R5 NEG

I negate: The appropriation of outer space by private entities is unjust. I value justice, because the resolution concerns the justness of a state action. The criterion is maximizing well being, (me and my opponent agree) prefer because:

[1] Pleasure and pain are intrinsically valuable. People consistently regard pleasure and pain as good reasons for action.

Moen 16 [Ole Martin Moen, Research Fellow in Philosophy at University of Oslo "An Argument for Hedonism" Journal of Value Inquiry (Springer), 50 (2) 2016: 267–281] GI

I think several things should be said in response to Moore's challenge to hedonists. First, I do not think the burden of proof lies on hedonists to explain why the additional values are not intrinsic values. If someone claims that X is intrinsically valuable, this is a substantive, positive claim, and it lies on him or her to explain why we should believe that X is in fact intrinsically valuable. Possibly, this could be done through thought experiments analogous to those employed in the previous section. Second, there is something peculiar about the list of **additional intrinsic values** that counts in hedonism's favor: the listed values have a strong **tend**ency **to be** well **explained as things that** help **promote pleasure and avert pain.** To go through Frankena's list, **life** and **consciousness** are necessary presuppositions for pleasure; **activity**, health, and strength **bring about pleasure;** and happiness, beatitude, and contentment are regarded by Frankena himself as "pleasures and satisfactions." The same is arguably true of beauty, harmony, and "proportion in objects contemplated," and also of affection, friendship, harmony, and proportion in life, experiences of achievement, adventure and novelty, self-expression, good reputation, honor and esteem. Other things on Frankena's list, such as understanding, wisdom, freedom, peace, and security, although they are perhaps not themselves pleasurable, are important means to achieve a happy life, and as such, they are things that hedonists would value highly. Morally good dispositions and virtues, cooperation, and just distribution of goods and evils, moreover, are things that, on a collective level, contribute a happy society, and thus the traits that would be promoted and cultivated if this were something sought after. To a very large extent, the intrinsic values suggested by pluralists tend to be hedonic instrumental values. Indeed, pluralists' suggested intrinsic values all point toward pleasure, for while the other values are reasonably explainable as a means toward pleasure, pleasure itself is not reasonably explainable as a means toward the other values. Some have noticed this. Moore himself, for example, writes that though his pluralistic theory of intrinsic value is opposed to hedonism, its application would, in practice, look very much like hedonism's: "Hedonists," he writes "do, in general, recommend a course of conduct which is very similar to that which I should recommend."24 Ross writes that "[i]t is quite certain that by promoting virtue and knowledge we shall inevitably produce much more pleasant consciousness. These are, by general agreement, among the surest sources of happiness for their possessors."25 Roger Crisp observes that "those goods cited by non-hedonists are goods we often, indeed usually, enjoy."26 What Moore and Ross do not seem to notice is that their observations give rise to two reasons to reject pluralism and endorse hedonism. The first reason is that*7if the suggested non-hedonic intrinsic values are potentially explainable by appeal to just pleasure and pain (which, following my argument in the previous chapter, we should accept as intrinsically valuable and disvaluable), then—by appeal to Occam's razor—we have at least a pro tanto reason to resist the introduction of any further intrinsic values and disvalues. **It is ontologically** more **costly to posit a plurality of intrinsic values and disvalues, so in case all values admit** of **explanation by** reference to **a single intrinsic value and** a single intrinsic **disvalue, we have reason to reject more complicated accounts.** The fact that suggested non-hedonic intrinsic values tend to be hedonistic instrumental values does not, however, count in favor of hedonism solely in virtue of being most elegantly explained by hedonism; it also does so in virtue of creating an explanatory challenge for pluralists. The challenge can be phrased as the following question: If the non-hedonic values suggested by pluralists are truly intrinsic values in their own right, then why do they te nd to point toward pleasure and away from pain?27

[2] Moral uncertainty means preventing extinction should be our highest priority.

Bostrom 12 [(Nick Bostrom, Faculty of Philosophy & Oxford Martin School University of Oxford) "Existential Risk Prevention as Global Priority." Global Policy, 2012] TDI

These reflections on moral uncertainty suggest an alternative, complementary way of looking at existential risk; they also suggest a new way of thinking about the ideal of sustainability. Let me elaborate.¶ Our present understanding of axiology might well be confused. We may not now know — at least not in concrete detail — what outcomes would count as a big win for humanity; we might not even yet be able to imagine the best ends of our journey. If we are indeed profoundly uncertain about our ultimate aims, then we should recognize that there is a great option value in preserving — and ideally improving — our ability to recognize value and to steer the future accordingly. Ensuring that there will be a future version of humanity with great powers and a propensity to use them wisely is plausibly the best way available to us to increase the probability that the future will contain a lot of value. To do this, we must prevent any existential catastrophe.

