## OFF

### NC – T

#### “Appropriation of outer space” is exclusive and permanent

TIMOTHY JUSTIN TRAPP, JD Candidate @ UIUC Law, ’13 quoting Smith 92, TAKING UP SPACE BY ANY OTHER MEANS: COMING TO TERMS WITH THE NONAPPROPRIATION ARTICLE OF THE OUTER SPACE TREATY UNIVERSITY OF ILLINOIS LAW REVIEW [Vol. 2013 No. 4]

The issues presented in relation to the nonappropriation article of the Outer Space Treaty should be clear.214 The ITU has, quite blatantly, created something akin to “property interests in outer space.”215 It allows nations to exclude others from their orbital slots, even when the nation is not currently using that slot.216 This is directly in line with at least one definition of outer-space appropriation.217 [\*\*Start Footnote 217\*\*Id. at 236 (“Appropriation of outer space, therefore, is ‘the exercise of exclusive control or exclusive use’ with a sense of permanence, which limits other nations’ access to it.”) (quoting Milton L. Smith, The Role of the ITU in the Development of Space Law, 17 ANNALS AIR & SPACE L. 157, 165 (1992)). \*\*End Footnote 217\*\*]The ITU even allows nations with unused slots to devise them to other entities, creating a market for the property rights set up by this regulation.218 In some aspects, this seems to effect exactly what those signatory nations of the Bogotá Declaration were trying to accomplish, albeit through different means.219

#### Violation: the non-Appropriation principle does not apply to resource extraction. International consensus and rejection of the Moon Treaty support the distinction between sovereign ownership and resource extraction

Wrench 19 [John, JD Candidate at Case Western, BA from Pace University] “Non-Appropriation, No Problem: The Outer Space Treaty Is Ready for Asteroid Mining,” Case Western Reserve Journal of International Law, Vol. 51 Issue 1, <https://scholarlycommons.law.case.edu/cgi/viewcontent.cgi?article=2546&context=jil>, 2019 RE

An interpretation of Article II supporting a blanket ban on resource ownership is unwarranted by the text of the OST and illfounded on account of the international community’s common practices. Scholars have noted that the international community has never questioned whether scientific samples harvested from celestial bodies belong to the extracting nation.60 Furthermore, space-faring members of the international community rejected the Moon Treaty precisely because it prohibited all forms of ownership in resources extracted from celestial bodies.61 The space-faring nations’ support for the OST, coupled with their rejection of an alternative set of rules governing extracted resources, is at the very least an indication of what those nations believe the non-appropriation principle to stand for.

It is equally improbable that the international community drafted the non-appropriation principle to be merely idealistic rhetoric. The OST leaves no room for interpretations to squirm out from under its ban on sovereign claims of land.62 The following section illustrates, however, that the distinction between sovereign ownership of land, and the vestment of property rights in resources extracted from that land, is nothing new.

#### Prefer:

#### 1] Precision--analogous treaties prove

Wrench 19 [John, JD Candidate at Case Western, BA from Pace University] “Non-Appropriation, No Problem: The Outer Space Treaty Is Ready for Asteroid Mining,” Case Western Reserve Journal of International Law, Vol. 51 Issue 1, <https://scholarlycommons.law.case.edu/cgi/viewcontent.cgi?article=2546&context=jil>, 2019 RE

Although the OST does not provide a comprehensive guideline for resource extraction in outer space, its foundational logic provides a workable distinction between ownership and use. This part explores three property regimes developed under the same fundamental constraints as the non-appropriation principle: the United Nations Convention on the Law of the Sea (“UNCLOS”), the Antarctica Treaty System, and the prior appropriation doctrine as applied in United States water law.63 Under each regime, parties may establish some form of ownership in extracted resources despite being restricted from claiming sovereignty over the underlying land.

#### Consensus of the literature votes neg—means our interp is most predictable

Tronchetti 10 [Fabio, Co-Director of the Institute of Space Law and Strategy and as a Zhuoyue Associate Professor at Beihang University, PhD in International Space Law from Leiden University] “The Moon Agreement in the 21st Century: Addressing its Potential Role in the Era of Commercial Exploitation of the Natural Resources of the Moon and Other Celestial Bodies,” Journal of Space Law, Vol. 36 No. 2, Winter 2010, <https://airandspace.confit.dev/pdfs/jsl-36-2.pdf> RE

A key issue, which is not directly addressed by the Treaty and which is of fundamental relevance for the present discussion, concerns the use of outer space resources. In this respect, the main question is whether or not the prohibition on appropriation of outer space is also applicable to its resources. No clear-cut answer can be provided based on the current legal framework. While some authors express the view that the restriction in Article II applies equally to outer space and its resources,28 others, the majority, argue that by analogy with the rules regulating the freedom of the high seas,29 the appropriation of space resources merely forms part of the freedom of exploration and use of outer space.30 This paper shares the opinion of the second group of authors.

#### 2] limits and ground: expanding the topic beyond appropriation allows for affs about any miniscule use of space resources which decimates links to generics which are based on property rights in space and results in a litany of small affirmatives that cause a race to the margins

#### Topicality is a voting issue that should be evaluated through competing interpretations – it tells the negative what they do and do not have to prepare for—there’s no way for the negative to know what constitutes a “reasonable interpretation” when we do prep – reasonability is arbitrary and causes a race to the bottom, proliferating abuse

#### No RVIs—it’s your burden to be topical.

## OFF

### NC – K [Long]

#### Their use of an ethical frame of “injustice” presumes a metaphysics of discrete individuals for injustice to be acted by and on – that’s both conceptually incorrect and leads us to egoistic violence

**Carpenter 17** Carpenter, Amber, works in ancient Greek and classical Indian philosophy, with a topical focus on the metaphysics, epistemology and moral psychology underpinning Plato’s ethics and Indian Buddhist ethics, taught or held visiting research appointments at the University of York, St Andrews, Cornell, Oxford, the University of Melbourne and Yale University. BA (Yale), PhD (Kings College London). "Ethics without Justice." A Mirror Is for Reflection: Understanding Buddhist Ethics (2017).

This study in the Buddhist claim that **we ought to eliminate anger**, and the distinctively Buddhist mode of doing so, has shown that the **link between injustice and ange**r presumes a **metaphysics**. The moral perspective that picks out injustice as a special and additional kind of harm requires a **metaphysics of discrete individuals,** **doing and “being done t**o” in turn, with a **clear distinction between the two**. But such a metaphysics and its moral categories engender in turn certain typical modes of thought—in particular, obsessing about Who is to Blame. Particularly in our victim-status-claiming age, we should wonder **whether this is especially fruitful**—or apt.

The Buddhist cannot show that their view will confirm or conform to all our intuitions about injustice because their basic metaphysical presumptions do not support the centrality of autonomous agency as a distinctive sort of cause, nor the violation of that by such free agents as a distinctive sort of harm. This is not, however, just an oversight or a morally horrifying omission. The **proposal of an alternative metaphysics** is the proposal of an alternative way of conceiving the moral. For every exercise in appreciating what no-self means, and what its implications are, is simultaneously an **exercise in detachme**nt, in recognizing the **impulse to blame and resent** as **harmful assertions** of oneself over and against others. Removing the conceptual structures for righteous indignation strips our evaluations of situations and persons of its **self-assertiveness**. Rather than being enervating, or blinding us to what moral responsiveness demands, this outlook is resolutely practical. None of this denies the no-self anger-eliminativist the resources necessary for forensics: we can see that some sets of conditions have intentions among them, and we can recognize that under some circumstances, these are more effectively engaged with in modes that differ from how we would engage with a forest fire.30 To regard someone’s raging violence as a forest fire does not mean that we turn the fire hose on it; it means that we consider the enabling conditions and defeating conditions and seek to eliminate the one and enhance the other.31

At the same time, as no-self introduces **fluidity** into our **practices of** individuation, it presents us with the **entangled mutual causation** of all factors and the **simultaneous suffering.** To see no-self, Buddhist-wise, just is to see that everything is conditioned and conditioning. Released from the demands of indignation, we are left with the **only attitude** that is appropriate in the **face of suffering—**a **practically oriented care to relieve that suffering**. Karuṇā is not an additional feature of a Buddhist outlook or the next thing on the list of dogmata. Care just is the **affective** and **practical recognition** of **no-self** metaphysics. Without discrete individuals to appeal to in any situation—these the perpetrators, these the victims—we have **only efficacy** in **removing suffering** as the standard preventing us from nihilism. Where before there were culprits to blame, and myself to exonerate or assert in retaliation, there is now only suffering, for which care to alleviate it is simply what is left when I am **no longer distracted by righteous indignation.**

#### Delusional egoism collapses the biosphere and produces rampant nationalism – extinction

**Loy 17** David R Loy, former Besl Professor of Ethics/Religion and Society at Xavier University, teacher in Sanbo Kyodan Buddhism. M.A. in Asian philosophy from the University of Hawaii in 1975, and Ph.D. in philosophy in 1984 from the National University of Singapore. “Are Humans Special?” Tikkun, Vol. 32, No. 1, Winter 2017, <http://www.davidloy.org/downloads/Loy%20Are%20Humans%20Special.pdf>.

One uniquely human characteristic, emphasized by Buddhism, is that we can develop the ability to **“dis-identify**” from anything and everything, letting go not only of **the individual sense of separate sel**f but also of collective selves: dissociating from dualisms such as patriarchy, nationalism, racism, even species-ism (“we’re human, not lower animals”). Meditation develops such nonattachment, yet the point of such letting-go is not to dissociate from everything but **to realize our nonduality** with everything.

That human beings are the only species (so far as we know) that can know it is a manifestation of the entire cosmos opens up a possibility that may need to be embraced if we are to survive the crises that now confront us. Instead of continuing to exploit the earth’s ecosystems for our own supposed benefit, we can choose to work for the **well-being of the whole**. That we are **not separate** from the **rest of the biosphere** makes the whole earth our body, in effect, which implies not only a sp cial understanding but also a special role in response to that realization. As the Metta Sutta declares: “Let one’s thoughts of boundless love pervade the whole world— above, below, and across — without any obstruction, without any hatred, without any enmity.”

To ask whether the universe itself is objectively meaningful or meaningless is to miss the point— as if the universe were outside us, or simply there without us. When we do not erase ourselves from the picture, we can see that we are meaning- makers, the beings by which the universe introduces a new scale of significance and value.

The Responsibility of Being Special

If we are special because of our potential, we must choose. We are free to derive the meaning of our lives from delusions about who we are—from dysfunctional stories about what the world is and how we fit into it—or we can **derive that meaning** from **insight into our nondualit**y with the rest of the world. In either case, there are consequences.

The problem with **basing one’s life on delusions** is that the **consequences** are **unlikely to be good**. As well as producing poetry and cathedrals, our creativity has recently found expression in world wars, genocides, and weapons of mass destruction, to mention a few disagreeable examples. We are in the early stages of an **ecological crisis t**hat threatens the natural and **cultural legacy of future generations**, including a **mass extinction event** that may lead to the disappearance of half the earth’s plant and animal species within a century, according to E. O. Wilson—an extinction event **that may include ourselves.**

What needs to be done so that our extraordinary co-creative powers will promote collective well-being (collective in this case referring to all the ecosystems of the biosphere)? Must we evolve further—not biologically but culturally—in order to survive at all? From a Buddhist perspective our unethical tendencies ultimately derive from a **misapprehension**: the **delusion of a self that is separate from others**, a big mistake for a species **whose well-being is not separate from the well-being of other species**. Insofar as we are ignorant of our true nature, individual and collective self-preoccupation **naturally motivates us to be selfish**. Without the compassion that arises when we feel empathy—not only with other humans, but with the **whole of the biosphere**—it is likely that **civilization** as we know it **will not survive many more generations.**

In either case, we seem fated to be special. If we continue to devastate the rest of the biosphere, we are arguably the worst species on earth: **a cancer of the biosphere**. If, however, humanity can wake up to become its collective bodhisattva—undertaking the long-term task of repairing the rupture between us and Mother Earth—perhaps we as a species will fulfill the unique potential of precious human life.

