There is no near-term return on investment; indeed, there is no aim of profitability at all, but rather of our species’ survival through the eons.

#### Privatization of space travel makes it politically polarizing and drains public support.

**Phillips 20** [(Leigh, science writer and EU affairs journalist, author of Austerity Ecology & the Collapse-Porn Addicts.) “We Don’t Need Elon Musk to Explore the Solar System,” May 8, 2021, https://jacobinmag.com/2021/05/elon-musk-space-exploration-mars-colonization] TDI

Elon Musk is right to dream of humanity’s future as a multi-planet species. However, the multigenerational, millennia-long project of **space colonization will be a public-sector endeavor, or it will not happen.** Elon Musk, the third-richest man in the world, CEO of SpaceX and Tesla (and dabbler in online edgelord provocation), issued a strange Twitter post last month in defense of his wealth. “I am accumulating resources to help make life multiplanetary & extend the light of consciousness to the stars,” he declared. And then, this week, the centibillionaire further provoked when he mentioned in an interview about Martian colonization that, while it would be a glorious experience, “a bunch of people will probably die in the beginning.” All this within days of NASA’s Perseverance Mars mission achieving the first helicopter flight on another planet and producing five grams of oxygen from the planet’s carbon dioxide–dominant atmosphere — two major milestones in space exploration. A reasonable critique of Musk’s SpaceX endeavors might begin by noting that, regardless of how noble an aim Musk may have for his centibillions, there simply should not be centibillionaires (or even regular millionaires and billionaires). One might also echo Neil Armstrong’s criticism of private space flight — a criticism that once made Elon cry when 60 Minutes asked him about his hero arguing against the privatization of space. We might note how space exploration during the Cold War, despite the militarist overtones of the Space Race, was explicitly intended to be for all mankind rather than in service of the jollies of ultrarich space tourists. A democratic and public redirection of Elon Musk’s billions might be spent differently. One might further assert that, given the non-identity of the set of all things that are beneficial and the set of all things that are profitable, space colonization will be a public-sector endeavor, or it will not happen — as such a private space travel has no near-term, medium-term, or even long-term prospect of any return on financial investment beyond servicing low-earth, medium-earth, or geostationary orbit. And, finally, we might denounce the union-busting at Musk’s factories or even argue that his “accumulation of resources” is less the product of his own efforts than it is primarily an upward redistribution of value created by his workers. That is to say that there are a raft of progressive critiques of Musk that could be made that nevertheless still value space exploration and, one day, human colonization of the cosmos. Indeed, if one values space exploration and looks forward to the time, as astronomer Carl Sagan put it, “when most human cultures will be engaged in an activity you might describe as a dandelion going to seed,” then a socialist critique is all the more necessary, given the irrational limitations markets impose on human endeavor. There are a raft of progressive critiques of Elon Musk that could be made that nevertheless still value space exploration and, one day, human colonization of the cosmos. But instead, there are thousands of snark-drenched tweets sneering at how crackpot, masculinist, and even childish Elon’s dream is. They argue that space travel is a waste of resources that would be better spent solving problems here on Earth, and that space colonization is a repetition of the colonization of the New World. Even Bernie Sanders responded to Musk by saying: “Space travel is an exciting idea, but right now we need to focus on Earth and create a progressive tax system so that children don’t go hungry, people are not homeless and all Americans have healthcare. The level of inequality in America is obscene and a threat to our democracy.” At the time of writing, the senator’s tweet had received some 95,000 likes. Bernie is, in this case, wrong. Space exploration, including space travel, is one of the grandest tasks humanity has ever set for itself. It is a false dichotomy — and an austerian one at that — to say that we do not have enough money for both a space program and social justice or environmental protection. We can more than afford to do both. NASA’s budget is but a fraction of the Pentagon’s. It should not be difficult to imagine a democratic socialist economy, or even just one a little less neoliberal, that permits much more space and much less war. We can have public health care and science. We can end homelessness and explore the cosmos. We can have unionized, family-supporting jobs for all and, one day, almost certainly some considerable time from now, colonies on other worlds. The Postcolonial Space Programs Let me offer a personal anecdote about how I came to change my mind about this. A few years ago, I was researching the space programs of developing nations in Sub-Saharan Africa and South America for a feature article for a science magazine. While I have always been a cheerleader for space science, I had heard that, in some cases, the states concerned did not really have the capacity for such activities and were doing little more than rebranding British or American satellites launched from Russian spaceports. I thought I would have a nice story of neoliberal regimes wasting what little money these countries had on vanity projects that were of dubious national provenance. So I got in touch with some of the British and American engineers that had worked on these projects and interviewed them off the record. To varying degrees, they conceded that this was more or less what was happening in some places, but not in others, where a country was more advanced and did have at least some of the capacity necessary. Off the record, they told stories of corruption and incompetence, delays and malfunctions. But they also said that there was a learning process and there absolutely was a transfer of skills and knowledge. It was a mixed bag, they said. It is a false dichotomy — and an austerian one at that — to say that we do not have enough money for both a space program and social justice or environmental protection. More than this, what told me that made me completely rethink my attitude toward developing world space programs. They said that, however much they might have questioned the priority given to a space program for a country without functioning roads or sewage systems, everywhere they went, when they said why they were in the country, ordinary people would respond by bursting with pride that their country, too, was going into space. For them, it symbolized that they were just as good as any developed nation, that modernity was coming, and that they, too, could be explorers and pioneers. I put away my story and never wrote it. Instead, I investigated the decline of mathematical training in Africa in the neoliberal era. During the postcolonial era, African socialist governments had been committed to developing a cadre of professionals schooled in advanced mathematics and science, sometimes with the assistance of the Soviet Union, sometimes with aid from the United States or France, depending on the contingencies of the Cold War. But the indifference that followed the end of the Cold War and the advent of neoliberalism had gutted such training, and now, in many countries, the aging, mathematically trained professionals were retiring or dying with no one to replace them. Such training is essential not just for scientific research but for civil engineering, national budgeting, and enterprise planning. Thankfully, a celebrated physicist, Neil Turok — also the son of the man who crafted the South African ANC’s armed struggle strategy, Ben Turok — had started a new institute expressly committed to reviving Africa’s mathematical capacity. I wrote about that instead. We can today spend on both space exploration and mathematics