## FWK

#### I value justice due to the word “unjust” in the resolution.

#### My value criterion is utilitarianism, or maximizing the greatest good for the greatest number

#### The constitutive obligation of the state is to protect citizen interest, which means that to be just, states must operate in a utilitarian manner

**Goodin 95** (Robert E. Goodin. Philosopher of Political Theory, Public Policy, and Applied Ethics. Utilitarianism as a Public Philosophy. Cambridge University Press, 1995. p. 26-7)

The great adventure of utilitarianism as a guide to public conduct is that it avoids gratuitous sacrifices, it ensures as best we are able to ensure in the uncertain world of public policy-making that policies are sensitive to people’s interests or desires or preferences. The great failing of more deontological theories, applied to those realms, is that they fixate upon duties done for the sake of duty rather than for the sake of any good that is done by doing one’s duty. Perhaps it is permissible (perhaps it is even proper) for private individuals in the course of their personal affairs to fetishize duties done for their own sake. It would be a mistake for public officials to do likewise, not least because it is impossible. The fixation on motives makes absolutely no sense in the public realm, and might make precious little sense in the private one even, as Chapter 3 shows. The reason public action is required at all arises from the **inability o**f uncoordinated **individual action to achieve** certain morally **desirable ends**. Individuals are rightly excused from pursuing those ends. The inability is real; the excuses, perfectly valid. But libertarians are right in their diagnosis, wrong in their prescription. That is the message of Chapter 2. The same thing that makes those excuses valid at the individual level – the same thing that relieves individuals of responsibility – makes it morally incumbent upon individuals to organize themselves into collective units that are **capable of acting where** they as isolated **individuals are no**t. When they organize themselves into these collective units, those collective deliberations inevitably take place under very different circumstances and their conclusions inevitably take very different forms. Individuals are morally required to operate in that collective manner, in certain crucial respects. But they are practically circumscribed in how they can operate, in their collective mode. And those special constraints characterizing the public sphere of decision-making give rise to the special circumstances that make utilitarianism peculiarly apt for public policy-making, in ways set out more fully in Chapter 4. Government house utilitarianism thus understood is, I would argue, a uniquely defensible public philosophy.

#### Utilitarianism is axiomatically true - all value stems from experienced wellbeing

**Harris 10** Sam Harris 2010. CEO Project Reason; PHD UCLA Neuroscience; BA Stanford Philosophy.  The Moral Landscape: How Science Can Determine Human Values.”

I believe that we will increasingly understand good and evil, right and wrong, in scientific terms, because moral concerns translate into facts about how our thoughts and behaviors affect the well-being of conscious creatures like ourselves. If there are facts to be known about the well-being of such creatures—and there are—then there must be right and wrong answers to moral questions. Students of philosophy will notice that this commits me to some form of moral realism (viz. moral claims can really be true or false) and some form of consequentialism viz. the rightness of an act depends on how it impacts the well-being of conscious creatures). While moral realism and consequentialism have both come under pressure in philosophical circles, they have the virtue of corresponding to many of our intuitions about how the world works. Here is my (consequentialist) starting point: **all questions of value** (right and wrong, good and evil, etc.) **depend upon** the possibility of **experiencing** such **value**. Without potential consequences at the level of experience—happiness, suffering, joy, despair, etc. —all talk of value is empty. Therefore, to say that an act is morally necessary, or evil, or blameless, is to make (tacit) claims about its consequences in the lives of conscious creatures (whether actual or potential).I am unaware of any interesting exception to this rule. Needless to say, if one is worried about pleasing God or His angels, this assumes that such invisible entities are conscious (in some sense) and cognizant of human behavior. It also generally assumes that it is possible to suffer their wrath or enjoy their approval, either in this world or the world to come. Even within religion, therefore, consequences and conscious states remain the foundation of all values.