#### Planetary interdependence uniquely extends into space – the alternative is a shift away from individuation towards a politics of care that recognizes our mutual interdependence

**Gál 20** Réka Gál, PhD student at the Faculty of Information and a Fellow at the McLuhan Centre for Culture and Technology, work unites feminist media theory and postcolonial studies with the history of science and environmental studies and explores how technological tools and scientific methods are employed to purportedly solve socio-political problems. B.A American and Media Studies, Humboldt Universität zu Berlin, M.A Cultural Studies, Humboldt Universität zu Berlin. "Climate Change, COVID-19, and the Space Cabin: A Politics of Care in the Shadow of Space Colonization." mezosfera.org, Oct, 2020, mezosfera.org/climate-change-covid-19-and-the-space-cabin-a-politics-of-care-in-the-shadow-of-space-colonization.

As much as dominant cultural narratives encourage us to entertain the idea that humans stand separate from and above their environments, the planetary crises of climate change and COVID-19 are painful reminders of the ways in which **human and nonhuman ecologies are perpetually entangled.** It is well-known that industrialized human-nonhuman relations, based on the capitalist extraction of what are considered natural resources, stand at the root of numerous environmental problems that are contributing to climate change. Animal industries – specifically the livestock industry – are one of the largest contributors to deforestation, greenhouse gas emission, and species extinctions.17 COVID-19’s believed origins in the Huanan wild animal markets and its eventual spread to humans is further testament to the ways in which our ecologies are always inseparable, with their intertwined nature here manifesting violently towards humans. Moreover, the spread of the coronavirus lays bare how local exploitation of nature can have global repercussions: the wildlife industry in China exists to this day because wildlife is considered a natural resource owned by the state, and the breeding, domestication, and trading of wildlife is encouraged by law.18

What must be made clear to those who are entertaining the idea that space habitats could provide a solution to such crises is that leaving Earth does not render these entanglements null and void. As much as spacecraft have been positioned as examples of subordinating the rules of nature to human control, their material reality only further consolidates the **reciprocity of human and nonhuman**, including human-machine, **relations**. 19 Our dependence on our surroundings intensifies in outer space. The inhospitality of space makes even the most physically fit astronauts dependent on numerous life support systems: oxygen and food supplies, waste management, and humidity control are all technologically operated but require continuous maintenance by humans. As such, ensuring the normal operation of a spacecraft is a relevant analogy for how a **relationship of care** with the **diverse life support systems on Earth could be established**.20

However, governments and private companies have been selling people the dream of human spaceflight ever since the Cold War, and the origins of this project in a **military enterprise** have made a significant mark on its implications for care work. The world of the 1960-70s astronauts was extremely segregated: the popular narrative was that of the hypermasculine astronaut, able to cope with danger and pain without complaint, with a brave wife at home waiting for his return.21 This segregation has had a remarkable impact on the types of work which have been considered “worthy” of these hypermasculine astronauts. In fact, the first American to travel to space, Alan Shepard, explicitly objected to having to learn maintenance techniques. As historian David Mindell put it, “the hottest test pilots didn’t want to be repairmen in space.”22 Similarly, data collected from NASA’s Skylab and the International Space Station’s 4-8 expeditions reveal that the time needed to complete maintenance activities on the Environmental Control and Life Support Systems was vastly underestimated, and in some cases even completely left out of operations plans.23 Even as late as the 2000s, the gendered view of care activities aboard spacecraft persisted: regarding the first female commander of a Space Shuttle, Eileen Collins, NASA made sure that her public persona was level-headed but also “pleasing.” She was referred to as “nice.” She took care of her fellow astronauts on board, taking on emotional labor by “providing support in ways that ease[d] the long hours and tension of training.” Her Air Force nickname was Mom.24

When this article calls for a feminist critique of outer space colonization, the argument is not that banishing technology and returning to a “pristine” nature or some other type of utopian primitivism is going to solve our planetary crises. Nor is it the point that more women need to be hired. What is being critiqued here is what Debbie Chachra has pointed out as a masculinist-capitalist obsession with progress and technological innovation that casts all maintenance, repair, and care work as inferior to creation.25 Much as our current experience of physical isolation during COVID-19 has exhibited, only during breakdowns are such taken-for-granted services made visible anew.26 The privileging of production obscures the societal understanding of the very real relationality of living, and the ongoing care and maintenance work required to keep human life running smoothly both on Earth and in outer space.

Therefore, the problem with extraplanetary colonization is not solely that this escape reinforces an enduring gendered opposition between exit and care, privileging the former over the latter, but also that machines only give the **illusion** of providing humans with **independence** from care work. Orsolya Ferencz, the Hungarian Secretary of Space Affairs, claims that Hungarian machines in outer space do not break down27 but the truth is that machines, just like our “natural” environments, do repeatedly break down. They require maintenance. Humans whose lives are intimately intertwined with technology are all too aware of this. Social scientist Laura Forlano writes about her experience as a diabetic who uses various technologies to monitor and maintain her blood glucose levels: “With respect to my insulin pump and glucose monitor, often, I am not really sure whether I am taking care of them, or they are taking care of me.”28 This interdependence additionally applies to the care for “natural” environments which can be regularly observed, for example, in the relationship of Indigenous communities to the environment. In the Hā’ena community in Hawaii, for instance, not only do they always return some of the fish caught to the water as a way of thanking the ocean, but they also managed to impose a ten-year fishing moratorium around their island in 2019, which will both help the renewal of the ecosystem and the recovery of the immediate environment, allowing future generations to fish sustainably.29 With this moratorium, the Hā’ena are providing care-based, restorative justice: the ocean ecosystem has fallen victim to injustice (overfishing), and remedying this ought to help heal the party wounded by the injustice, which is in this case the ocean.30

The extractive industry practices deeply embedded within Western social systems clearly propel us toward unsustainable development. Escaping Earth will not solve these problems. Rather, the solution requires a **fundamental onto-epistemological shift**, one that will enable us to move **away from the exploitative** Western-**colonialist worldview** and **towards one that prioritizes care and sustainability**. The works of feminist and Indigenous thinkers can inspire us to imagine and understand such a worldview. Numerous pre-colonial Indigenous cultures were sustainability-centric: the acceptance of the reciprocity between humans and their environment and the enforcing of the ethics of care in all areas of life were essential parts of several nations’ worldviews. Indigenous epistemologies see humans and nature as members of an ecological family in which humans, the nonhuman beings around them (for example, badgers, antelopes) and materials (for example, water, clay) all form part of their **kinship structures.**31 In Indigenous cultures that have survived colonization, such teachings and ethical approaches are passed down to this day.32 Research by Potawatomi scholar Kyle P. Whyte and Chris Cuomo demonstrate that Indigenous conceptions of care emphasize the importance of recognizing that humans, nonhumans (animals) and collectives (e.g. forests) exist in networks of interdependence. Indigenous care ethics manifest also in the fact that mutual responsibility is seen as the moral basis of relationships.33 An important part of this mutual responsibility is that care-based justice **is not punishment-centered** but **recovery-centered:** as in the example of the fishing moratorium of the Hā’ena, it seeks to promote restorative justice for those wounded by injustice. This restoration is aimed not only at people and communities, but also at nature.34 Similarly, **an ethics of care** in feminist philosophy treats the **state of interdependence** of human and nonhuman beings **as a moral foundation.35**

Since all infrastructures break, they require continuous maintenance. Information scientist Steven Jackson therefore proposes that the starting point to our thinking on the human relationship to technology has to be a contemplation of “erosion, breakdown, and decay, rather than novelty, growth, and progress.”36 If we accept that our world is “always-almost-falling-apart,”37 then instead of simply focusing on technological innovation as the vessel of our salvation,38 we need to look at the ways in which the world is constantly fixed, cared for, and maintained. This, of course, does not only translate to humans’ relationship to machines, but also to our relationship to our environment –in fact, feminist scholars have already made this point about dealing with our environmental problems: historian of science Donna Haraway’s concept of “staying with the trouble”39 explicitly pleads for the foregrounding of the inherent interconnectedness and interdependence of living, and for working on restoring our broken systems. What we are looking at here is a promising paradigm shift in human-machine and human-nature relations that promotes the recognition that the processes of care and maintenance are foundational to the way humanity relates to our biotic and abiotic environments.40

Both life during the social isolation of COVID-19 and life in the space cabin highlight our perpetual interdependence with our environments. Our life support systems are in a state of continuous decay, but the solution to this is **not building more and more invasive risk-mitigation** machines based on **individualization**, isolation and an **imperative of absolute, one-directional control**. Instead, a better, safer, more sustainable future starts with **acknowledging one’s place in a web of interdependent relationships**.41 Among other steps, this means that instead of acting as though our biotic and abiotic infrastructures can endlessly care for us, we need to care for them in return. This entails not only planting new forests and cleaning up shorelines, but also policy decisions such as the fishing moratorium mentioned above. As anthropologist Gökçe Günel indicates, even the technologies used for the harvesting of renewable energies require maintenance: solar panels, for example, need to be wiped clean of dust and sand regularly.42 Thinking through the lens of maintenance and care also means providing infrastructures for effectively repairing machines as opposed to producing e-waste and continuously buying new ones which are thrown away once a smarter version is released. Additionally, it means respecting and paying theworkers who are cleaning our hospitals, nursing our sick and harvesting food – most of them immigrants, predominantly women43 – better, as they are the reason we have clean hospitals, transport, and food on our tables, even during a global pandemic.44

## OFF

### NC – CP

#### Next off is the Crypto Counterplan:

#### The private appropriation of outer space to create terrestrially accessible blockchain verification computing centers and cryptocurrency mining centers on the Moon and deep space is just.

#### Climate-motivated terrestrial mining regulations kill crypto now – those don’t get applied to space because of unique environments – that saves crypto with sufficient private investment

Greene 21 Greene, Tristan. Tristan covers human-centric artificial intelligence advances, quantum computing, STEM, Spiderman, physics, and space stuff. As far as I can tell his highest level of education was that he was in the Navy for a while. "What happens to Bitcoin when billionaires build cryptocurrency miners on the Moon?" TNW | Hardfork, 8 June 2021, thenextweb.com/news/bitcoin-billionaires-build-cryptocurrency-miners-on-moon-bitcoin.