education — and we could have in the 1960s. We don’t only need charity, but we need vaulting ambition as well: not just social programs but science. Or, put another way: we want bread, but we want roses, too. How Venus Helped Us Understand Global Warming But even if Bernie made an unwittingly neoliberal argument by imagining there is not enough wealth in America to afford both an ambitious space program and luxuriant social programs, he did at least state that he thought space travel was exciting. It was a matter of prioritization rather than outright opposition. There were others, however, who attacked the very idea of going into space, not least at a time of climate emergency. We should focus on this living planet rather than unfathomably distant dead ones, they said. This is not a one-off; Left critics of space programs repeatedly issue calls for a focus on the environmental challenges Earth faces instead of going to space. But this is a second false dichotomy. Space science, in so many respects, is Earth science. NASA is perhaps the premier Earth science research agency in the world. Its Landsat program, originally named the Earth Resources Technology Satellite and dating back to 1972, is the longest running effort to deliver satellite imagery of the planet. Its latest iteration, Landsat 8, launched in 2013 and delivers millions of images free of charge to researchers or any member of the public, tracking forest loss and degrowth, glacier and icecap melt, land-use change and agricultural water use. Left critics of space programs repeatedly issue calls for a focus on the environmental challenges Earth faces instead of going to space. But space science, in so many respects, is Earth science. Then there is AIRS, the Atmospheric Infrared Sounder, on NASA’s Aqua satellite, which gathers infrared energy emitted from Earth’s surface and atmosphere and measurements of temperature and water vapor that are used to assess the accuracy of climate models, detect volcanic plumes, and forecast droughts. The Geostationary Carbon Observatory (GeoCarb), yet to launch, will monitor greenhouse gas emissions, and the Ice, Cloud and land Elevation Satellite-2 (ICESat-2) mission will measure ice-sheet elevation, sea-ice thickness, and tree-canopy height to track changes in Greenland and Antarctica ice and assess changes in the total mass of the world’s vegetation. As of 2021, there are some forty different current and soon-to-launch Earth science missions performed by NASA. When we send missions to other worlds, again, learning about them teaches us as much about Earth as they do about the Moon, Mars, Venus, Europa, Titan, or Enceladus. Let’s remember that climatologist James Hansen — whose 1988 congressional testimony on global warming was one of the main catalysts of early public and political awareness of the climate emergency — had his start studying the transfer of radiation through the Venusian atmosphere. It was his work investigating Venus — a planet with a runaway greenhouse effect — that led him to work on climate change on Earth. Indeed, the study of the atmospheres of both Venus and Mars is a key part of the story of how we discovered global warming. Robots vs. Humans One might respond that all of this is unmanned space exploration. Surely steady advances in robotics and miniaturization have weakened the case for manned spaceflight. Robots like the Perseverance rover (nicknamed Percy), which recently landed in Jezero Crater on Mars aiming, among other goals, to search for evidence of ancient microbial life, are much more able to access extreme environments inhospitable to humans and at a much lower cost. But while there are many things robots can do that humans cannot, there are also many things humans can do that robots cannot and will never be able to (at least until the advent of artificial general intelligence). As British planetary scientist Ian Crawford argues, humans have the advantage over robots with respect to on-the-spot decision-making and flexibility and thus increased probability of making serendipitous discoveries. There is also greater efficiency of sample collection and return with humans (382 kg of moon rocks returned by Apollo vs the 0.32 kg from the sample returns of the Soviet Union’s robotic Luna missions), and greater potential for large-scale exploratory activity, deployment, and maintenance of complex equipment. But it is the universal problem-solving capability of humans that is key. Crawford quotes Steve Squyres, the principal investigator for the Mars exploration rovers Spirit and Opportunity, who concluded in 2005: “The unfortunate truth is that most things our rovers can do in a perfect sol [a Martian day] a human explorer can do in less than a minute.” An artist’s rendering of the Perseverance rover on Mars. (Tim Tim / Wikimedia Commons) And we see this in the scientific literature. Comparing the number of refereed publications resulting from the Apollo moon missions (the only human exploration missions) with those from robotic missions to the Moon and Mars, Crawford finds the former has produced a much greater volume. Dividing the cumulative number of publications by days of fieldwork on the surface, Crawford gauges that the Apollo project was three orders of magnitude more efficient in producing scientific papers per day than its unmanned counterparts, while being about one or two orders of magnitude more expensive. He notes that the next most productive missions are the Luna sample return missions. This shows how important sample return is, and indeed, one of Percy’s goals is to collect rock and regolith (“soil”) samples that, at some point in the early 2030s, will be retrieved by a “fetch rover” mission and sent back to Earth via a Mars Ascent Vehicle, a miniature rocket whose design has yet to be agreed. One of the main reasons robotic missions have been cheaper is that they do not return. The return mission thus bumps up the cost. But the quantity and diversity of samples will not be as high as a human mission could deliver. He is keen to stress that none of this should downplay the importance of robotic Martian sample return, which is necessary until humans can safely be sent to Mars and back. The point is to correct the erroneous notion that manned space missions are merely white elephants servicing national pride in contests with geopolitical rivals such as the USSR or China but have no real scientific purpose. Even though the priority should be, and very much is, on robotic exploration, we will learn more if we do both over time than if we depend upon robotic exploration alone. Robots enhance rather than replace human exploration. The Prison of the Possible One might then argue, nevertheless, that, given the exorbitant cost of space travel, whether by human, robot, or satellite (a robot of a sort), we should still, as Bernie’s tweet stated, focus instead on hunger, homelessness, and health care on Earth. Prioritization of spending will always be necessary, but a strictly utilitarian approach that demands we cannot spend on large scientific endeavors until poverty and inequality are eradicated would likewise have to rule out other big-ticket but curiosity-driven science efforts such as the Large Hadron Collider. Indeed, it also follows that any scholarship that is not applied research with a demonstrably near-term human benefit should be halted until all other problems are solved, expensive or not. Of course, applied research would sooner or later come to a halt as well under such a utilitarian research regime as, by definition, applied research is an application of basic research. Those in the seventeenth century who thought, “Isn’t it kind of neat and weird that when I rub a piece of amber against a cat’s fur, the amber can pick up a feather? I wonder why this is,” had no notion that any investigation into the phenomenon of what we now call electricity would one day result in applications that power much of the world. And the demand that we only engage in activities with clear utility requires that all resources allocated to art and music be shifted elsewhere. How like the university administration philistines we see today slashing humanities funding to deliver more to STEM subjects, mothballing language courses and classics programs!