#### Evaluate the debate through comparative worlds: that means look at the two worlds where private entities either can or cannot appropriate space and decide which one is more just – this is key to evaluating consequences of

## Contention 1 is Mining

#### Commercial asteroid mining is coming now – lower costs and improving tech make it economically viable – and the legal basis is already in place in multiple countries– that helps acquire water for rocket fuel and rare earth metals

Gilbert, PhD student in space resources at the Colorado School of Mines, writes in 21 alex gilbert, is a complex systems researcher and a PhD student in space resources at the Colorado School of Mines. "Mining in Space Is Coming." Milken Institute Review, April 26, 2021, [www.milkenreview.org/articles/mining-in-space-is-coming](http://www.milkenreview.org/articles/mining-in-space-is-coming). [Quality Control]

Space exploration is back. after decades of disappointment, a combination of better technology, falling costs and a rush of competitive energy from the private sector has put space travel front and center. indeed, many analysts (even some with their feet on the ground) believe that commercial developments in the space industry may be on the cusp of starting the largest resource rush in history: mining on the Moon, Mars and asteroids.

While this may sound fantastical, some baby steps toward the goal have already been taken. Last year, NASA awarded contracts to four companies to extract small amounts of lunar regolith by 2024, effectively beginning the era of commercial space mining. Whether this proves to be the dawn of a gigantic adjunct to mining on earth — and more immediately, a key to unlocking cost-effective space travel — will turn on the answers to a host of questions ranging from what resources can be efficiently.

As every fan of science fiction knows, the resources of the solar system appear virtually unlimited compared to those on Earth. There are whole other planets, dozens of moons, thousands of massive asteroids and millions of small ones that doubtless contain humungous quantities of materials that are scarce and very valuable (back on Earth). Visionaries including Jeff Bezos imagine heavy industry moving to space and Earth becoming a residential area. However, as entrepreneurs look to harness the riches beyond the atmosphere, access to space resources remains tangled in the realities of economics and governance.

Start with the fact that space belongs to no country, complicating traditional methods of resource allocation, property rights and trade. With limited demand for materials in space itself and the need for huge amounts of energy to return materials to Earth, creating a viable industry will turn on major advances in technology, finance and business models.

That said, there’s no grass growing under potential pioneers’ feet. Potential economic, scientific and even security benefits underlie an emerging geopolitical competition to pursue space mining. The United States is rapidly emerging as a front-runner, in part due to its ambitious Artemis Program to lead a multinational consortium back to the Moon. But it is also a leader in creating a legal infrastructure for mineral exploitation. The United States has adopted the world’s first spaceresources law, recognizing the property rights of private companies and individuals to materials gathered in space.

However, the United States is hardly alone. Luxembourg and the United Arab Emirates (you read those right) are racing to codify space-resources laws of their own, hoping to attract investment to their entrepot nations with business-friendly legal frameworks. China reportedly views space-resource development as a national priority, part of a strategy to challenge U.S. economic and security primacy in space. Meanwhile, Russia, Japan, India and the European Space Agency all harbor space-mining ambitions of their own. Governing these emerging interests is an outdated treaty framework from the Cold War. Sooner rather than later, we’ll need new agreements to facilitate private investment and ensure international cooperation.

What’s Out There

Back up for a moment. For the record, space is already being heavily exploited, because space resources include non-material assets such as orbital locations and abundant sunlight that enable satellites to provide services to Earth. Indeed, satellite-based telecommunications and global positioning systems have become indispensable infrastructure underpinning the modern economy. Mining space for materials, of course, is another matter.

In the past several decades, planetary science has confirmed what has long been suspected: celestial bodies are potential sources for dozens of natural materials that, in the right time and place, are incredibly valuable. Of these, water may be the most attractive in the near-term, because — with assistance from solar energy or nuclear fission — H2O can be split into hydrogen and oxygen to make rocket propellant, facilitating in-space refueling. So-called “rare earth” metals are also potential targets of asteroid miners intending to service Earth markets. Consisting of 17 elements, including lanthanum, neodymium, and yttrium, these critical materials (most of which are today mined in China at great environmental cost) are required for electronics. And they loom as bottlenecks in making the transition from fossil fuels to renewables backed up by battery storage.