Space exploration and exploitation have traditionally been nationalist endeavors. But the rise of the 12-digit billionaire has suddenly made outer space look like open territory. The players Jeff Bezos is stepping down from his position as the CEO of Amazon after 25 years ahead of his imminent launch into space aboard one of his own Blue Origin spaceships. This will be the future of fintech 6 trends that will dominate fintech in 2022 While it’s easy to imagine the long-time leader retiring to live out a childhood fantasy, there’s nothing in Bezos’ history as an incredibly ambitious person and businessman to indicate his he’ll just blast off into the sunset to live a life of quiet leisure. Simply put, Bezos’ interest in the space sector likely won’t end with offering consumer thrill rides. While it’s impossible to know where the soon-to-be-former CEO might take his ambition, it’s likely Amazon and/or Blue Origin is already looking for ways to exploit the space sector for profit. But, obviously, Bezos isn’t the only private citizen with a spaceship company. Elon Musk’s SpaceX has spent the last decade becoming the belle of NASA’s ball and he’s already all-in on the idea of sending humans to Mars. And we can’t forget Richard Branson. He may only be worth a paltry $5 billion (lol), but his Virgin Galactic company’s been banking on making some money in space tourism for a long time. Let’s also not forget that Virgin’s dabbled in everything from railroad technology to record labels. And the list goes on. Anyone with a few billion dollars has business options and opportunities that extend beyond our planet’s surface. Space for profit In the past, we’ve discussed the idea of mining space asteroids for profit. Some experts believe there are unimaginable fortunes floating around in space in the form of resource-rich asteroids. In fact, you can even get a degree in asteroid mining. And even Goldman Sachs has considered getting in on the action. But, at the end of the day, we still have to figure out where these resources are, build machines capable of extracting them, and get them safely to somewhere they can be useful. Right now, there’s not much value in investing in asteroid mining futures because the technology either doesn’t exist or isn’t ready yet. However, there’s more than one kind of mining you can do in space. Enter cryptocurrency and the future Elon Musk recently got involved in a friendly space race, but this time it has nothing to do with competition over rockets or government contracts. He’s racing against BitMEX, a cryptocurrency exchange and derivative platform, to see who can get a cryptocurrency on the Moon first. If you’re curious about how that works, here’s a snippet from BitMEX’s official announcement: BitMEX will mint a one-of-a-kind physical bitcoin, similar to the Casascius coins of 2013, which will be delivered to the Moon by Astrobotic. The coin will hold one bitcoin at an address to be publicly released, underneath a tamper-evident hologram covering. The coin will proudly display the BitMEX name, the mission name, the date it was minted and the bitcoin price at the time of minting. According to BitMEX, this isn’t just a ceremonial or token delivery. The coin itself is a hardware wallet containing an actual Bitcoin, so its value will change with the value of the BTC here on Earth. In other words, BitMEX is sending a literal treasure to the Moon for anyone brave (or rich) enough to retrieve it. Per the company’s blog post: A moon surface background with text superimposed, quote below Credit: BitMEX Come and Get It. When the physical coin lands, it will remain on the Moon until anyone deems it worthy of retrieval. Decades from now, what will it be worth? It’s a great question. Some experts have predicted a single bitcoin will one day be worth $100K, $1M, or even more. But an even better question is this: What’s the end game for cryptocurrency in space? Billionaires want to be trillionaires Back in 1999 Wired ran a feature about the imminent rise of the world’s first trillionaire. At the time, everyone assumed the richest man in the world, Microsoft CEO Bill Gates, would be the first trillionaire by a long shot. Here’s a quote from that article: The value of Bill’s Microsoft stake has grown from $233.9 million at the time of Microsoft’s 1986 IPO to $72.2 billion as of June 15, 1999 (disregarding stock sales). At this rate – 58.2 percent a year – he will become a trillionaire in March 2005, at age 49, and his Microsoft holdings will be valued at $1 quadrillion in March 2020, when he is 64. Of course, we still haven’t seen a trillionaire in modern history. As of the time of this writing, the richest person in the world is France’s Bernard Arnault, whose $193.6 billion empire edges out Jeff Bezos’ $189 billion. At some point, if Bezos wants to pull away with it or Elon Musk wants to close the widening gap between his $151.4 billion and a first place finish, the world’s richest people are going to have to do more than squeeze terrestrial markets for every last drop of profit. That’s why many experts view Elon Musk’s heavy involvement in cryptocurrency as the potential difference maker. On any given day the Tesla, SpaceX, and Neuralink founder’s total worth can skyrocket or plummet by tens of billions of dollars based on how his cryptocurrency holdings are performing. When you consider that market movements can be directly tied to Musk’s social media statements, the power proposition for billionaires holding cryptocurrency is unbridled. Simply put: Elon Musk has more control over the so-called “volatile” world of cryptocurrency than most. Putting a cryptocurrency in space, much like firing a Tesla off into the galaxy, is a PR move meant to generate interest in the burgeoning cryptomarket. But that’s not the only purpose they serve. These acts remind us that people like Musk and Bezos can do anything they want. If they want to put a coin on the Moon, they have the means to do it. And, for example, if Musk or Bezos suddenly wanted to solve the biggest problems with cryptocurrency mining – power consumption, carbon footprint, developing powerful-enough hardware – they’re in a unique position to do so. In space, no one can hear you mine Arguably, one of the biggest things stopping an apex whale like Elon Musk from spending a fair portion of his billions on cryptomining centers is the fact that such an operation would almost certainly draw universal condemnation for its potential effect on the global climate crisis. But the Moon’s atmosphere isn’t necessarily as fragile as the Earth’s. Hypothetically speaking, there’s nothing to stop a billionaire from building a facility on the Moon to mine cryptocurrency. They would, of course, need to be able to build their own batteries, have experience with artificial intelligence and supercomputers, and already have their own satellite network set up in space – all boxes Elon Musk can tick today. And, in the near-future, as we perfect deep space transmission technology, what’s to stop a billionaire from putting a supercomputer on a satellite and sending it somewhere in deep space to mine cryptocurrency 24/7 at near absolute-zero temperatures? All of this is conjecture, but the writing is on the wall. Cryptocurrency enthusiasts fear what the experts are consistently warning: regulation is coming. Eventually, it’s possible cryptocurrency mining could become regulated with harsh policies designed to keep mining operations from further damaging the environment. This could seriously hinder the market. If humanity walks away from terrestrial mining to save the planet, we’ll be leaving unfathomable amounts of money on table. Billionaires don’t become billionaires by doing that. The only logical path forward, barring some unknown new green mining technology, may be moving the cryptocurrency industry to space.

#### Cryptocurrency reach a wide rollout---that builds resilience to survive inevitable existential filters.

Alex McShane 21, Writer and Head of Video for Bitcoin Magazine, BA from the University of Iowa, Degree from the University College Dublin, Degree from Kirkwood Community College, “Bitcoin and Existential Risk”, Bitcoin Magazine, 9/5/2021, https://bitcoinmagazine.com/culture/bitcoin-and-existential-risk-alex-mcshane

TL;DR - An existential risk is the possibility of an event or series of events that could drastically curtail humanity’s potential. A hypothetical global catastrophe could be anthropogenic or non-anthropogenic and internal or external in nature. The adoption of Bitcoin will better position us to address these risks as a society.

EXTERNAL NON-ANTHROPOGENIC

A catastrophic collision with an astronomical object, such as an asteroid impact would be an external non-anthropogenic risk. This has already occurred here several times. During the Permian Triassic period (ending 250 million years ago) an astronomical impact killed 90 percent of the species on Earth. It took tens of millions of years for life on Earth to repopulate and Earth’s intelligence potential to recover.

One interesting external non-anthropogenic risk is Earth’s reflected light, which could be measured by an external intelligence who then come to extinguish us. (The topic of our own signal bringing about this death by misadventure is discussed further below.)

What does this have to do with Bitcoin?

Generally, hard money facilitates greater innovation and technological process. At this point one might argue that if we do not migrate to some degree from Earth as a species, and are subsequently wiped out by an astronomical object impact or a super-volcanic event, the risk becomes anthropogenic in nature. We are a centralized species on a grand scale, and at this point one could say we have through consensus chosen to remain vulnerable to a single vector of attack by staying here.

Bitcoin is not only the hardest money known to man, it is the most responsible from this standpoint. Bitcoin as it currently operates is currency that can provide a monetary framework on which humans can achieve greater capital growth, collaboration, resource allocation, and therefore technological progress. Because the terminal supply of Bitcoin is capped, we can store value in it indefinitely as a society.

66 Million years ago the Cretaceous-Paleogene Extinction Event extinguished the life and intelligence potential of the non-avian dinosaurs. This series of events was external, and broadly non-anthropogenic in the sense that no form of life on Earth at the time contributed to its own demise, but more specifically, at the time of those astronomical impacts the first humans hadn’t split from chimpanzee lineages. This split is thought to have occurred between between 4 and 8 million years ago.

An important distinction between astronomical impacts or super-volcanic events of the past and such events if they were to happen today is that one could argue that our intelligence potential is now mature enough to tackle certain of the external existential risks. Today, the risk posed by an asteroid impact or something similar would still be external in its origin, but at what point does the burden of responsibility to migrate off of the planet fall upon our population? We can surely solve for some external existential risks, and in any case, no one is going to do it for us. You could say that failing to collectively pursue a solution when technically we could have would recategorize a civilization-extinguishing asteroid impact as an external but anthropogenic risk.

At what point do innovation dampening authoritarian states and their mandated broken money cause society to stall at a local optimum? Surely the government has already caused this. It’s only a matter of time before another object strikes the Earth with devastating consequence. I would argue it is irresponsible to continue life here with government money. Government money is an existential risk. Bitcoin is not only a solution, it is a societal responsibility.

INTERNAL ANTHROPOGENIC

Nuclear war is one example of an internal anthropogenic risk. That is, should nuclear war arise, it would be both self destructive, and relatively self contained on a cosmic scale. It follows that biological warfare is an internal anthropogenic risk, the reality of which we as a species can surely understand now. If I were to hazard a guess I would say virtual emergencies and cyber pandemics are next. These self constructed catastrophes are the government’s misguided attempts at proof of work. This is a topic for another time. Do not surrender your ability to think and speak freely.

The second law of thermodynamics can summed thus, processes that involve the transfer or conversion of heat energy are irreversible. The law indicates we have not observed a spontaneous transfer of energy from cold to hot. Another way to think of this is that there is no such thing as cold, only lesser degrees of hot. Nothing cannot transfer. So broadly, within a closed system, the second law of thermodynamics would indicate that all differences tend to level out.

So what has this got to do with Bitcoin?

Well firstly, all hardware is subject to entropy. The distributed nature of the blockchain increases the probability that it will survive centralized entropy. At Bitcoin’s inception, imagine a failure because Satoshi’s computer randomly crashed. Distributed networks are inherently hedged against this particular centralized form of existential risk.

The second law of thermodynamics also suggests that on a grander scale, relatively isolated (centralized) systems will degenerate more and more into disordered states. Proof of work, and network growth are two ways Bitcoin fights against falling into disrepair.

Bitcoin uses proof of work to stave off entropy. The system cannot stay dormant. It must continue to use proof of work to advance the state of the chain, and to fight entropy to secure the monetary value all of the users have stored in the network. The U.S. dollar, as many have pointed out, relies on proof of war, or distributed political energies to maintain dominance. Its methodology can be described as haphazard at best.

INTERNAL NON-ANTHROPOGENIC

One internal non-anthropogenic risk is that of a super-volcanic eruption, provided it wasn’t humans who brought about the eruption. Just like with external non-anthropogenic risks, Bitcoin alone cannot prevent them, but it can help humans prepare for them such that we may survive these relatively small intelligence filters the universe throws our way.

Bitcoin allows for fundamental capital accumulation and human innovation, and promotes collaboration to such a degree that we will find an increased collective problem solving power as humans the further Bitcoin adoption spreads. It is worth mentioning that Bitcoin also maintains and appreciates wealth to such a degree that often those of us to chose to live our lives on a Bitcoin standard will experience relatively greater freedoms, and vastly greater amounts of free time than our peers who chose to continue their lives on a fiat standard, and are perpetually working to outpace their chronic debt. Many Bitcoiners will likely forego that newfound free time to work and continue to provide value to others in whatever area interests them, because Bitcoin incentivizes the collaborative accumulation of capital but also the responsible reallocation of it.

EXTERNAL ANTHROPOGENIC

An external anthropogenic risk has the least probability of occurring. This is a problem of reach. Imagine human intelligence being sent into the cosmos and signaling or generally causing an external intelligence or astronomical object to come back to extinguish us. This is a most improbable extinction by misadventure.

The probability that we send messages of consequence into the cosmos that in turn cause some other far-flung intelligence, with knowledge enough to reach us, to come and bring about our own destruction is next to zero, but it isn’t zero.

I would posit that the probability increases every day that Bitcoin survives, with each person that chooses to hold Bitcoin over fiat, because on a fiat standard we are again, stuck at a local optimum at best, and each day the global monetary system devolves further into chaos. The fiat world may continue to be habitable chaos, but our technological progress and our greatest capacity for innovation cannot be achieved on a fiat standard.

A Bitcoin standard is not only our current best bet, it is the only monetary vehicle that will take us from here, or enable us to build technology that can effectively communicate with places in the universe where other intelligence has emerged. The other reason this fatal miscommunication is unlikely to occur is that once through a Bitcoin standard we have manage to build a society that can effectively reach and communicate at greater depths of the cosmos we will at that time have already become a multi-planetary, if not transitory, if not multi-solar system species. The topic of Bitcoin in space and planetary interoperability will be discussed in a later essay.

The most distant human made object from the earth is the Voyager 1, which is over 13 billion miles away. (For perspective, Apha Centuri, the nearest star system to Earth, is 25 trillion miles away.) Human radio signals have announced our presence and our intelligence to the cosmos since around 1900. The first human radio signals have all ready traveled 114 light years, that is 681,920,540,000,000 miles. Although the reach of our radio signals is very great, the probability of us being heard and subsequently extinguished is negligible. External anthropogenic risks are the least of our concerns at the moment.

As Bitcoin adoption grows, it serves to promote advances in artificial intelligence and nanotechnology. External anthropogenic risks will become more relevant to human intelligence at a much later time. External non-anthropogenic risks are similarly out of our hands for the time being. That is, at the moment there is nothing we can do to prevent the Sun from becoming a red giant star and subsuming the Earth.

But we do already have the monetary technology upon which to engineer solutions to some of these problems. We have the potential as humans to prevent internal global catastrophes, both those set on by us and not. Survival and longevity is arguably our greatest task as a species. Adopting Bitcoin, and protecting this network is proceeding with diligence and a long eye toward the future in all of our political and scientific affairs. The existential risks of living are great, though it is human nature for our ambitions to out pace our current abilities. The only evidence of life is change. To change is to exit fiat currency, it is to use Bitcoin instead.