#### Space exploration is essential to the survival of humanity. It solves a litany of existential threats – don’t put all your eggs in one basket.

**Fitzgerald 3/9** [(Shanon, Assistant Websites Editor at Liberty Fund), “Why Human Space Exploration Matters,” March 9 2021, https://www.econlib.org/why-human-space-exploration-matters/] TDI

While the yields to space exploration and the development of spaceflight technology may appear minimal in the immediate future, shifting our perspective to the longer term renders the human situation vis a viz space exploration extremely clear: if humans want to survive in perpetuity, we need to establish ourselves on other planets in addition to Earth. It is as simple as that. And yet we are not doing all that much to make that happen. To be clear, I’m long on Earth, too, and hope that technological improvements will continue to allow our species to get “more from less” right here on the third rock from the sun, enabling us to keep occupying the planet that saw us evolve into consciousness. I like to imagine that the distant future on Earth has the potential to be an extremely pleasant one, as advances in our scientific understanding and bio-technical praxis should hopefully allow our descendants to clean up any of the remaining messes previous generations will have left behind (e.g., nuclear and industrial waste, high amounts of atmospheric carbon, other lingering nasties) and stable-state free societies will hopefully allow all persons (or very nearly all persons) to live free and meaningful lives in productive community and exchange with their fellows. As the previous qualification highlights, the trickiest problems here on Earth and extending to wherever humans end up in the spacefaring age will still be social and political, and their successful resolution will depend more on the future state of our governing arts than our hard sciences. But regarding the negative events that could very well happen to Earth I think we all need to be equally clear: life might not make it here. There is no guarantee that it will, and in the very long run, with the expansion and subsequent death of our sun, we know with near certainty that it will not. Consider just a few possible extinction-level events that could strike even earlier: large meteors, supervolcanic eruptions, drastic climactic disruption of the “Snowball Earth” variety. As SpaceX founder and Tesla CEO Elon Musk recently observed on the Joe Rogan Experience podcast, “A species that does not become multiplanetary is simply waiting around until there is some extinction event, either self-inflicted or external.” This statement, applied to the human species, is obviously true on its face. As doomsday events go a giant asteroid might be more shocking, since we (people living today) have never experienced one before while concerned atomic scientists warn us about the nuclear bomb all the time, but the odds that we blow ourselves up are still there. Slim, but there. It’s more plausible that a severe nuclear war and the nuclear winter it would likely trigger would leave the human population greatly reduced as opposed to completely extinct, but then the question becomes: why is that a risk we would want to take? The bomb is here to stay for now, but there is no reason that 100% of known life in the universe needs to stay here on Earth to keep it company, waiting around for something even more destructive to show up. While we’re on that happy subject: Do you have any good intuitions about our collective chances against hostile, or simply arrogant or domineering, technologically-advanced extraterrestrial lifeforms, if and/or when they decide to pay us a visit on our home turf? These scary situation sketches will suffice. At bottom, the core reason I am a believer in the need to make life—and not just human life—multiplanetary is the same basic reason I would never counsel a friend to keep all their money and valuables in one place: diversification is good. Wisdom and experience suggest we store precious resources in multiple safe(ish) places. Diversification limits our exposure to risk, and increases our resilience when bad things do happen. One reserve gets hit, two or three others survive, and you probably feel that the effort to spread things out was worth it. What I’m saying here has strong undercurrents of common sense, yet our approach to the human population itself—the universal store and font of “human capital”—does not currently prioritize diversification to the degree our technological capabilities would allow. The distribution of the human population, and of almost all human knowledge and works, is overwhelmingly local. (Let us set to one side the possibility that aliens somewhere maintain an archive of captured human information.) Establishing outposts at least as large as those we maintain in Antarctica on the Moon and Mars, or other more suitable sites, by the end of this century would be a great first step toward genuinely diversifying the physical locations of the most precious resources known to us: human consciousness and creativity, human love and human soul, the great works in which all these things are displayed. Add also to this list repositories of scientific knowledge and knowhow, seed reserves, and certain materials necessary to re-start the manufacturing of fundamental technologies. Spreading these goods to a few additional locations within the solar system would be a major species-and-civilization-level accomplishment that all living at the time could feel satisfied by, and even take some pride in. And this is something that we seem to be just on the cusp of being able to do, given our recent and rapid technological advances in rocketry, computers, and materials science and engineering, among other important fields for space exploration and settlement. Quickly the uniplanetary human situation is becoming, if it is not already, one of pure choice.