#### However, the legal framework that strikes the best balance of providing economic incentives for mining while preventing unbeneficial land claims requires a doctrine of appropriation – the plan prevents that

Meyers 15 Meyers, Ross. J.D. candidate at the University of Oregon Law School. "The doctrine of appropriation and asteroid mining: incentivizing the private exploration and development of outer space." Or. Rev. Int'l L. 17 (2015): 183. Italics in original. [Quality Control]

The doctrine of appropriation is a reasonable rule for adjudicating asteroid claims, and it could easily be modified to apply to asteroid mining. In the context of water rights, the doctrine of appropriation requires that the claimant be a landowner in order to claim the right to use a water source. It does not make sense, however, for the international community to grant complete ownership over asteroids toa single entity, so the landowner requirement of the rule should be removed. A similar modification would need to be made to the "beneficial use" language of the doctrine.

In the context of water rights, an appropriator obtains rights only to water that he or she can reasonably put to beneficial use. The metals contained in asteroids have a high level of marketability. For that reason, a mining entity could potentially put any amount of obtained metal to beneficial use, in the sense that the resources can be sold. This, however, would defeat the purpose of the rule, which is to limit such unreasonable claims. To ameliorate this problem, the doctrine of appropriation could be modified to define "beneficial use "constructively by providing that beneficial use is assumed for any resources that have been removed from the asteroid that the mining entity can reasonably hope to transport to market in a return journey. With the astronomical cost of undertaking a trip to such an asteroid, this modification would limit mining entities to only what they can carry back, thereby leaving the untapped resources available to other entities capable of making the same trip. Considering the size and profitability of metal deposits on asteroids, this modification to the doctrine of appropriation would not be overly burdensome to corporate interests. At the same time, it would satisfy the economic imperative of promoting the rapid development of asteroid resources.

By changing the landowner requirement, and qualifying the “beneficial use" language, the doctrine of appropriation would be essentially ready for application to asteroid mining claims. The only other changes necessary would be some additional requirements that are common to other space related provisions, like those found in the Outer Space Treaty of 1968. For example, a reporting requirement or clause guaranteeing asylum for other astronauts. A functional rule might read something like this:

*State parties or private entities may, upon actual possession, lay claim to natural resources found on or below the surface of asteroids. Rights to appropriate are given in order of seniority, starting with the first party to land on the surface of the asteroid and establish control over the resources, be it water, methane, metal, or any other beneficial substances. A party will be said to have established control over a resource once he has mined the substance and removed it from the asteroid. A senior appropriator may use as much of the asteroid's resources as he can take from the asteroid and put to beneficial use, and may continue to enlarge his share until another junior appropriator begins to appropriate resources from source for beneficial use. For the purposes of this Agreement, "beneficial use “refers to the amount of resources that an appropriator has removed from the asteroid that the actor may reasonably hope to bring home in a return voyage. Resources in excess of what an appropriator can reasonably hope to transport to market in a single voyage do not qualify as having a beneficial use, and are therefore not yet claimed. This means that the extraction of metal from an asteroid does not serve to provide ownership if the appropriator plans on letting the resources languish until another voyage is undertaken to secure the resources and bring them back to Earth. Junior appropriators receive rights in the source of resources (the asteroid) as they find it, and may prevent the senior appropriator from enlarging his share to the junior appropriator’s detriment under a no-injury rule. No state party will attempt to hinder other parties from landing on or using the asteroid, and parties will assist other entities on an asteroid, should they need emergency assistance. Mining claims on asteroids will be reported to the Secretary-General of the United Nations, and state parties agree to release the location of the asteroid, and any scientific findings to the United Nations, the general public, and the scientific community. In the event that the asteroid is on a collision course with any other celestial body, all state parties agree to follow the course of action suggested by the United Nations. Should the United Nations decide the asteroid must be destroyed, no state party may claim liability for resources contained within the asteroid, but not yet captured. This provision applies only to asteroids as classified by the scientific community, and does not apply to planets, comets, meteorites, or any other celestial body not mentioned.*