## Case

### Space War

#### Asteroid mining is privatized and feasible – it solves resource conflict and environmental catastrophe

Kevin MacWhorter 16, J.D. Candidate, William & Mary Law School, "Sustainable Mining: Incentivizing Asteroid Mining in the Name of Environmentalism", William & Mary Environmental Law and Policy Review, Vol 40, Issue 2, Article 11, <https://scholarship.law.wm.edu/cgi/viewcontent.cgi?referer=https://www.google.com/&httpsredir=1&article=1653&context=wmelpr>

A. Rare Element Mining on Earth In the next sixty years, scientists predict that certain elements crucial to modern industry such as platinum, zinc, copper, phosphorous, lead, gold, and indium could be exhausted on Earth. 12 Many of these have no synthetic alternative, unlike chemical elements such as oil or diamonds.13 Liquid-crystal display (LCD) televisions, cellphones, and laptops are among the various consumer technologies that use precious metals.14Further, green technologies including wind turbines, solar panels, and catalytic converters require these rare elements. 15 As demand rises for both types of technologies, and as reserves of rare metals fall, prices skyrocket.16 Demand for nonrenewable resources creates conflict, and consumerism in rich countries results in harsh labor treatment for poorer countries.17 In general, the mining industry is extremely destructive to Earth’s environment.18 In fact, depending on the method employed, mining can destroy entire ecosystems by polluting water sources and contributing to deforestation.19 It is by its nature an unsustainable practice, because it involves the extraction of a finite and non-renewable resource.20 Moreover, by extracting tiny amounts of metals from relatively large quantities of ore, the mining industry contributes the largest portion of solid wastes in the world.21 The Environmental Protection Agency (EPA) describes the industry as the source of more toxic and hazardous waste than any other industrial sector [in the United States], costing billions of dollars to address the public health and environmental threats to communities. 22 Poor regulations and oxymoronic corporate definitions of sustainability, however, make it unclear as to just how much waste the industry actually produces.23 Platinum provides an excellent case study of the issue, because it is an extremely rare and expensive metal—an ore expected to exist in vast quantities in asteroids.24 Further, production of platinum has increased sharply in the past sixty years in order to keep up with growing demand for use in new technologies.25 In fact, despite their high costs, platinum group metals are so useful that [one] of [four] industrial goods on Earth require them in production. 26 Scholars do not expect demand to slow any time soon.27 Among other technologies, industries use platinum in products such as catalytic converters, jewelry production, various catalysts for chemical processing, and hydrogen fuel cells.28 While there is no consensus on how far the Earth’s reserves of platinum will take humanity, many scientists agree that platinum ore reserves will deplete in a relatively short amount of time.29 With the rate of mining at an all-time high,30 it is increasingly clear that historical patterns of mineral resources and development cannot simply be assumed to continue unaltered into the future. 31 The platinum mining industry, however, has a strong incentive to increase its rate of extraction as profits grow with the rate of demand. Without any alternative, this destructive practice will continue into the future.32 So-called platinum-group metal (PGM) ores are mined through underground or open cut techniques.33 Due to these practices, all but a very small fraction of the mined platinum ore is disposed of as solid waste.34 The environmental consequences of platinum production are thus quite significant, but like the mining industry in general, the amount of waste is typically under-reported.35 While this is due to high production levels at the moment, those levels will only increase given the estimated future demand of platinum.36 In spite of the negative consequences, mining continues unabated because it is economically important to many areas.37 The future environmental costs provide a major challenge in creating a sustainable system. Relegating at least some mining companies to near-Earth asteroids would reduce the negative effects of future mining levels on Earth. The economic benefits of mining need not be sacrificed for the sake of the environment.38 B. Privatization of the Space Industry For most of the Space Age, the role of private companies has been as that of government contractors.39 During the past fifteen years, however, space flight has become increasingly the realm of private industry.40 Space tourism is on the rise,41 and private companies have been launching their own satellites into orbit for decades.42 In May 2012, SpaceX docked with the International Space Station the first private company to do so. 43 While the National Aeronautics and Space Administrations (NASA) federal outlay has increased since 1958, NASAs budget as a percentage of US spending has decreased dramatically.44The private space industry has seen dramatic growth as a result.45 Since NASA retired its shuttle fleet in 2011, the agency has turned to private actors to design and build spacecraft.46 That year, NASA awarded four private space companies SpaceX, Blue Origin LLC, Boeing Co., and Sierra Nevada Corp. contracts worth a combined total of $269.3 million to transport cargo and crew to and from the International Space Station.47 More companies, such as Orbital Sciences, have followed suit.48 Space mining in particular has been a focus of private investment.49 The promise of abundant rare Earth resources creates the possibility of vast wealth for intrepid investors.50 For example, Google founders Larry Page and Eric Schmidt have invested heavily in private space flight.51 Google is offering the Lunar X Prize: $30 million in prizes to any team who is able to safely land a robot on the surface of the Moon, have that robot travel 500 meters [1,640 feet] over the lunar surface, and send video, images, and data back to the Earth before 2016. 52 The purpose behind the contest should be apparent: investors think private space flight and mining could be extremely lucrative.53 Rare metals, such as platinum, could become far more accessible.54 In 2012, Page, Schmidt, director James Cameron, and other distinguished entrepreneurs announced they were investing considerable financial resources in Planetary Resources, a company developing the technology to mine an asteroid.55The companys goalis to land a mining vessel on a near-Earth asteroid, mine its valuable minerals, and bring the natural resources of space within humanitys economic sphere. 56 To that end, many companies are focused on the idea of asteroid mining.57 Privatization, however, has brought many legal and economic considerations to the forefront. One of the most significant obstacles for the private space industry has been the price tag of traveling into space. Complicating matters, the current law governing claims of property in space is ambiguous.58 Companies therefore cannot be sure whether their property claims will be enforced after they extract minerals in space and bring them back to Earth.59 When investing large sums of money such a consideration is absolutely critical.60 Although there has been investment in the area, sending an actual mission to an asteroid will require less ambiguous property provisions in international space law. C. Asteroid Mining 101 As the Planetary Resources website exclaims, [T]he more we learn about asteroids, the more enticing they become! 61 Certain types of asteroids including X-type and S-type asteroids contain both precious and base metals in quantities sufficient to make any entrepreneur salivate.62 Metals on which many current technologies rely such as iron, gold, and platinum can be found in most asteroids. 63 Current estimates count around two million asteroids in the solar system that are a kilometer or more in diameter.64 Astrophysicists estimate that each could contain 30 million tons of nickel, 1.5 million tons of cobalt, and 7,500 tons of platinum, among other minerals.65 To put that in economic terms, the value of each asteroid could be somewhere in the trillions [of dollars] or higher. 66 Indeed, because of their zero gravity fields and availability of metals, asteroids have been considered as candidates for resource extraction since the beginning of the space age.67 The technology needed to extract resources from asteroids, however, is a very recent phenomenon.68 With the European Space Agency successfully landing the Philae Lander on Comet 67P, it is much more plausible to land a mining operation on an asteroid.69 Although companies likely are not able to send mining ventures to asteroids immediately, as the preceding section suggested, asteroid mining is a possibility in the near future.70 First of all, two companies are developing the technology needed to mine asteroids.71Planetary Resources is creating cheaper prospecting spacecraft small enough to hitch a ride into space with larger, primary payloads. 72 Another company, Deep Space Industries (DSI), is developing a four-stage system for mining in space: Prospecting, Processing, Harvesting, and Manufacturing.73 It has already invented one spacecraft to be used for the Prospecting stage: a tiny probe, called FireFly, designed to scout asteroids and study their size, shape, spin and composition . . . . 74 For the Processing phase, DSI is creating technology required to transform regolith to raw materials for manufacture.75 The company is currently developing another spacecraft, called a Harvestor, for the third stage to collect and transport resources.76Finally, the company is creating technology to manufacture finished products in space.77 The United States space policy is also embracing the idea of asteroid mining. In April 2010, President Obama promised to send astronauts to explore an asteroid by 2025.78 In 2014, NASA requested, much to the surprise of asteroid scientists, a budget that includes $105 million to begin work on a mission that would send a robotic spacecraft to capture an asteroid as early as 2019 and haul it back so that astronauts could rendezvous with it by 2022. 79 Further, NASA has awarded contracts to Planetary Resources and Deep Space Industries to prepare for and ultimately execute missions to land on and mine asteroids for valuable resources. 80 NASA is also designing a spacecraft, the primary goal of which is to land on an asteroid and take samples.81 It is scheduled for launch in September 2016.82 As all this recent development suggests, the technology to mine asteroids is not far off. In fact, the requisite technology exists it just needs to be adapted for use in an extraterrestrial environment.83 As Chris Lewicki, president of Planetary Resources, said: [T]he single biggest challenge that Planetary Resources will have to overcome is convincing people that asteroid mining will happen sooner than they think. 84 Asteroid mining will gain in popularity as resources deplete, forcing humans to dig deeper and deeper in the Earths crust for minerals. 85 A recent article summarized some of Lewickis reasoning succinctly: [T]he energy required to extract minerals from an asteroid is considerably less than to extract from the Earth, or even the moon . . . , because in space there is no atmosphere to oxidise or salt to corrode, no weather, no gravity or friction to oppose transportation, dissipate energy and waste heat and unlimited heat from the sun and coldness in space for refrigeration, creating the perfect vacuum . . . .86

#### Outweighs the aff.

Phil Torres 16. Affiliate scholar at the Institute for Ethics and Emerging Technologies. “Biodiversity loss: An existential risk comparable to climate change.” *Bulletin of the Atomic Scientists* 4/11/2016. http://thebulletin.org/biodiversity-loss-existential-risk-comparable-climate-change9329

Such considerations warrant decoupling biodiversity loss from climate change, because the former has been consistently subsumed by the latter as a mere effect. Biodiversity loss is a distinct environmental crisis with its own unique syndrome of causes, consequences, and solutions—such as restoring habitats, creating protected areas (“biodiversity parks”), and practicing sustainable agriculture. The sixth extinction. The repercussions of biodiversity loss are potentially as severe as those anticipated from climate change, or even a nuclear conflict. For example, according to a 2015 study published in Science Advances, the best available evidence reveals “an exceptionally rapid loss of biodiversity over the last few centuries, indicating that a sixth mass extinction is already under way.” This conclusion holds, even on the most optimistic assumptions about the background rate of species losses and the current rate of vertebrate extinctions. The group classified as “vertebrates” includes mammals, birds, reptiles, fish, and all other creatures with a backbone. The article argues that, using its conservative figures, the average loss of vertebrate species was 100 times higher in the past century relative to the background rate of extinction. (Other scientists have suggested that the current extinction rate could be as much as 10,000 times higher than normal.) As the authors write, “The evidence is incontrovertible that recent extinction rates are unprecedented in human history and highly unusual in Earth’s history.” Perhaps the term “Big Six” should enter the popular lexicon—to add the current extinction to the previous “Big Five,” the last of which wiped out the dinosaurs 66 million years ago. But the concept of biodiversity encompasses more than just the total number of species on the planet. It also refers to the size of different populations of species. With respect to this phenomenon, multiple studies have confirmed that wild populations around the world are dwindling and disappearing at an alarming rate. For example, the 2010 Global Biodiversity Outlook report found that the population of wild vertebrates living in the tropics dropped by 59 percent between 1970 and 2006. The report also found that the population of farmland birds in Europe has dropped by 50 percent since 1980; bird populations in the grasslands of North America declined by almost 40 percent between 1968 and 2003; and the population of birds in North American arid lands has fallen by almost 30 percent since the 1960s. Similarly, 42 percent of all amphibian species (a type of vertebrate that is sometimes called an “ecological indicator”) are undergoing population declines, and 23 percent of all plant species “are estimated to be threatened with extinction.” Other studies have found that some 20 percent of all reptile species, 48 percent of the world’s primates, and 50 percent of freshwater turtles are threatened. Underwater, about 10 percent of all coral reefs are now dead, and another 60 percent are in danger of dying. Consistent with these data, the 2014 Living Planet Report shows that the global population of wild vertebrates dropped by 52 percent in only four decades—from 1970 to 2010. While biologists often avoid projecting historical trends into the future because of the complexity of ecological systems, it’s tempting to extrapolate this figure to, say, the year 2050, which is four decades from 2010. As it happens, a 2006 study published in Science does precisely this: It projects past trends of marine biodiversity loss into the 21st century, concluding that, unless significant changes are made to patterns of human activity, there will be virtually no more wild-caught seafood by 2048. Catastrophic consequences for civilization. The consequences of this rapid pruning of the evolutionary tree of life extend beyond the obvious. There could be surprising effects of biodiversity loss that scientists are unable to fully anticipate in advance. For example, prior research has shown that localized ecosystems can undergo abrupt and irreversible shifts when they reach a tipping point. According to a 2012 paper published in Nature, there are reasons for thinking that we may be approaching a tipping point of this sort in the global ecosystem, beyond which the consequences could be catastrophic for civilization. As the authors write, a planetary-scale transition could precipitate “substantial losses of ecosystem services required to sustain the human population.” An ecosystem service is any ecological process that benefits humanity, such as food production and crop pollination. If the global ecosystem were to cross a tipping point and substantial ecosystem services were lost, the results could be “widespread social unrest, economic instability, and loss of human life.” According to Missouri Botanical Garden ecologist Adam Smith, one of the paper’s co-authors, this could occur in a matter of decades—far more quickly than most of the expected consequences of climate change, yet equally destructive. Biodiversity loss is a “threat multiplier” that, by pushing societies to the brink of collapse, will exacerbate existing conflicts and introduce entirely new struggles between state and non-state actors. Indeed, it could even fuel the rise of terrorism. (After all, climate change has been linked to the emergence of ISIS in Syria, and multiple high-ranking US officials, such as former US Defense Secretary Chuck Hagel and CIA director John Brennan, have affirmed that climate change and terrorism are connected.) The reality is that we are entering the sixth mass extinction in the 3.8-billion-year history of life on Earth, and the impact of this event could be felt by civilization “in as little as three human lifetimes,” as the aforementioned 2012 Nature paper notes. Furthermore, the widespread decline of biological populations could plausibly initiate a dramatic transformation of the global ecosystem on an even faster timescale: perhaps a single human lifetime. The unavoidable conclusion is that biodiversity loss constitutes an existential threat in its own right. As such, it ought to be considered alongside climate change and nuclear weapons as one of the most significant contemporary risks to human prosperity and survival.