## Adv 2: Debris

#### The advantage is Debris:

#### Privatization of space is unsustainable and increases debris – triggers the Kessler Syndrome

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* Kessler syndrome: objects outside Earth’s immediate orbit causing more damage the longer it’s allowed to orbit

Back in 1978, the astrophysicist Donald Kessler made an alarming prediction: Space junk could **wreck our ability to keep satellites aloft**. In a fascinating paper, Kessler noted that “low earth orbit” — a region between 99 miles and 1,200 miles up — was getting pretty crowded. In 1978 there were already 3,866 objects being tracked in space. That included satellites used by scientists (say, to monitor weather) or spy agencies. It also included a lot of debris: Every time a rocket launches a satellite into orbit, it tends to leave stray bits of material. The thing is, when objects are zooming through space **about 2 km/s**, even something as tiny as a chip of paint can **smash through glass or steel**. Pieces of debris become **bullets**. What Kessler predicted is that sooner or later, **objects** in low-earth orbit would start **colliding**, and produce **chain effects**, like billiard balls colliding on a crowded pool table. If a piece of debris hit a **satellite**, it would produce **more debris,** which would to increase the risk of **other collisions** … and so on, and so on. At some point, you could reach a **tipping point**. There’d be so many chunks of debris that collisions would be **inevitable**, leaving low-earth orbit a **junkyard where no satellites could survive.** Remember the scene in Wall-E where they blast off Earth, and the planet is utterly ringed with crap? That’s what Kessler worried about. Except in our situation the pieces of junk could be quite small — billions of objects the size of grains of sand, which is actually a lot **harder to deal with**, because you **can’t see it coming**. In essence, Kessler predicted we could create an artificial asteroid belt of junk: The result would be an **exponential increase** in the number of objects with time, creating a **belt of debris around the earth**. This process of mutual collisions is thought to have been responsible for creating most of the astroids from larger planetlike bodies. Space folks began calling this the “Kessler Syndrome”. It was hard to predict when this might start happening. Kessler worried that conditions could be ripe by as early as 2000. Thankfully, that estimate turned out to be premature. But wow, it looks like it might happen soon. **What’s happened recently that makes the “Kessler Syndrome” more likely**? A couple of things: **Way more satellites are going up** The pace at which satellites are going up in the sky is simply exploding. Back when Kessler wrote his paper in 1978, we humans were launching about 53 new satellites a year. Going to space was hard. But now launches are an order of magnitude more common, and they’re increasing in pace rapidly. SpaceX in particular is launching oodles of satellites as it builds its orbital Internet-access service Starlink. In the last two years, it has put 1,740 satellites in low-earth orbit, with plans to eventually shoot 30,000 up there. This is part of a larger trend, which is … The **privatization of outer space** The private sector is rapidly **becoming the dominant actor in space**. There’s a huge demand for satellite data — everyone wants better info about weather, crops, traffic patterns, tree coverage, emissions, you name it, on top of the explosive use of satellites for communication and Internet. SpaceX’s remarkable innovations in rocketry (the leading folks, though others are following in their footsteps) have made it cheaper than ever to get a satellite into orbit. It is unlocking a huge pent-up demand for near-earth-orbit tech. More launches mean not only more **intentional objects in orbit but unintentional ones** — bits of rocket parts and detritus from launches.