There is no doubt that asteroids may be extremely beneficial to mankind, both as a source of resources and as a jumping-off point to far off locations in space. The human-race has progressed scientifically and technologically to the point that space travel is within commercial reach, and the need for new international laws governing the ownership of space has never been more apparent. The Outer Space Treaty of 1968made great strides in developing rational rules for space and many of its provisions should be maintained in their original form. However, by allowing ownership of asteroids under the doctrine of appropriation, the international community can incentivize the exploration and development of space in a way that reflects the needs of society in general, without vesting an absolute monopoly in a single entity. The doctrine of appropriation helped drive American westward expansion, and its application to space mining would help drive the human race in its expansion into the space, the final frontier.

#### Asteroid mining offsets terrestrial growth that ruins the environment and enables solar power satellites – both solve climate change

Taylor 19 Chris Taylor is a veteran journalist. Previously senior news writer for Time.com a year later. In 2000, he was named San Francisco bureau chief for Time magazine. He has served as senior editor for Business 2.0, West Coast editor for Fortune Small Business and West Coast web editor for Fast Company. Chris is a graduate of Merton College, Oxford and the Columbia University Graduate School of Journalism. "How asteroid mining will save the Earth — and mint trillionaires." Mashable, 2019, mashable.com/feature/asteroid-mining-space-economy. [Quality Control]

The mission is essential, Joyce declares, to save Earth from its major problems. First of all, the fictional billionaire wheels in a fictional Nobel economist to demonstrate the actual truth that the entire global economy is sitting on a mountain of debt. It has to keep growing or it will implode, so we might as well take the majority of the industrial growth off-world where it can’t do any more harm to the biosphere.

Secondly, there’s the climate change fix. Suarez sees asteroid mining as the only way we’re going to build solar power satellites. Which, as you probably know, is a form of uninterrupted solar power collection that is theoretically more effective, inch for inch, than any solar panels on Earth at high noon, but operating 24/7. (In space, basically, it’s always double high noon).

The power collected is beamed back to large receptors on Earth with large, low-power microwaves, which researchers think will be harmless enough to let humans and animals pass through the beam. A space solar power array like the one China is said to be working on could reliably supply 2,000 gigawatts — or over 1,000 times more power than the largest solar farm currently in existence.

“We're looking at a 20-year window to completely replace human civilization's power infrastructure,” Suarez told me, citing the report of the Intergovernmental Panel on Climate Change on the coming catastrophe. Solar satellite technology “has existed since the 1970s. What we were missing is millions of tons of construction materials in orbit. Asteroid mining can place it there.”

The Earth-centric early 21st century can’t really wrap its brain around this, but the idea is not to bring all that building material and precious metals down into our gravity well. Far better to create a whole new commodities exchange in space. You mine the useful stuff of asteroids both near to Earth and far, thousands of them taking less energy to reach than the moon. That’s something else we’re still grasping, how relatively easy it is to ship stuff in zero-G environments.

#### Environmental destruction is profoundly unjust – prioritize environmental justice over primarily human concerns

Cafaro 14 Dr. Philip Cafaro (philip.cafaro@colostate.edu) is Professor of Philosophy at Colorado State University, an affiliated faculty member with CSU's School of Global Environmental Sustainability and Book Review Editor of Elsevier's Biological Conservation journal. His main research interests are in environmental ethics, consumption and population issues, and wild lands preservation. He is the author of Thoreau's Living Ethics and Life on the Brink: Environmentalists Confront Overpopulation, among other books. Dr. Richard B. Primack (primack@bu.edu) is Professor of Biology at Boston University [go terriers!] and Editor-in-Chief of Biological Conservation, an Elsevier journal focusing on the protection of biodiversity. His research concerning the effects of climate change on the plants and animals of Massachusetts is the focus of a new book coming out in March titled Walden Warming: Climate Change Comes to Thoreau's Woods. "Species extinction is a great moral wrong." Elsevier Connect, 12 Feb. 2014, [www.elsevier.com/connect/species-extinction-is-a-great-moral-wrong](http://www.elsevier.com/connect/species-extinction-is-a-great-moral-wrong). [Quality Control]