#### Resource wars go nuclear, but natural resource scarcity controls the internal link, not the aff.

Klare 13 – Michael T., professor emeritus of peace and world-security studies at Hampshire College and senior visiting fellow at the Arms Control Association in Washington, DC, " How Resource Scarcity and Climate Change Could Produce a Global Explosion", *The Nation*, 4/22/2013, <https://www.thenation.com/article/how-resource-scarcity-and-climate-change-could-produce-global-explosion/> JHW

Resource Shortages and Resource Wars Start with one simple given: the prospect of future scarcities of vital natural resources, including energy, water, land, food and critical minerals. This in itself would guarantee social unrest, geopolitical friction and war. It is important to note that absolute scarcity doesn’t have to be on the horizon in any given resource category for this scenario to kick in. A lack of adequate supplies to meet the needs of a growing, ever more urbanized and industrialized global population is enough. Given the wave of extinctions that scientists are recording, some resources—particular species of fish, animals and trees, for example—will become less abundant in the decades to come, and may even disappear altogether. But key materials for modern civilization like oil, uranium and copper will simply prove harder and more costly to acquire, leading to supply bottlenecks and periodic shortages. Oil—the single most important commodity in the international economy—provides an apt example. Although global oil supplies may actually grow in the coming decades, many experts doubt that they can be expanded sufficiently to meet the needs of a rising global middle class that is, for instance, expected to buy millions of new cars in the near future. In its 2011 World Energy Outlook, the International Energy Agency claimed that an anticipated global oil demand of 104 million barrels per day in 2035 will be satisfied. This, the report suggested, would be thanks in large part to additional supplies of “unconventional oil” (Canadian tar sands, shale oil and so on), as well as 55 million barrels of new oil from fields “yet to be found” and “yet to be developed.” However, many analysts scoff at this optimistic assessment, arguing that rising production costs (for energy that will be ever more difficult and costly to extract), environmental opposition, warfare, corruption and other impediments will make it extremely difficult to achieve increases of this magnitude. In other words, even if production manages for a time to top the 2010 level of 87 million barrels per day, the goal of 104 million barrels will never be reached and the world’s major consumers will face virtual, if not absolute, scarcity. Water provides another potent example. On an annual basis, the supply of drinking water provided by natural precipitation remains more or less constant: about 40,000 cubic kilometers. But much of this precipitation lands on Greenland, Antarctica, Siberia and inner Amazonia where there are very few people, so the supply available to major concentrations of humanity is often surprisingly limited. In many regions with high population levels, water supplies are already relatively sparse. This is especially true of North Africa, Central Asia and the Middle East, where the demand for water continues to grow as a result of rising populations, urbanization and the emergence of new water-intensive industries. The result, even when the supply remains constant, is an environment of increasing scarcity. Wherever you look, the picture is roughly the same: supplies of critical resources may be rising or falling, but rarely do they appear to be outpacing demand, producing a sense of widespread and systemic scarcity. However generated, a perception of scarcity—or imminent scarcity—regularly leads to anxiety, resentment, hostility and contentiousness. This pattern is very well understood, and has been evident throughout human history. In his book Constant Battles, for example, Steven LeBlanc, director of collections for Harvard’s Peabody Museum of Archaeology and Ethnology, notes that many ancient civilizations experienced higher levels of warfare when faced with resource shortages brought about by population growth, crop failures or persistent drought. Jared Diamond, author of the bestseller Collapse, has detected a similar pattern in Mayan civilization and the Anasazi culture of New Mexico’s Chaco Canyon. More recently, concern over adequate food for the home population was a significant factor in Japan’s invasion of Manchuria in 1931 and Germany’s invasions of Poland in 1939 and the Soviet Union in 1941, according to Lizzie Collingham, author of The Taste of War. Although the global supply of most basic commodities has grown enormously since the end of World War II, analysts see the persistence of resource-related conflict in areas where materials remain scarce or there is anxiety about the future reliability of supplies. Many experts believe, for example, that the fighting in Darfur and other war-ravaged areas of North Africa has been driven, at least in part, by competition among desert tribes for access to scarce water supplies, exacerbated in some cases by rising population levels. “In Darfur,” says a 2009 report from the UN Environment Programme on the role of natural resources in the conflict, “recurrent drought, increasing demographic pressures, and political marginalization are among the forces that have pushed the region into a spiral of lawlessness and violence that has led to 300,000 deaths and the displacement of more than two million people since 2003.” Anxiety over future supplies is often also a factor in conflicts that break out over access to oil or control of contested undersea reserves of oil and natural gas. In 1979, for instance, when the Islamic revolution in Iran overthrew the Shah and the Soviets invaded Afghanistan, Washington began to fear that someday it might be denied access to Persian Gulf oil. At that point, President Jimmy Carter promptly announced what came to be called the Carter Doctrine. In his 1980 State of the Union Address, Carter affirmed that any move to impede the flow of oil from the Gulf would be viewed as a threat to America’s “vital interests” and would be repelled by “any means necessary, including military force.” In 1990, this principle was invoked by President George H.W. Bush to justify intervention in the first Persian Gulf War, just as his son would use it, in part, to justify the 2003 invasion of Iraq. Today, it remains the basis for US plans to employ force to stop the Iranians from closing the Strait of Hormuz, the strategic waterway connecting the Persian Gulf to the Indian Ocean through which about 35 percent of the world’s seaborne oil commerce passes. Recently, a set of resource conflicts have been rising toward the boiling point between China and its neighbors in Southeast Asia when it comes to control of offshore oil and gas reserves in the South China Sea. Although the resulting naval clashes have yet to result in a loss of life, a strong possibility of military escalation exists. A similar situation has also arisen in the East China Sea, where China and Japan are jousting for control over similarly valuable undersea reserves. Meanwhile, in the South Atlantic Ocean, Argentina and Britain are once again squabbling over the Falkland Islands (called Las Malvinas by the Argentinians) because oil has been discovered in surrounding waters. By all accounts, resource-driven potential conflicts like these will only multiply in the years ahead as demand rises, supplies dwindle and more of what remains will be found in disputed areas. In a 2012 study titled Resources Futures, the respected British think-tank Chatham House expressed particular concern about possible resource wars over water, especially in areas like the Nile and Jordan River basins where several groups or countries must share the same river for the majority of their water supplies and few possess the wherewithal to develop alternatives. “Against this backdrop of tight supplies and competition, issues related to water rights, prices, and pollution are becoming contentious,” the report noted. “In areas with limited capacity to govern shared resources, balance competing demands, and mobilize new investments, tensions over water may erupt into more open confrontations.” Heading for a Resource-Shock World Tensions like these would be destined to grow by themselves because in so many areas supplies of key resources will not be able to keep up with demand. As it happens, though, they are not “by themselves.” On this planet, a second major force has entered the equation in a significant way. With the growing reality of climate change, everything becomes a lot more terrifying. Normally, when we consider the impact of climate change, we think primarily about the environment—the melting Arctic ice cap or Greenland ice shield, rising global sea levels, intensifying storms, expanding desert and endangered or disappearing species like the polar bear. But a growing number of experts are coming to realize that the most potent effects of climate change will be experienced by humans directly through the impairment or wholesale destruction of habitats upon which we rely for food production, industrial activities or simply to live. Essentially, climate change will wreak its havoc on us by constraining our access to the basics of life: vital resources that include food, water, land and energy. This will be devastating to human life, even as it significantly increases the danger of resource conflicts of all sorts erupting. We already know enough about the future effects of climate change to predict the following with reasonable confidence: \* Rising sea levels will in the next half-century erase many coastal areas, destroying large cities, critical infrastructure (including roads, railroads, ports, airports, pipelines, refineries and power plants) and prime agricultural land. \* Diminished rainfall and prolonged droughts will turn once-verdant croplands into dust bowls, reducing food output and turning millions into “climate refugees.” \* More severe storms and intense heat waves will kill crops, trigger forest fires, cause floods and destroy critical infrastructure. No one can predict how much food, land, water and energy will be lost as a result of this onslaught (and other climate-change effects that are harder to predict or even possibly imagine), but the cumulative effect will undoubtedly be staggering. In Resources Futures, Chatham House offers a particularly dire warning when it comes to the threat of diminished precipitation to rain-fed agriculture. “By 2020,” the report says, “yields from rain-fed agriculture could be reduced by up to 50%” in some areas. The highest rates of loss are expected to be in Africa, where reliance on rain-fed farming is greatest, but agriculture in China, India, Pakistan and Central Asia is also likely to be severely affected. Heat waves, droughts and other effects of climate change will also reduce the flow of many vital rivers, diminishing water supplies for irrigation, hydro-electricity power facilities and nuclear reactors (which need massive amounts of water for cooling purposes). The melting of glaciers, especially in the Andes in Latin America and the Himalayas in South Asia, will also rob communities and cities of crucial water supplies. An expected increase in the frequency of hurricanes and typhoons will pose a growing threat to offshore oil rigs, coastal refineries, transmission lines and other components of the global energy system. The melting of the Arctic ice cap will open that region to oil and gas exploration, but an increase in iceberg activity will make all efforts to exploit that region’s energy supplies perilous and exceedingly costly. Longer growing seasons in the north, especially Siberia and Canada’s northern provinces, might compensate to some degree for the desiccation of croplands in more southerly latitudes. However, moving the global agricultural system (and the world’s farmers) northward from abandoned farmlands in the United States, Mexico, Brazil, India, China, Argentina and Australia would be a daunting prospect. It is safe to assume that climate change, especially when combined with growing supply shortages, will result in a significant reduction in the planet’s vital resources, augmenting the kinds of pressures that have historically led to conflict, even under better circumstances. In this way, according to the Chatham House report, climate change is best understood as a “threat multiplier…a key factor exacerbating existing resource vulnerability” in states already prone to such disorders. Like other experts on the subject, Chatham House’s analysts claim, for example, that climate change will reduce crop output in many areas, sending global food prices soaring and triggering unrest among those already pushed to the limit under existing conditions. “Increased frequency and severity of extreme weather events, such as droughts, heat waves and floods, will also result in much larger and frequent local harvest shocks around the world….These shocks will affect global food prices whenever key centers of agricultural production area are hit—further amplifying global food price volatility.” This, in turn, will increase the likelihood of civil unrest. When, for instance, a brutal heat wave decimated Russia’s wheat crop during the summer of 2010, the global price of wheat (and so of that staple of life, bread) began an inexorable upward climb, reaching particularly high levels in North Africa and the Middle East. With local governments unwilling or unable to help desperate populations, anger over impossible-to-afford food merged with resentment toward autocratic regimes to trigger the massive popular outburst we know as the Arab Spring. Many such explosions are likely in the future, Chatham House suggests, if current trends continue as climate change and resource scarcity meld into a single reality in our world. A single provocative question from that group should haunt us all: “Are we on the cusp of a new world order dominated by struggles over access to affordable resources?” For the US intelligence community, which appears to have been influenced by the report, the response was blunt. In March, for the first time, Director of National Intelligence James R. Clapper listed “competition and scarcity involving natural resources” as a national security threat on a par with global terrorism, cyberwar and nuclear proliferation. “Many countries important to the United States are vulnerable to natural resource shocks that degrade economic development, frustrate attempts to democratize, raise the risk of regime-threatening instability, and aggravate regional tensions,” he wrote in his prepared statement for the Senate Select Committee on Intelligence. “Extreme weather events (floods, droughts, heat waves) will increasingly disrupt food and energy markets, exacerbating state weakness, forcing human migrations, and triggering riots, civil disobedience, and vandalism.” There was a new phrase embedded in his comments: “resource shocks.” It catches something of the world we’re barreling toward, and the language is striking for an intelligence community that, like the government it serves, has largely played down or ignored the dangers of climate change. For the first time, senior government analysts may be coming to appreciate what energy experts, resource analysts and scientists have long been warning about: the unbridled consumption of the world’s natural resources, combined with the advent of extreme climate change, could produce a global explosion of human chaos and conflict. We are now heading directly into a resource-shock world.