#### Privatization exponentially increases the curve but ending dangerous missions prevents it.

**Bernat 20** [Pawel, 2020, Military University of Aviation, “ORBITAL SATELLITE CONSTELLATIONS AND THE GROWING THREAT OF KESSLER SYNDROME IN THE LOWER EARTH ORBIT,” SAFETY ENGINEERING OF ANTHROPOGENIC OBJECTS, Volume 4, PDF] Justin

5. **Orbital satellite constellations and the growing threat of the Kessler syndrome** Space 2.0 – the new era of **space exploration** that we witness now in the 21st century means, in words of Buzz Aldrin, “moving human enterprise into space” (Pyle, 2019, p. xiv). The process of **commercialization of outer space has already begun** and is **not limited to private companies** providing technologies and services for national or international space agencies, as it was in the past. On the contrary, private companies from the space sector have now matured to carry out their own independent projects. As for 2020, SpaceX is a company that serves as the best example – it launches satellites to the orbit, both for state and private contractors, it successfully realized two crew missions to the International Space Station, and is in the process of constructing Starlink satellite constellation that will provide high-speed internet access across the planet. Each satellite weighs around 260 kg, is equipped with an ion propulsion system, autonomous collision avoidance system, and orbits Earth at approximately 540-560 km altitude (Starlink, 2020). At the beginning of November 2020, more than 860 Starlink satellites were orbiting the Earth (Jewett, 2020). Immediate plans include launching **12,000 satellites, but they assume a potential later extension to 42,000** (Henry, 2019a). Of course, SpaceX has employed, at least declaratively, all necessary measures to keep the space clean – the satellites are equipped with the deorbiting system, and in the event of inoperability of the propulsion system (Starlink, 2020). The orbital collisions are, however, inevitable. As it was shown before, the possibility of collisions grows with the number of orbital objects. Bastida Virgili with the team compared (2016, p. 154-155) orbital debris environment development **without** and **with** a large **hypothetical constellation** consisting of merely 1080 satellites, distributed across 20 orbital planes at 1,100 km altitude (Fig. 5).

Chart, line chart

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It has to be noted that although SpaceX’s Starlink is the only constellation that is being built in orbit, it is not the only one planned. There are at least a **few initiatives aiming at the same goal** – to construct internet infrastructure at the Earth’s orbit. The planned Kuiper Systems LLC, which is a subsidiary of Amazon and intends to place 3,236 broadband satellites in the LEO, is one of Starlink’s biggest competitors (Henry, 2019b). Now, there is even a **rivalry between the two companies** because Kuiper’s **lowest orbital shell is planned to be 590 km**, with a tolerance of 9 km either above or below (Cao, 2020), which is the altitude of Starlink satellites. Moreover, the race for space in orbit is now at the beginning. The outer space is vast. It increasingly becomes more cluttered with both **operational satellites and space debris**. The threat of collisions increases and no institution or body has enough power to license, coordinate and regulate what is sent to the orbit. The UNOOSA has not such power. National states decide what the companies from the space industry can launch to space. In the United States, which is most advanced in the area of private constellations, it is the Federal Aviation Administration (FAA) that issues the appropriate approvals. The race to put broadband internet satellites bears similarities to the gold rush – there are **no rules**, at the global level, apart from **first-come, first-served.**

#### Debris triggers miscalculated war.

Peter **Dockrill 16**. Award-winning science & technology journalist. “Space Junk Accidents Could Trigger Armed Conflict, Study Finds.” <https://www.sciencealert.com/space-junk-accidents-could-trigger-armed-conflict-expert-warns>.

**The increasingly crowded space in Earth's low orbit could set the stage for an international armed conflict**, says a new study. Researchers from the Russian Academy of Sciences warn **that accidents stemming from the steady rise in space junk floating around the planet could incite political rows and even warfare, with nations potentially mistaking debris-caused incidents as the results of intentional aggressive acts by others.** In a paper published in Acta Astronautica, the **team suggests that space debris in the form of spent rocket parts and other fragments of hardware hurtling at high speed pose a "special political danger" that could dangerously escalate tensions between nations.** According to the study, **destructive impacts caused by random space junk cannot easily be told apart from military attacks.** "**The owner of the impacted and destroyed satellite can hardly quickly determine the real cause of the accident**," the authors write. **The risks of such an event occurring are compounded by the sheer volume of debris now orbiting Earth. Recent figures from NASA indicate that there are more than 500,000 pieces of space junk currently being tracked in orbit, travelling at speeds up to 28,160 km/h** (17,500 mph). The majority of those objects are small – around the size of a marble – but some 20,000 of them are bigger than a softball. In addition to these 500,000 or so fragments – which are big enough for scientists to know about them – **NASA estimates that there are millions of undetectable pieces of debris in orbit that are too small to be monitored. But even extremely small fragments such as these pose a threat – in fact, they're considered a greater risk than trackable debris, as their invisible status means spacecraft and satellites can't do anything to avoid them until it's too late.** As NASA observed in 2013:"**Even tiny paint flecks can damage a spacecraft when travelling at these velocities**. In fact a number of space shuttle windows have been replaced because of damage caused by material that was analysed and shown to be paint flecks… With so much orbital debris, there have been surprisingly few disastrous collisions." **While we may have been lucky in the past, we can't rely on that to continue**. The study by the Russian team **cites the repeated sudden failures of defence satellites in past decades that were never explained. The researchers attribute two possible causes: either unrecorded collisions with space junk, or aggressive actions from adversaries. "This is a politically dangerous dilemma," the authors write.**

#### Goes nuclear.

Les **Johnson 14**. Baen science fiction author, popular science writer, and NASA technologist. “Living without satellites”. <https://www.baen.com/living_without_satellites>.