Extinguishing species through the continued expansion of human economic activities appears to be morally acceptable to Kareiva, Marvier and some other Anthropocene proponents, as long as this destruction does not harm people themselves. But this view is selfish and unjust. Human beings already control more than our fair share of Earth's resources. If increased human population and economic demands threaten to extinguish the polar bear and many other species, then we need to limit our population and economic demands, not make excuses that will just lead to greater ecological damage.

Conservation biologists, with our knowledge and appreciation of other species, are the last people who should be making excuses for their displacement or making light of their extinction. It is particularly inappropriate for Peter Kareiva to do so, given his position as chief scientist at the Nature Conservancy, an organization dedicated to preserving biodiversity. TNC's fundraising rests in part on appeals to a strong and widely shared moral view that other species have a right to continued existence. Much of the conservation value of TNC's easements and land purchases depends on society-wide moral and legal commitments to preserve threatened and endangered species and their habitats. Kareiva and Marvier state that they "do not wish to undermine the ethical motivations for conservation action," or presumably, conservation law. Yet their articles do precisely that, with potentially disastrous implications for practical conservation efforts, particularly in the long term.

To be clear: We do not think there is anything wrong with people looking after our own legitimate needs. This is an important aspect of conservation. Kareiva and Marvier are right to remind us that protecting ecosystem services for human beings is important. They are right that concern for our own wellbeing can sometimes motivate significant biodiversity preservation. We believe that people should preserve other species both for their sakes and for ours.

But it is a mistake to reduce conservation solely to concern for our own well-being, or to assume that it is acceptable to extinguish species that do not benefit humans. Such an overly economistic approach to conservation leads us astray morally. It makes us selfish, which is the last thing we want when the very existence of so many other life forms is at stake. Fairly sharing the lands and waters of Earth with other species is primarily a matter of justice, not economic convenience.

## Case

#### Contention two has no inherency: the OST already prohibits space mining

Bhattacharya 18 [Kriti Bhattacharya, National University of Juridical Sciences, West Bengal, India.] “The Viability of Space Mining in the Current Legal Regime” Astropolitics The International Journal of Space Politics & Policy Volume 16, 2018 - Issue 3 (https://doi.org/10.1080/14777622.2018.1536858)

Several private players have expressed their desire to mine resources in space. This posits ethical and legal concerns. Several scholars argue that space mining activities flout the national non-appropriation principle enshrined in Article II of the Outer Space Treaty. However, it is the opinion of the author that space mining does not per se violate the provisions of Article II, though space mining brings forward other concerns of breach of cooperation and environmental damage. The current legal regime is not adequately equipped to address these problems. The national legislations of several countries which allow for space mining do not address these issues. Even though an international regime emulating deep seabed mining addresses some of these concerns, the current political structure is not in favor of such a development. Hence, the legal viability of any potential space mining industry is on tenuous terms.

#### 1] Probability – 0.1% chance of a collision.

Salter 16

Alexander William Salter, Economics Professor at Texas Tech, ’16, “SPACE DEBRIS: A LAW AND ECONOMICS ANALYSIS OF THE ORBITAL COMMONS” 19 STAN. TECH. L. REV. 221 \*numbers replaced with English words

The probability of a collision is currently low. Bradley and Wein estimate that the maximum probability in LEO of a collision over the lifetime of a spacecraft remains below one in one thousand, conditional on continued compliance with NASA’s deorbiting guidelines.3 However, the possibility of a future “snowballing” effect, whereby debris collides with other objects, further congesting orbit space, remains a significant concern.4 Levin and Carroll estimate the average immediate destruction of wealth created by a collision to be approximately $30 million, with an additional $200 million in damages to all currently existing space assets from the debris created by the initial collision.5 The expected value of destroyed wealth because of collisions, currently small because of the low probability of a collision, can quickly become significant if future collisions result in runaway debris growth.