#### Solves warming.

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.

#### Warming causes extinction

Peter Kareiva 18, Ph.D. in ecology and applied mathematics from Cornell University, director of the Institute of the Environment and Sustainability at UCLA, Pritzker Distinguished Professor in Environment & Sustainability at UCLA, et al., September 2018, “Existential risk due to ecosystem collapse: Nature strikes back,” Futures, Vol. 102, p. 39-50

In summary, six of the nine proposed planetary boundaries (phosphorous, nitrogen, biodiversity, land use, atmospheric aerosol loading, and chemical pollution) are unlikely to be associated with existential risks. They all correspond to a degraded environment, but in our assessment do not represent existential risks. However, the three remaining boundaries (climate change, global freshwater cycle, and ocean acidification) do pose existential risks. This is because of intrinsic positive feedback loops, substantial lag times between system change and experiencing the consequences of that change, and the fact these different boundaries interact with one another in ways that yield surprises. In addition, climate, freshwater, and ocean acidification are all directly connected to the provision of food and water, and shortages of food and water can create conflict and social unrest.

Climate change has a long history of disrupting civilizations and sometimes precipitating the collapse of cultures or mass emigrations (McMichael, 2017). For example, the 12th century drought in the North American Southwest is held responsible for the collapse of the Anasazi pueblo culture. More recently, the infamous potato famine of 1846–1849 and the large migration of Irish to the U.S. can be traced to a combination of factors, one of which was climate. Specifically, 1846 was an unusually warm and moist year in Ireland, providing the climatic conditions favorable to the fungus that caused the potato blight. As is so often the case, poor government had a role as well—as the British government forbade the import of grains from outside Britain (imports that could have helped to redress the ravaged potato yields).

Climate change intersects with freshwater resources because it is expected to exacerbate drought and water scarcity, as well as flooding. Climate change can even impair water quality because it is associated with heavy rains that overwhelm sewage treatment facilities, or because it results in higher concentrations of pollutants in groundwater as a result of enhanced evaporation and reduced groundwater recharge. Ample clean water is not a luxury—it is essential for human survival. Consequently, cities, regions and nations that lack clean freshwater are vulnerable to social disruption and disease.

Finally, ocean acidification is linked to climate change because it is driven by CO2 emissions just as global warming is. With close to 20% of the world’s protein coming from oceans (FAO, 2016), the potential for severe impacts due to acidification is obvious. Less obvious, but perhaps more insidious, is the interaction between climate change and the loss of oyster and coral reefs due to acidification. Acidification is known to interfere with oyster reef building and coral reefs. Climate change also increases storm frequency and severity. Coral reefs and oyster reefs provide protection from storm surge because they reduce wave energy (Spalding et al., 2014). If these reefs are lost due to acidification at the same time as storms become more severe and sea level rises, coastal communities will be exposed to unprecedented storm surge—and may be ravaged by recurrent storms.

A key feature of the risk associated with climate change is that mean annual temperature and mean annual rainfall are not the variables of interest. Rather it is extreme episodic events that place nations and entire regions of the world at risk. These extreme events are by definition “rare” (once every hundred years), and changes in their likelihood are challenging to detect because of their rarity, but are exactly the manifestations of climate change that we must get better at anticipating (Diffenbaugh et al., 2017). Society will have a hard time responding to shorter intervals between rare extreme events because in the lifespan of an individual human, a person might experience as few as two or three extreme events. How likely is it that you would notice a change in the interval between events that are separated by decades, especially given that the interval is not regular but varies stochastically? A concrete example of this dilemma can be found in the past and expected future changes in storm-related flooding of New York City. The highly disruptive flooding of New York City associated with Hurricane Sandy represented a flood height that occurred once every 500 years in the 18th century, and that occurs now once every 25 years, but is expected to occur once every 5 years by 2050 (Garner et al., 2017). This change in frequency of extreme floods has profound implications for the measures New York City should take to protect its infrastructure and its population, yet because of the stochastic nature of such events, this shift in flood frequency is an elevated risk that will go unnoticed by most people.

4. The combination of positive feedback loops and societal inertia is fertile ground for global environmental catastrophes

Humans are remarkably ingenious, and have adapted to crises throughout their history. Our doom has been repeatedly predicted, only to be averted by innovation (Ridley, 2011). However, the many stories of human ingenuity successfully addressing existential risks such as global famine or extreme air pollution represent environmental challenges that are largely linear, have immediate consequences, and operate without positive feedbacks. For example, the fact that food is in short supply does not increase the rate at which humans consume food—thereby increasing the shortage. Similarly, massive air pollution episodes such as the London fog of 1952 that killed 12,000 people did not make future air pollution events more likely. In fact it was just the opposite—the London fog sent such a clear message that Britain quickly enacted pollution control measures (Stradling, 2016). Food shortages, air pollution, water pollution, etc. send immediate signals to society of harm, which then trigger a negative feedback of society seeking to reduce the harm.

In contrast, today’s great environmental crisis of climate change may cause some harm but there are generally long time delays between rising CO2 concentrations and damage to humans. The consequence of these delays are an absence of urgency; thus although 70% of Americans believe global warming is happening, only 40% think it will harm them (http://climatecommunication.yale.edu/visualizations-data/ycom-us-2016/). Secondly, unlike past environmental challenges, the Earth’s climate system is rife with positive feedback loops. In particular, as CO2 increases and the climate warms, that very warming can cause more CO2 release which further increases global warming, and then more CO2, and so on. Table 2 summarizes the best documented positive feedback loops for the Earth’s climate system. These feedbacks can be neatly categorized into carbon cycle, biogeochemical, biogeophysical, cloud, ice-albedo, and water vapor feedbacks. As important as it is to understand these feedbacks individually, it is even more essential to study the interactive nature of these feedbacks. Modeling studies show that when interactions among feedback loops are included, uncertainty increases dramatically and there is a heightened potential for perturbations to be magnified (e.g., Cox, Betts, Jones, Spall, & Totterdell, 2000; Hajima, Tachiiri, Ito, & Kawamiya, 2014; Knutti & Rugenstein, 2015; Rosenfeld, Sherwood, Wood, & Donner, 2014). This produces a wide range of future scenarios.

Positive feedbacks in the carbon cycle involves the enhancement of future carbon contributions to the atmosphere due to some initial increase in atmospheric CO2. This happens because as CO2 accumulates, it reduces the efficiency in which oceans and terrestrial ecosystems sequester carbon, which in return feeds back to exacerbate climate change (Friedlingstein et al., 2001). Warming can also increase the rate at which organic matter decays and carbon is released into the atmosphere, thereby causing more warming (Melillo et al., 2017). Increases in food shortages and lack of water is also of major concern when biogeophysical feedback mechanisms perpetuate drought conditions. The underlying mechanism here is that losses in vegetation increases the surface albedo, which suppresses rainfall, and thus enhances future vegetation loss and more suppression of rainfall—thereby initiating or prolonging a drought (Chamey, Stone, & Quirk, 1975). To top it off, overgrazing depletes the soil, leading to augmented vegetation loss (Anderies, Janssen, & Walker, 2002).

Climate change often also increases the risk of forest fires, as a result of higher temperatures and persistent drought conditions. The expectation is that forest fires will become more frequent and severe with climate warming and drought (Scholze, Knorr, Arnell, & Prentice, 2006), a trend for which we have already seen evidence (Allen et al., 2010). Tragically, the increased severity and risk of Southern California wildfires recently predicted by climate scientists (Jin et al., 2015), was realized in December 2017, with the largest fire in the history of California (the “Thomas fire” that burned 282,000 acres, https://www.vox.com/2017/12/27/16822180/thomas-fire-california-largest-wildfire). This catastrophic fire embodies the sorts of positive feedbacks and interacting factors that could catch humanity off-guard and produce a true apocalyptic event. Record-breaking rains produced an extraordinary flush of new vegetation, that then dried out as record heat waves and dry conditions took hold, coupled with stronger than normal winds, and ignition. Of course the record-fire released CO2 into the atmosphere, thereby contributing to future warming.

Out of all types of feedbacks, water vapor and the ice-albedo feedbacks are the most clearly understood mechanisms. Losses in reflective snow and ice cover drive up surface temperatures, leading to even more melting of snow and ice cover—this is known as the ice-albedo feedback (Curry, Schramm, & Ebert, 1995). As snow and ice continue to melt at a more rapid pace, millions of people may be displaced by flooding risks as a consequence of sea level rise near coastal communities (Biermann & Boas, 2010; Myers, 2002; Nicholls et al., 2011). The water vapor feedback operates when warmer atmospheric conditions strengthen the saturation vapor pressure, which creates a warming effect given water vapor’s strong greenhouse gas properties (Manabe & Wetherald, 1967).

Global warming tends to increase cloud formation because warmer temperatures lead to more evaporation of water into the atmosphere, and warmer temperature also allows the atmosphere to hold more water. The key question is whether this increase in clouds associated with global warming will result in a positive feedback loop (more warming) or a negative feedback loop (less warming). For decades, scientists have sought to answer this question and understand the net role clouds play in future climate projections (Schneider et al., 2017). Clouds are complex because they both have a cooling (reflecting incoming solar radiation) and warming (absorbing incoming solar radiation) effect (Lashof, DeAngelo, Saleska, & Harte, 1997). The type of cloud, altitude, and optical properties combine to determine how these countervailing effects balance out. Although still under debate, it appears that in most circumstances the cloud feedback is likely positive (Boucher et al., 2013). For example, models and observations show that increasing greenhouse gas concentrations reduces the low-level cloud fraction in the Northeast Pacific at decadal time scales. This then has a positive feedback effect and enhances climate warming since less solar radiation is reflected by the atmosphere (Clement, Burgman, & Norris, 2009).

The key lesson from the long list of potentially positive feedbacks and their interactions is that runaway climate change, and runaway perturbations have to be taken as a serious possibility. Table 2 is just a snapshot of the type of feedbacks that have been identified (see Supplementary material for a more thorough explanation of positive feedback loops). However, this list is not exhaustive and the possibility of undiscovered positive feedbacks portends even greater existential risks. The many environmental crises humankind has previously averted (famine, ozone depletion, London fog, water pollution, etc.) were averted because of political will based on solid scientific understanding. We cannot count on complete scientific understanding when it comes to positive feedback loops and climate change.