**Satellite imagery is used by the military and** our **political leaders to maintain the peace**. **When** your **potential adversaries can’t hide what they’re doing, where their armies are moving and what they are doing with their civilian and military infrastructure, then the danger of surprise attack is diminished**. **In** our **nuclear age with instant death only minutes away by missile attack**, the doctrine of Mutual Assured Destruction **(MAD) only works if both sides know whether or not they are being attacked.** The launch of missiles or a bomber fleet **can easily be seen from space far in advance of either reaching their potential targets halfway around the globe**. The **danger of surprise attack is therefore small, making an accidental war far less likely.** So what does all this mean? And what do we do about it? First of all, it means that the advocates of space development, exploration and commercialization have succeeded far beyond their initial expectations and dreams. The economies and **security of countries** in the developed world **are now dependent on space satellites**. We space advocates should celebrate our success and be terrified of it at the same time. **Should we lose these fragile assets in space,** our **economy would experience a disruption like no other: ship, air and train travel would stop and only restart/operate in a much-reduced capacity for years (GPS loss)**. Many banking and retail transactions would cease (VSAT loss). Distribution of news and vital national information would be crippled (communications satellite loss). **Lives would be put at risk and the productivity of our farming would dramatically decrease (weather satellite loss). The risk of war, including nuclear war, would increase (loss of spy satellites) and our military’s ability to react to crises would be significantly reduced (loss of military logistics and intelligence gathering satellites).**

#### The United States federal government should end commercial space exploration and tourism, ruling that they violate its non-appropriation obligations under the Outer Space Treaty of 1967 and its succeeding treaties.

**Cooper 8** [Cooper, Nikhil D. "Circumventing Non-Appropriation: Law and Development of United States Space Commerce." Hastings Const. LQ 36 (2008): 457.] TDI