#### 2] Time frame – Kessler effect 200 years away.

Stubbe 17

Peter Stubbe, PhD in law @ Johann Wolfgang Goethe University Frankfurt, ’17, State Accountability for Space Debris: A Legal Study of Responsibility for Polluting the Space Environment and Liability for Damage Caused by Space Debris, Koninklijke Brill Publishing, ISBN 978-90-04-31407-8, p. 27-31

The prediction of possible scenarios of the future evolution of the debris p o p ulation involves many uncertainties. Long-term forecasting means the prediction of the evolution of the future debris environment in time periods of decades or even centuries. Predictions are based on models84 that work with certain assumptions, and altering these parameters significantly influences the outcomes of the predictions. Assumptions on the future space traffic and on the initial object environment are particularly critical to the results of modeling efforts.85 A well-known pattern for the evolution of the debris population is the so-called Kessler effect’, which assumes that there is a certain collision probability among space objects because many satellites operate in similar orbital regions. These collisions create fragments, and thus additional objects in the respective orbits, which in turn enhances the risk of further collisions. Consequently, the num ber of objects and collisions increases exponentially and eventually results in the formation of a self-sustaining debris belt aroundthe Earth. While it has long been assumed that such a process of collisional cascading is likely to occur only in a very long-term perspective (meaning a time 1 n of several hundred years),87 a consensus has evolved in recent years that an uncontrolled growth of the debris population in certain altitudes could become reality much sooner.88 In fact, a recent cooperative study undertaken by various space agencies in the scope of i a d c shows that the current l e o debris population is unstable, even if current mitigation measures are applied. The study concludes: Even with a 90% implementation of the commonly-adopted mitigation measures [...] the l e o debris population is expected to increase by an average of 30% in the next 200 years. The population growth is primarily driven by catastrophic collisions between 700 and 1000 km altitudes and such collisions are likely to occur every 5 to 9 years.89

#### 3] Status quo solves – mitigation and remediation compliance is growing

Colombo et. al 18—Camilla Colombo, PhD, visiting academic in Spacecraft Engineering within Engineering and Physical Sciences at the University of Southampton; Francesca Letizia, PhD, Space Debris Engineer at ESA Space Debris Office; Mirko Trisolini, PhD, Postdoctoral researcher at the Politecnico di Milano Department of Aerospace Engineering; Hugh Lewis, PhD, Professor within Engineering and Physical Sciences at the University of Southampton (“Space Debris: Risk Mitigation,” from Frontiers of Space Risk: Natural Cosmic Hazards & Societal Challenges, Chapter 5, p 128-136)