#### NASA rock relocations thump the aff --- plan doesn’t affect, and there’s other methods of mining

Sarah Scoles 15, “Dust from asteroid mining spells danger for satellites,” New Scientist, 5-27-2015, https://www.newscientist.com/article/mg22630235-100-dust-from-asteroid-mining-spells-danger-for-satellites/

NASA chose the second option for its Asteroid Redirect Mission, which aims to pluck a boulder from an asteroid’s surface and relocate it to a stable orbit around the moon. But an asteroid’s gravity is so weak that it’s not hard for surface particles to escape into space. Now a new model warns that debris shed by such transplanted rocks could intrude where many defence and communication satellites live – in geosynchronous orbit. According to Casey Handmer of the California Institute of Technology in Pasadena and Javier Roa of the Technical University of Madrid in Spain, 5 per cent of the escaped debris will end up in regions traversed by satellites. Over 10 years, it would cross geosynchronous orbit 63 times on average. A satellite in the wrong spot at the wrong time will suffer a damaging high-speed collision with that dust. The study also looks at the “catastrophic disruption” of an asteroid 5 metres across or bigger. Its total break-up into a pile of rubble would increase the risk to satellites by more than 30 per cent (arxiv.org/abs/1505.03800). That may not have immediate consequences. But as Earth orbits get more crowded with spent rocket stages and satellites, we will have to worry about cascades of collisions like the one depicted in the movie Gravity. Handmer and Roa want to point out the problem now so that we can find a solution before any satellites get dinged. “It is possible to quantify and manage the risk,” says Handmer. “A few basic precautions will prevent harm due to stray asteroid material.”

#### This advantage is backwards – resource wars happen because of a lack of resources, not an abundance of them. Klare is about a lack of existing resources on Earth, not in the context of a boom and bust cycle on the Moon, which presents an entirely different set of problems.

#### No space war – it’s hype and systems are redundant

Johnson-Freese and Hitchens 16 [Dr. Joan Johnson-Freese is a member of the Breaking Defense Board of Contributors, a Professor of National Security Affairs at the Naval War College and author of Space Warfare in the 21st Century: Arming the Heavens. Views expressed are those of the author alone. Theresa Hitchens is a Senior Research Scholar at the Center for International and Security Studies at Maryland (CISSM), and the former Director of the United Nations Institute for Disarmament Research (UNIDIR) in Geneva, Switzerland. Stop The Fearmongering Over War In Space: The Sky’s Not Falling, Part 1. December 27, 2016. https://breakingdefense.com/2016/12/stop-the-fearmongering-over-war-in-space-the-skys-not-falling-part-1/]

In the last two years, we’ve seen rising hysteria over a future war in space. Fanning the flames are not only dire assessments from the US military, but also breathless coverage from a cooperative and credulous press. This reporting doesn’t only muddy public debate over whether we really need expensive systems. It could also become a self-fulfilling prophecy. The irony is that nothing makes the currently slim possibility of war in space more likely than fearmongering over the threat of war in space.

Two television programs in the past two years show how egregious this fearmongering can get. In April 2015, the CBS show 60 Minutes ran a segment called “The Battle Above.” In an interview with General John Hyten, the then-chief of U.S. Air Force Space Command, it came across loud and clear that the United States was being forced to prepare for a battle in space — specifically against China — that it really didn’t want.

It was explained by Hyten and other guests that China is building a considerable amount of hardware and accumulating significant know-how regarding space, all threatening to space assets Americans depend on every day. If viewers weren’t frightened after watching the segment, it wasn’t for lack of trying on the part of CBS.

Using terms like “offensive counterspace” as a 1984 NewSpeak euphemism for “weapons,” it was made clear that the United States had no choice but to spend billions of dollars on offensive counterspace technology to not just thwart the Chinese threat, but control and dominate space. While it didn’t actually distort facts — just omit facts about current U.S. space capabilities — the segment was basically a cost-free commercial for the military-industrial complex.

In retrospect though, “The Battle Above” was pretty good compared to CNN’s recent special, War in Space: The Next Battlefield. The latter might as well have been called Sharknado in Space – because the only far-out weapons technology our potential adversaries don’t have, according to the broadcast, seems to be “sharks with frickin’ laser beams attached to their heads!”

First, CNN needs to hire some fact checkers. Saying “unlike its adversaries, the U.S. has not yet weaponized space” is deeply misleading, like saying “unlike his political opponents, President-Elect Donald Trump has not sprouted wings and flown away”: A few (admittedly alarming) weapons tests aside, no country in the world has yet weaponized space. Contrary to CNN, stock market transactions are not timed nor synchronized through GPS, but a closed system. Cruise missiles can find their targets even without GPS, because they have both GPS and precision inertial measurement units onboard, and IMUs don’t rely on satellite data. Oh, and the British rock group Pink Floyd holds the only claim to the Dark Side of the Moon: There is a “far side” of the Moon — the side always turned away from the Earth — but not a “dark side” — which would be a side always turned away from the Sun.

More nefariously, the segment sensationalized nuggets of truth within a barrage of half-truths, backed by a heavy bass, dramatic soundtrack (and gravelly-voiced reporter Jim Sciutto) and accompanied by sexy and scary visuals.

Make no mistake there are dangers in space, and the United States has the most to lose if space assets are lost. The question is how best to protect them. Here are a few facts CNN omitted.

The Reality

The U.S. has all of the technologies described on the CNN segment and deemed potentially offensive: maneuverable satellites, nano-satellites, lasers, jamming capabilities, robotic arms, ballistic missiles that can be used as anti-satellite weapons, etc. In fact, the United States is more technologically advanced than other countries in both military and commercial space.

That technological superiority scares other countries; just as the U.S. military space community is scared of other countries obtaining those technologies in the future. The U.S. military space budget is more than 10 times greater than that of all the countries in the world combined. That also causes other countries concern.

More unsettling still, the United States has long been leery of treaty-based efforts to constrain a potential arms race in outer space, as supported by nearly every other country in the world for decades. Indeed, under the administration of George W. Bush, the U.S. talking points centered on the mantra “there is no arms race in outer space,” so there is no need for diplomat instruments to constrain one. Now, a decade later, the U.S. military – backed by the Intelligence Community which operates the nation’s spy satellites – seems to be shouting to the rooftops that the United States is in danger of losing the space arms race already begun by its potential adversaries. The underlying assumption — a convenient one for advocates of more military spending — is that now there is nothing that diplomacy can do.

However, it must be remembered that most space-related technologies – with the exception of ballistic missiles and dedicated jammers – have both military and civil/commercial uses; both benign — indeed, helpful — and nefarious uses. For example, giving satellites the ability to maneuver on orbit can allow useful inspections of ailing satellites and possibly even repairs.

Further, the United States is not unable to protect its satellites, as repeated during the CNN broadcast by various interviewees and the host. Many U.S. government-owned satellites, including precious spy satellites, have capabilities to maneuver. Many are hardened against electro-magnetic pulse, sport “shutters” to protect optical “eyes” from solar flares and lasers, and use radio frequency hopping to resist jamming.

Offensive weapons, deployed on the ground to attack satellites, or in space, are not a silver bullet. To the contrary, U.S. deployment of such weapons may actually be detrimental to U.S. and international security in space (as we argued in a recent Atlantic Council publication, Towards a New National Security Space Strategy). Further, there are benefits to efforts started by the Obama Administration to find diplomatic tools to restrain and constrain dangerous military activities in space.

These diplomatic efforts, however, would be undercut by a full-out U.S. pursuit of “space dominance.” This includes dialogue with China, the lack of which Gen. William Shelton, retired commander of Air Force Space Command, lamented in the CNN report.

Given CNN’s “cast,” the spin was not surprising. Starting with Ghost Fleet author Peter Singer set the sensationalist tone, which never altered. The apocalyptic opening, inspired by Ghost Fleet, posited a scenario where all U.S. satellites are taken off-line in nearly one fell swoop. Unless we are talking about an alien invasion, that scenario is nigh on impossible. No potential adversary has such capabilities, nor will they ever likely do so. There is just too much redundancy in the system.

#### No space war – prefer data over political rhetoric

Klimas interviewing Weeden 18 [Brian Weeden, smart space guy. Is the space war threat being hyped? August 3, 2018. https://www.politico.com/story/2018/08/03/space-war-threat-hype-force-760781]

There’s been increasing rhetoric...about the militarization of space and the potential for conflicts on Earth to extend into space. That’s driven in part by reports about anti-satellite testing in Russia and China...The report really grew out of our frustration at the level of publicly available information on this topic.

A lot of what you get are public statements from military leadership or politicians, or sometimes news articles talking about something and it’s really hard to get down to details and...sort through what might be real, what might be hype. Our goal was to dig into the open source material and see what we could determine from a factual standpoint was really going on -- what types of capabilities were being developed and how might they be used in a future conflict.

Ultimately we hoped that would lead to a more informed debate about what U.S. strategy should be to address those threats.

What sort of feedback have you gotten so far?

A lot of the feedback has been either informal or private because a lot of the issues we talk about, people in the government research using classified materials. So it’s difficult for them to give detailed feedback.

In general, the feedback we’ve gotten has been pretty positive. People have said they like the fact that this sort of stuff is being put in the public domain and encouraged us to continue.

Were your findings better or worse than the picture public discourse paints?

In general, it’s a little bit better. A lot of political rhetoric and news stories focus on the most extreme examples, so using kinetic weapons to blow up satellites. While there is research and development going on to develop those capabilities, what we found is there’s yet to be any publicly-known example of them being used.

What is being used and what seems to be of the most utility are the non-kinetic things, like jamming and cyber attacks. The good news is we have yet to see the most destructive kinetic attacks that can cause really harmful long-term damage to the space environment, but unfortunately we are seeing non-kinetic attacks being used, and that’s likely to continue.

### Debris

#### Debris are totally inevitable – satellites, public space stations, discarded rocket parts – 1AC cards say the plan is necessary but not sufficient.

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

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

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

What is Kessler Syndrome?

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

It is a dark picture.

Is Kessler Syndrome likely to happen?

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

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

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

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

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

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

How bad could Kessler Syndrome in High LEO be?

Let’s imagine a worst case scenario.

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

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

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

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

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

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

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

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

#### It takes centuries and adaptation solves

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The dynamics of the Kessler Syndrome are real, and most people studying it agree on the concept: if there is sufficient density of objects and mass, a chain reaction of debris breaking up objects and creating more debris can occur. But the timescale of this process takes decades and centuries. There are many assumptions that go into these models. Though there is still argument about this, many people in the field think that the process is already underway in low earth orbit. But others, including myself, think we can stop it if we take action. This is a slow motion disaster that we can prevent.

But in spite of hype to the contrary, we will never “lose access to space”. Certain missions may become impractical or too expensive, and we may decide that some orbits are too risky for humans. Even that depends on the tolerance for the risk. But robots don’t have mothers, and if we feel it is worthwhile we will take the risk and fly the satellites where we need to.

To the specifics of the question, it will take many decades. It will not destroy all satellites in LEO. You won’t be able to see it from the ground unless you were extraordinarily lucky, and you happened to see a flash from a collision in the instant you were looking, with just the right lighting.

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

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

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

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

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

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

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

#### No impact on future activity – future spacecraft will be hardened and space mining occurs in deep space.

#### Satellite loss shuts down global fracking

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Energy, environment, farming, mining, land use. All of these areas and more are now inextricably linked to satellite data and would be devastated should that flow of data stop.

Environmental Monitoring

Oh how complacent we've become. We take for granted that we will have instant images from space showing a volcanic eruption somewhere in the South Pacific within hours of learning that it happened. When the BP oll spill happened in the Gulf of Mexico in 2010, satellite images were used in conjunction with aircraft and ships to monitor the extent and evolving nature of the spill (Figures 10.1 and 10.2).

The data were also used to direct the ships that were attempting to clean up the spill, to warn fishermen of areas in which it would be dangerous to fish, and to generally monitor the extent of the disaster. This is the type of data we get from space in a field known as remote sensing.

Remote sensing is, well, exactly what its name implies. With it, you gather data, or sense, usually in the form of electromagnetic radiation (light), remotely - that is, you are not physically touching what you are looking at. Satellite remote sensing began shortly after we began launching satellites and many industries are now totally dependent upon having the capability.

We use satellites, like the venerable Landsat series, to study the Earth m unprecedented detail. Since 1972, Landsat satellites have taken millions of high resolution images of the Earth's surface, allowing comprehensive studies of how the land has changed due to human intervention (deforestation, agriculture, settlement, etc.) and natural processes (desertification, floods, etc.).