The latest piece of congressional legislation regulating the commercial space industry was the **C**ommercial **S**pace **L**aunch **A**ct (CSLA) 77 that was spurred on in part by the host of new technologies capable of commercially exploiting space. 78 The CSLA streamlined the earlier space-launch bureaucracy and **mandated** the DOT to issue **licenses for** all **commercial space launch** programs, 79 regulate forms of **space tourism**8 and space advertising, 8 ' impose minimum liability insurance **and financial responsibility** requirements, and82 provide for administrative and judicial review of DOT Secretariat decisions.83 Il. A Legal System? The CSLA represents the most recent and comprehensive United States space commerce legislation; but, in the years since its passage, no one has seriously questioned its consistency with United States international obligations of "non-appropriation." The issue is especially apt now, however, because the current and future capacities of commercially exploiting space seem primed to challenge non-appropriation as the guiding theme in space commerce. Therefore, the question we must ask now is whether or not **the United States is circumventing the intent of non-appropriation by encouraging and protecting private commercial expansion into space**. A. Treaties Versus Congressional Acts Whether the regulatory regime outlined in the CSLA conflicts with the national non-appropriation principle, as outlined in the Outer Space Treaty of 1967 and in its succeeding treaties, is **an issue that could be reviewed by the federal judiciary under its constitutional grant of subject-matter jurisdiction over cases "arising under" treaties**.8 4 The judiciary's power to interpret treaties is a power distinct from the treaty-making authority delegated to the executive and legislative branches. Article II of the United States Constitution authorizes the president to ratify treaties with the consent of two-thirds membership of the Senate. 5 Treaties entered into in this manner are the supreme law of the United States and bind state constitutions, legislatures, and judiciaries.8 6 Generally, courts employ distinct methods of interpretation when called on to perform the separate but related tasks of interpreting treaties and resolving treaty-statutory disputes. As to the former, courts generally will liberally construct a treaty "to give effect to the purpose which animates it" and will prefer that liberal construction "[e]ven where a provision of a treaty fairly admits of two constructions, one restricting, the other enlarging [of] rights which may be claimed under it."87 A preference for broad construction, however, is not a license for courts to impose any interpretation they deem appropriate. For example, although courts have a greater ability to construct treaties more broadly than private contracts, they are still precluded from interpreting a treaty beyond the "apparent intent and purport" of its language.88 in this way, determining a treaty's "intent" delineates the boundaries of how broadly or narrowly the court may interpret a treaty's provision. Courts obviously have a much easier time determining a treaty's intent where the treaty language is unambiguous. In these instances, courts expressly forbid looking beyond the language of the treaty to supply the intent of the parties at the time the treaty was drawn.89 When the language of the treaty is ambiguous, however, the court will attempt to effectuate the drafter's intent through a broader inquiry into "the letter and spirit of the instrument," and may take into account "considerations deducible from the situation of the parties; and the reasonableness, justice, and nature of the thing, for which provision has been made." 90 The United States Supreme Court summarized its interpretive process in the case Eastern Airlines Inc., v. Floyd: When interpreting a treaty, [begin] "with the text of the treaty and the context in which the written words are used." 91 [When confronted with difficult or ambiguous passages, the Court provided that] [o]ther general rules of construction may be brought to bear[.] [And it finally noted that] treaties are construed more liberally than private agreements, and to ascertain their meaning we may look beyond the written words to the history of the treaty, the negotiations, and the practical construction adopted by the parties. 92 Treaty interpretation as described above is important when determining whether the treaty conflicts with an act of Congress. Each being the supreme law of the land, treaties and congressional acts are governed by the last-in-time rule: when they conflict, courts must privilege the last enacted treaty or congressional act over the other. 93 Still, federal courts often avoid finding such conflicts between congressional acts and treaty obligations. As Justice Marshall opined in 1804: [A]n act of Congress ought never to be construed to violate the law of nations if any other possible construction remains, and consequently can never be construed to violate neutral rights, or to affect neutral commerce, further than is warranted by the law of nations as understood in this country. 94 Supreme Court jurisprudence since has largely followed the same presumption and, therefore, courts are inclined to harmonize treaties and congressional legislation that are seemingly antithetical to one another. 95 In the event that a congressional act were to supplant United States treaty obligations, courts would look for unambiguous evidence appearing “clearly and distinctly" in the text of the statute or treaty provision. 96 In other words, repeals of prior statutes or treaty provision must likely be made express. In contrast, "repeals by implication" are generally disfavored "unless the last statute is so broad in its terms and so clear and explicit in its words as to show that it was intended to cover the whole subject, and, therefore, to displace the prior statute. 97 B. CSLA Versus the Outer Space Treaty Both being duly enacted, the CSLA and the Outer Space Treaty are considered the supreme law of the land. If there is a conflict between the United States space commerce provisions as outlined in the CSLA and the Outer Space Treaty, a reviewing court would first be called upon to interpret the intent of the treaty itself. Recall that in the context of treaty interpretation, a court would be at liberty to give the treaty a broad construction to effectuate its intent. The key provision of the Outer Space Treaty at issue would be the language of Article II which forecloses "national appropriation" of space by claims of sovereignty, means of use, occupation, or any other means.98 Black's Law Dictionary defines "appropriation" as "the exercise of control over property, a taking of possession." 99 If defined broadly enough, the joint enterprise nature of the United States space commerce, as implemented in the CSLA, might violate the "spirit" of non-appropriation as outlined in the Outer Space Treaty of 1967. The best argument one could make against the CSLA's provisions is to advocate the court to broadly interpret the "appropriation" principle of the Outer Space Treaty. The proponent of this argument would urge that in so doing, a court should look beyond the words of the treaty and examine the history, negotiations, and practical considerations at the time of the treaty's negotiation to determine its true intent. 100 One would also want to argue **that the space commerce industry violates** perhaps not the "letter" of the treaty, but circumvents entirely **its "spirit**" if a court were taking into account "considerations deducible from the situation of the parties; and the reasonableness, justice, and nature of the thing, for which provision has been made."' 01 One who attacked the CSLA's general legitimacy in this way could argue that the United States **is effectively "appropriating" space through its protection and encouragement of private industry**. Such an appropriation would take place not by realizing a "sovereign" right to space property or the uses of space as expressly proscribed in the Outer Space Treaty, but, instead, through the effective use of government power, services, and contracts to encourage and support the rapid development of the private space commerce industry in the United States. In essence, the result of such government encouragement might not amount to wholesale sovereign appropriation, but, at the very least, a kind of sovereign and private space activity that would cast doubt on whether the non-appropriation principle is actually being respected. Therefore, one arguing that such activities were tantamount to sovereign appropriation would highlight the interrelatedness of government and private industry and argue for a broad interpretation of "appropriation" that encompassed the practical effects of such a relationship. In addition to the regulatory interaction between the CSLA and private space commerce industries, the interrelatedness between government and private industry is clearly illustrated by the interaction between CSLA and the 1972 Liability Convention. Recall that the Outer Space Treaty and its progeny envision a "state-oriented" system of responsibility 10 2 where each member state is responsible for all actions in outer space undertaken by the state and its nationals. 10 3 The Liability Convention further binds member states by holding each strictly liable for its actions or the actions of its nationals within outer space and permits only member states to petition for remuneration under the terms of the treaty. 1 04 In its text, the CSLA cites to such international obligations,'0 5 while also mitigating the United States' liability under the Liability Convention. 0 6 **The CSLA licensing program** ensures overall safety of private space ventures, 0 7 raises the funds necessary to pay "potential treaty claims through its liability insurance requirement,' 10 8 and limits the United States' joint and several liability exposure through **restricti**ng **private use of foreign launch and reentry facilities**.'09 These provisions **effectively allow the U**nited **S**tates **to pass on** the financial cost and recover from their private entities the amount of **damages for which they are internationally liable**. 110 In this way, the government is limiting its international liability exposure by passing on the cost to the private sector. When highlighting the further interrelatedness between government and private industry, one could also note that the United States government holds something of a monopoly in launch services and currently requires that decisions regarding commercial space-launch must be approved through the CSLA. 1' In addition, one making this argument would want to highlight the highly interdependent nature of investment flowing from government to private space commerce: in a February 4, 2008 press release, NASA Deputy Administrator Shana Dale justified the agency's 2009 budget request of $17.6 billion by claiming that "[t]he development of space simply cannot be 'all government all the time[]' . . . . NASA's budget for [fiscal year] 2009 provides $173 million for entrepreneurs-from big companies or small ones-to develop commercial transport capabilities. . . [and] NASA is designating $500 million toward the development of this commercial space capability." 2

#### The aff solves orbital debris and decreases collision risks.

**Budhiraia 20** [(Mili, LL.B. candidate 2022 at Faculty of Law, University of Delhi.) “The Menace of Space Debris,” August 30, 2020, https://www.jurist.org/commentary/2020/08/mili-budhiraja-space-debris-india/] TDI