5.4 MITIGATION MEASURES The space debris problem is nowadays internationally recognized, therefore mitigation measures are being taken and guidelines discussed. These can be divided into two classes: The avoidance or protection measures and the active and passive debris removal measures. The avoidance or protection measures include the design of satellites to withstand impacts by small debris, or the selection of safe procedures for operational spacecraft such as orbits with less debris, specific attitude configurations, or implementing active avoidance maneuvers to avoid collisions. On the other hand, measures for debris removal currently consist in limiting the creation of new debris (by prevention of in-orbit explosions and ensuring spacecraft subsystems reliability), to free some orbital implementing end-of-life disposal maneuvers protected regions, or to reenter in the atmosphere. Active debris removal is also being considered as a mean to stabilize the growth of space debris by removing from orbit some selected noncompliant objects. The e.Deorbit mission will target an ESA-owned derelict satellite in low orbit, capture it with a net or robotic arm technology, and reenter with a controlled atmospheric reentry (Biesbroek et al. 2014). Acknowledging the fact that the projected growth in the number of satellites orbiting the Earth will increase in the future, space agencies and international organizations have been discussing and building a set of guidelines to ensure the sustainability of future space activities. The InterAgency Debris Coordination Committee (IADC) was founded in 1993 by ESA (Europe), NASA (the United States), the Japan Aerospace Exploration Agency (JAXA, Japan), and the Roscosmos Russian Federation. As of January 2017, the IADC also includes the Italian Space Agency (ASI, Italy), the Centre National d'Études Spatiales (CNES, France), the China National Space Administration (CNSA, China), the Canadian Space Agency (CSA, Canada), the German Aerospace Centre (DLR, Germany), the Korea Aerospace Research Institute (KARI, South Korea), the Indian Space Research Organisation (ISRO, India), the National Space Agency of Ukraine (NSAU, Ukraine), and the UK Space Agency (UKSA, United Kingdom). This international cooperation decided a set of space debris mitigation measures (Inter-Agency Space Debris Coordination Commitee, 2002), which includes: 1. Limitation of debris released during normal operations. 2. Minimization of the potential for on-orbit breakups (resulting from stored energy after the completion of mission operations, or during the operational phases of the mission and by avoiding intentional destruction and other harmful activities). 3. Post Mission Disposal in particular in geosynchronous regions and for objects passing through the LEO region. 4. Prevention of on-orbit collisions. The IADC guidelines were presented to the United Nations Committee on the Peaceful Uses of Outer Space (UN COPUOS) and contributed to the creation of the Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space to be considered for the mission planning, design, manufacture and operational phases of spacecraft and launch vehicle orbital stages” (United Nations Office for Outer Space Affairs 2010): 1. Limit debris released during normal operations. 2. Minimize the potential for breakups during operational phases. 3. Limit the probability of accidental collision in orbit. 4. Avoid intentional destruction and other harmful activities. 5. Minimize potential for post-mission breakups resulting from stored energy 6. Limit the long-term presence of spacecraft and launch vehicle orbital stages in the low Earth orbit region after the end of their mission. 7. Limit the long-term interference of spacecraft and launch vehicle orbital stages with the geosynchronous region after the end of their mission. 5.4.1 Mitigation Guidelines for Post Mission Disposal In this section we focus on the third of the measures dictated by the IADC, namely Post Mission Disposal. A “25-year rule” was defined to limit the presence of satellites

#### Rockets are less than 1 in ten million of emissions

Brown 21 — (Mike Brown, Mike Brown is a London-based journalist who covers innovation at Inverse. He is the author of Musk Reads, a regular newsletter that focuses on electric cars, space exploration, clean energy, and everything in-between. Mike holds a BA in English from Queen Mary, University of London, and an MS in journalism from Columbia Journalism School. His work has featured in CityMetric, International Business Times, Neowin.net, Building Magazine, and more. He has also made guest appearances on CBC Radio, Cheddar, Good Day New York, Trailblazers, and more. , “Are space rockets bad for the Earth? Why the question ignores an important truth“, Inverse, 11-23-2021, Available Online at https://www.inverse.com/innovation/are-rockets-environmentally-friendly, accessed 1-15-2022, HKR-AR)

Current rocket launches have a negligible effect on total carbon emissions — Everyday Astronaut found they accounted for 0.0000059 percent of global carbon emissions in 2018, while the airline industry produced 2.4 percent the same year. But the long-term effect is less clear, especially as companies like SpaceX move from hosting 26 launches in a year to 1,000 launches per rocket in a year. “I think we can guess that rockets won't be a huge impact on the environment, and they probably won't stand out as a sole source of new problems,” Darin Toohey, professor at the University of Colorado Boulder’s Atmospheric and Ocean Sciences, tells Inverse. “But they will add to the growing list of activities that have negative impacts on the environment.”