The best way to understand how useful Landsat and similar data can be to governments at all levels is best illustrated by looking at 14then and now" photographs. For example, Africa's Lake Chad has been shrinking for 40 years, as the desert has encroached on this once plentiful inland freshwater lake. Forty years ago, there were about 15,000 square miles of water within the lake. Now, it is less than 500 square miles (Figure 10.3) [1].

And what is the practical side of this particular bit of information?

Governments use this type of satellite imagery to avoid human tragedy. Hundreds of thousands of people, if not millions, depend upon the waters of Lake Chad for agriculture, industry, and personal hygiene. With the lake going dry, how has this impacted on their livelihoods, their families, and their very lives?

The European Space Agency (ESA) is freely providing satellite data to developing countries as they search for new sources of drinking water. For example, ESA assessed data obtained from space over Nigeria to find over 90 new freshwater sources within that country. After ground teams visited the new sites, all were confirmed to contain fresh water. This was no accident. These were satellites with sensors developed for just such purposes in mind [2].

Desertification is but one example of changing climates affecting people's everyday lives. What about more direct observations of our impact on the planet? Figures 10.4 and 10.5 show the scarring of the Earth's surface as a result of surface mining in West Virginia. This is not a polemic against mining; rather, it is an observation that we can use satellite imagery to monitor such mining and be mindful of its impact on the environment.

Other than taking pictures of surface features, like lakes and open pit mines, how are satellites monitoring the Earth's changing climate? In just about every way, by: monitoring global land, sea, and atmospheric temperatures; measuring yearly average rainfall amounts just about everywhere on the globe; measuring glaciation rates; measuring sea surface heights; and more. Remote sensing is more than taking pictures of the Earth in the visible part of the spectrum. We can learn a great deal from looking at part of the spectrum that our eyes cannot see - but our instruments can.

Shown in Figure 10.6 is a composite image of the Earth's surface showing the average land-surface temperature at night. The data came from two NASA satellites, Terra and Aqua, as they orbit the Earth in a polar orbit. (This means that they circle the Earth from top to bottom, passing over both the North and South Poles with each complete orbit.) Terra's orbit is such that it passes from the north to the south across the equator in the morning; Aqua passes south to north over the equator in the afternoon. Taken together, they observe the Earth's surface in its entirety every two days. Data sets such as this exist for just about any day of the year and can show either night-time lows or daytime highs.

By looking in different parts of the spectrum, like the infrared light discussed above, we can make observations as described in Table 10.1.

Pollution Monitoring

As emerging countries industrialize, they also become polluters. Many of these countries are not exactly forthright about releasing air-pollution details to the media, so much of our awareness of the rising pollution there is anecdotal - typically m the form of stories told by people who have visited these countries and seen the extreme pollution at first hand. This, by the way, is not exactly scientific.

Using satellites, and not relying on either the governments in question or second-hand stories, we can accurately assess the pollution levels there and elsewhere. Using satellite images to measure the amount of light absorbed or blocked by fine particulates in the atmosphere, otherwise known as air pollution, you can determine not only what the airborne pollutant might be, but also its size. And, by looking at the overall light blockage, an accurate estimate of the amount of pollution in the air can also be made. Recent studies show that many of these countries are covered in a pollution cloud that countries in the developed world would deem extremely harmful. And how do we know this with scientific certainty? From satellite measurements.

Energy Production

The recent boom in the production of shale oil in the United States and elsewhere is due in large part to the identification and geolocation of promising geologic formations for test drilling and fracking. "Fracking" is a somewhat new term that comes from the phrase "hydraulic fracturing". In fracking, massive amounts of previously unusable reservoirs of oil and natural gas are released for capture, sale, and transport from deposits deep within the Earth - many located at least a mile below the surface. In the United States alone, there may be as much as 750 trillion cubic feet of natural gas within shale deposits releasable by fracking [3]. How do energy companies know where to look for these deposits? In large part, by analyzing satellite imagery.

According to Science Daily (26 February 2009), a new map of the Earth's gravitational field based on satellite measurements makes it much less resource intensive to find new oil deposits. The map will be particularly useful as the ice melts in the oil-rich Arctic regions. The easy-to-find oilfields have already been found. To fuel the growing world economy, those harder-to-find deposits must be located and tapped - which is why satellite imagery is so important. Take away this and other satellite-dependent techniques of oil and gas exploration and the world economy will feel the impact through higher oil and natural gas prices.

#### Fracking makes extinction inevitable---try-or die to shut it off

Rev. Mac Legerton 18, Co-Founder and Executive Director of the Center for Community Action, Member of the Board of Directors of the NC Climate Solutions Coalition, Member of the Board of Directors of the Windcall Institute, “Will The U.S. Blaze A Trail To Mass Extinction?”, APPPL News, 1/15/2018, https://www.apppl.org/news/will-the-u-s-blaze-a-trail-to-mass-extinction/

As an elder, I now realize that there is even a greater threat to humanity and life on Earth than nuclear war—though, unlike a nuclear exchange, this threat is a slow-motion catastrophe. Can you guess what it is? Here’s a clue: it is something with which most people don’t have a personal relationship. Tragically, some persons remain in total denial of its validity, much less its present danger. And that’s the problem – that’s why this threat needs to be more seriously addressed on the local, state, national, and international level.

What is it? It’s the slow-motion but rapidly growing catastrophe of climate change. There’s now good news amidst this seemingly overwhelming challenge. But the answer may surprise you. Today we know what is the #1 preventable cause of climate change. It’s not coal, it’s not nuclear, and it’s not oil and gasoline. It’s actually the use of the very fuel that is touted as being cleaner, greener, and cheaper than all the rest. This fuel is called “Natural Gas”.

Let’s start with its name – “Natural Gas”. What is “natural gas”? There’s actually nothing “natural” about it when it is forcibly extracted from the ground through hydraulic fracturing, commonly known as “fracking”. When something is forcibly ruptured from deep within the earth with the use of toxic chemicals, the last name you would use for it is “natural”.

Fracking disrupts the geologic fault lines causing earthquakes, uses millions of gallons of fresh water that becomes permanently poisoned by unknown, cancer-producing chemicals added to it, creates air pollution during the drilling process, increases the risk of injury and explosions, raises major health risks to both people and place in close proximity to it, and changes the nature of both neighborhoods and landscapes. Fracking also leaves a massive carbon footprint of drilling wells as deep as 8,000 feet and then drilling horizontally over 10,000 feet; On top of all this, it leaks major amounts of gas into the environment.

So, what is this gas? It is 90-95% methane gas which is a hydrocarbon compound made up of one carbon atom and four hydrogen atoms (CH4). It releases carbon into the atmosphere and produces carbon dioxide (C02) just like coal does when it is burned. Methane is not its trace element–it is its undisputed compound of this fossil fuel product. If a compound is 90-95% of a product, it makes sense to call it by that name. Doesn’t it? Well, actually not if you want people to believe and think that it is something that it is not. It is un-natural methane gas produced under massive and highly toxic pressure and hazardous conditions.

Now that we know what this gas is, what does it do to the atmosphere and climate that is so dangerous? This hydrocarbon has properties that block the radiation of heat from Earth’s surface 100 times more effectively than CO2 (released from burning coal) during its first 10 years of release and 86 times more effectively in its first 20 years. Because of the climate emergency underway, the first 10 or 20 years matter most.

When utility companies and the larger fossil fuel companies state that they are committed to lowering carbon emissions, this just isn’t true. They are radically escalating the most dangerous and worst of all fossil fuels in relation to its impact on the climate. Now the industry wants to expand production of methane gas all over the world by calling it “the most environmentally friendly fossil fuel”and a “bridge fuel” that we can safely use until we transition to 100% renewable energy sources.

Why would a major business industry want to call its product by another name? Perhaps for the same reason that the tobacco industry did not like the term “coffin nails” or “cancer sticks” for cigarettes. Honestly, there’s a striking similarity between what are called cigarettes and natural gas. When both were produced and named, their harm was not fully known. Once the industries promoting them learned of their significant harm, they did everything they could to hide this knowledge from the public. They even hired scientists to deny their dangers. The tobacco industry was eventually sued, the truth was acknowledged, and billions of dollars were paid out in the tobacco settlement.

This same scenario that occurred with the tobacco industry needs to occur with methane gas and the fossil fuel industry. The major difference in these two scenarios is that that this fossil fuel product doesn’t just threaten the lives of individuals who voluntarily breathe it in – it threatens the lives of not only every human being, but also all life on the planet. The outcome of this scenario needs to be a moratorium and eventual end to all use of methane gas as an energy source. For the sake of all of us, our communities, and world, the sooner the better. This abomination is different. There is no time to waste.

#### Plan eliminates the satellites they think are good

Takaya et al 18 “The Principle of Non-Appropriation and the Exclusive Uses of LEO by Large Satellite Constellations” Yuri Takaya-Umehara [Visiting researcher at the University of Tokyo since April 2017. She was affiliated to the Kobe University to provide a course on space law to post-graduate students (2011-2017). She chairs a working group on the formulation of global norms in space law organized by the Keio University since 2018. She obtained her Ph.D. degree at the IDEST of Paris XI University in France, LL.M. at the Leiden University in the Netherlands.] Quentin Verspieren [Ph.D. in public policy @ The University of Tokyo, Assistant Professor of Space Policy @UTokyo, General Manager, Global Strategy @ArkEdge Space Inc., Associate Research Fellow @ESPI] Goutham Karthikeyan [The University of Tokyo & Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency (ISAS-JAXA)] 2018 https://www.researchgate.net/publication/328094878\_The\_Principle\_of\_Non-Appropriation\_and\_the\_Exclusive\_Use\_of\_LEO\_by\_Large\_Satellite\_Constellations SM

By investigating expected large satellite constellation projects and by reviewing existing interpretations of international space law, this paper argues that the exclusive use of specific LEO orbits by a large constellation of satellite could constitute a violation of the non-appropriation principle by means of occupation and by means of use, drawing a parallel between orbits as resources and the exploitation of tangible mineral resources in space. Based on this, the important question to be raised is what constitutes an exclusive use of a specific orbit. In other words, an important hurdle in the concrete evaluation of whether a planned or established constellation potentially violates the non-appropriation principle through an exclusive use of LEO resides in the lack of clear definition on what can be considered an exclusive use. While the authors claim that legal issue can be clearly solved in abstracto, it naturally shifts towards a regulatory challenge.

This regulatory challenge consists in first defining qualitatively what is the exclusive use of an orbit before translating this definition into measurable, technical rules. In this paper, the authors define an exclusive use of an orbit by a state40 as any use that would prevent/hinder the usage of the same orbit by any other state. Translating this definition into an applicable regulation could consist in defining a threshold of orbital collision risk or a threshold of density of satellites along an orbit based on its altitude, shape, relative velocity of neighbouring objects, etc. It is however not the purpose of this space law paper. What is more appropriate here is to think about which organization or forum would be in charge of elaborating this technical definition. Serious candidates could be the ITU, with excellent track-record in dealing with the use of the GEO region but which would have to review its “first come, first served” principle, or the UNCOPUOS, aiming for the widespread adoption of a new piece of international law. Moreover, even if its rules suffer from a low implementation rates, the IADC would be an appropriate discussion platform thanks to its very deep technical focus.

6. Conclusion

The various announced projects of LSC, also called mega-constellations, push existing regulations and practices to their limit, forcing researchers and practitioners around the world to rethink the applicability of existing space law principles to this new trend. In this paper, the authors, after providing background information on current LSC plans as well as recalling the legal status of the LEO region, investigate whether the deployment of an LSC having an exclusive use of an orbit constitutes a violation of the nonappropriation principle as stated in OST Article II. This paper concludes that:

The exclusive use of an orbit by an LSC constitutes a violation of the non-appropriation principle by means of occupation due to the innate nature of orbit being a specific location in space that can be occupied, but most notably by means of use, considering orbits as “limited natural resources” and invoking parallels with the exploitation of natural resources in outer space;

ITU’s “first come, first served” principle is reaching its limits with current LSC projects and should be re-evaluated;

The main challenge ahead is not legal but technical and regulatory and consists in defining precisely what can constitute an exclusive use of an orbit and in translating such definition into a clear regulation or code of conduct.