For most of the time India has participated in the space industry, it has played with one hand firmly tied behind its back. But with the introduction of the Self-Reliant India Movement (Aatma Nirbhar Bharat Abhiyaan), private companies hold the baton along with the government organizations to operate in the entire range of space activities. The Indian space industry now has unrivaled possibilities in the sectorial dimensions that constitute the field of space research and exploration. This raises the question of how privatization in the new space economy has increased the threshold of accountability for state actors involved in the operations. As of now, there are 375 private companies all across the globe engaged in the space industry. The privatization of the space industry relies upon the premise that it would lead to the expansion of opportunities to utilize the space. When in the mid-twentieth century the concept of privatization rose to the fore, it was faced with a bitter backlash. The Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, popularly known as the ‘Outer Space Treaty’, was made when the concept of involving commercial entities into the multitude of space operations was not favored. The United States Communication Satellite Act of 1962 provided foundational support to the launch of communication satellites by commercial enterprises, thereby setting the stage for the entry of private players into the industry. But with increasing access to space operations and a growing level of satellite population, the problem of space debris, and the pollution caused due to the congestion of satellites, witnessed a simultaneous growth reaction. Space debris ranges from defunct spacecraft to paint flecks chipped off from wear and tear. A small debris particle of a mere 1 millimeter has the potential to cause catastrophic collisions. Privatization can act as an inducement in a hyper-dependent society banking upon satellite supported technology to launch more satellites into space. The estimate hints upon a possible 1100 satellites launched by the space industry each year by 2025. While satellites provide a broad, interdisciplinary use including human space exploration, meteorology, and climate change to name a few, the situation has the potential to significantly increase space traffic. It calls for a higher level of safety in the orbiting region from the floating debris, which can cause collisions. Astrophysicist Donald J. Kessler predicted that the debris in the Lower Earth Orbit (LEO) would reach a breaking point with an increase in satellite traffic and would start a collision chain reaction. This phenomenon is known as Kessler Syndrome. As a corollary to this phenomenon runs the concept of “Tragedy of the Commons” introduced by Garrett Hardins. The tragedy of commons occurs in a shared-resource system where independent operations motivated by self-interests deplete the shared-resource through their collective action. The increase in space traffic, which subsequently leads to an increase in space debris, can render LEO economically unviable for other participants. The legal framework dealing with the issue of space contamination is insufficient to provide any recourse. The Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space (2007) provides an international instrument of a persuasive nature and therefore, making it obligatory on the state parties is an onerous task. Article VI of the Outer Space Treaty imposes an international responsibility on the states, and Article VII renders a state party internationally liable to other states for any harm caused due to their operations. Though these provisions address the issues of responsibility in case of ruptures caused at an international level, they do not obligate states to take preventive actions or to remove the harmful agents from the outer space region. Moreover, Article IX of the Outer Space Treaty creates an obligation on the state parties to intimate with other members of the “potentially harmful activities”, but because the release of pollution is a recurrent phenomenon, the law cannot be put to good use. Article I of the Convention on International Liability for Damage Caused by Space Objects (Liability Convention) does not even cover environmental harm under the definition of damage. It exhibits the temperament of organizations on addressing the issues of environmental safety. The academic debate over the tackling of this issue has steered into the arena of taxation. A study has suggested that the problem of space debris can be controlled by levying “Orbit Tax”. The concept of Orbit Tax or Orbital Use Fees (OUF) stems from the Pigouvian Tax System proposed by the economist, Arthur Pigou. The Pigouvian tax was assessed on activities that adversely affect societal interests. The carbon tax which is assessed on the emission of greenhouse gasses illustrates the nature of this taxation system and the jurisprudence behind it. But as the question stands, is the employing of Orbit Tax an effective solution to curb the menace of space pollution? The answer cannot be in a binary nature. The implementation of the OUF requires global participation of the state actors who are involved in the space industry. Harmonious participation could only be ensured with the consensus reached among the state parties on the rate of taxation proposed, the criteria of assessing tax, etc. The Carbon Tax, a form of pollution tax, was implemented under the United Nations Framework Convention on Climate Change. It has witnessed significant participation and changes brought about in the municipal laws of many state members. But there has been a difference in the rate of taxation among the states which convolutes its implementation. Such disparities cannot be allowed to persist in the OUF model adopted for space debris taxation. Even if a presumption is accepted that Orbit Tax will be efficient in controlling the space debris release, the issue of the increased cost of operating satellites can result in a subsequent increase in the cost of providing satellite services. This can have an adverse impact on economically backward countries which are dependent on other state parties for launch and other satellite operations. Moreover, this does not provide an ultimate solution to eliminate the greater risk that debris causes. A better solution would be to motivate states to deploy efficient satellite infrastructure with a lower depletion rate. Instead of increasing the overall cost of a satellite through haphazard taxation measures, the satellite infrastructure shall be made more efficient. The goal should be of sustainable use of the resources. With the growing privatization of the Space Industry, the responsibility in outer space requires prompt actions. There is a need for international agreements of a binding nature to increase the threshold of accountability of member states to ensure a sustainable orbital domain. While increased participation of commercial enterprises is expounded as an economically growing feature of a country, the liability involved with the enlargement of the opportunity base cannot be side-lined. A legal framework has to be structured at both the international and national level to respond to the international responsibility laid down in Article VI of the Outer Space Treaty. Since the Outer Space Treaty is limited in its jurisdiction to state-sponsored activities, there is a need for an international instrument governing the operations of private players. The delay in employing environmental measures has significantly impacted the atmospheric make-up. The same temperament showcased for this issue could bring Kessler Syndrome to life.