Prefer-

1~ Bindingness— I could put my hand on a hot stove and I'd automatically pull it back before a signal is sent to my brain— Anything else fails to be morally binding because one could always ask "why not?"
2~Degrees of wrongness – only consequentialism can explain why breaking a promise to take someone to the hospital is worse than breaking a promise to play video games – absolutist frameworks fail because you can't weigh between violations of framework
That outweighs:
3~ Extinction first under any framework
A~ Future lives — trillions of future lives are lost. They are just as valuable as current ones – anything else says some lives are worth less than others which is genocidal rhetoric
B~ Reversibility — extinction forecloses future improvement; prefer — if we're unsure about which interpretation of the world is true, we should preserve it to figure things out.

Innovation

Commercialization is driving innovation now - Weeden 15

https://spacenews.com/op-ed-american-leadership-in-space-2-0/

The main driver for this new leadership is the commercial space sector, not the U.S. government. Instead of attempting to recapture "Space 1.0" leadership by focusing purely on stronger U.S. government space programs, another possible strategy is to develop a "Space 2.0" approach and focus on encouraging, shaping and leveraging the commercial space sector to help propel it into the future.

This new leadership approach is possible because we are currently in the beginnings of a revolution in commercial space activities. The revolution is based on a potent combination of Moore's Law, spin-in technologiies from the information technology (IT) sector, and cloud computing that has enabled small-satellite technology to change the price/performance ratio, fueled by a significant infusion of private venture capital. These drivers have spurred the creation of dozens of new American space companies and a rekindling of competitive spirit in many legacy companies. The end result has been an infusion of fresh ideas, new approaches, increased innovation and new excitement in the space world. Although it's uncertain which commercial space companies will emerge from the competition and actually make it to space, we know for certain that humanity as a whole will benefit. The commercial revolution in space is radically reducing the costs of accessing data and services from satellites While simultaneously increasing the amount, frequency and quality of information gathered. At the same time, improved analytics are being developed to turn the raw data into useful information and increasing accessibility to a wider number of users. That in turn leads to more "eyeballs" examining and investigating data, which leads to more [and] new insights and applications that no one else thought of. The end result is going to be vastly more knowledge about the world we live in and socioeconomic benefits we cannot even dream of today.…It should be obvious that stopping, or even controlling, the commercial space revolution is not a useful public policy option. Most of the technology driving the revolution comes from smartphones, cloud computing and the broader IT sector. That technology is already globalized, and Cold War technology transfer restrictions are increasingly ineffective in controlling space technology. Putting in place stricter policy restrictions or prohibitions on what commercial companies can do in space will only create greater incentives for the companies to relocate to other countries that might have more attractive policies. The end result would be the same global access to the capabilities, even less U.S. government ability to control them, and the loss of the economic benefits from a robust domestic industry. Of all the countries in the world, the United States is best placed to be able to fully leverage the benefits from a robust commercial space sector. It was the birthplace of the computer revolution, and is the global leader in information technology. It has a strong legal system for protecting intellectual property rights while simultaneously encouraging robust competition. It is the

U.S. commercial space industry, not government space programs, that will truly play to America's strengths in a more competitive environment.There are agencies within the U.S. government that have already embraced this approach. One standout is the National Geospatial-Intelligence Agency (NGA). Under the leadership of Robert Cardillo, NGA is implementing a new strategy to find and exploit the innovations of the private sector, and increase the data and products it releases publicly. NGA understands that the only way it can succeed in a more complex and dynamic world is by staying ahead of technology trends, which in turn means embracing private-sector innovation. The rest of the U.S. government should follow NGA's lead and continue to implement the elements of the Obama administration's 2010 National Space Policy that encourage, foster and leverage the commercial space revolution. The focus should be on putting in place policies that will enabl[ing] the U.S. commercial sector to innovate even faster, ensuring that it will continue to outpace foreign competition and foreign government programs. Where necessary, the U.S. government should be funding basic research and development R&D, incentivizing industrial R&D, and helping new technologies move through the "valley of death" from basic research toward commercialization. It should be looking at how commercial products and services can complement, or even replace, government-only programs. And at the same time it should be watching out for the public good and putting in place minimal oversight functions to ensure a sustainable, reliable and predictable space environment that allows private investment to flourish.

Appropriation is key to sustained investment in the space economy- Brehm '15

https://uwlaw-omeka.s3.us-east-2.amazonaws.com/original/85c099453455f8163454cd946f8762427c1a910f.pdf

Wayne White's treaty proposal creates a strong foundation for international discussion of the increasingly important issue of private property acquisition in outer space. White's well-crafted treaty proposal seeks to advance private exploration of outer space within the regulatory framework of the Outer Space Treaty and existing international space law. By creating a system in which private entities can establish real property rights in their space objects and a surrounding safety zone, the proposal incentivizes private investment of large sums into space exploration programs. Provisions which authorize the right to exclude, the right to be free from interference, the exclusive right to appropriate resources within an established safety zone, and the right to sell real property further encourage private space exploration and create strong associated incentives. 7 Private space exploration and resource extraction entities allocate substantial investments in furtherance of their space programs.0 8 Allowing such entities to mine valuable platinum group resources, as well as water and hydrogen in celestial bodies that can be used to propel deeper space exploration, not only provides a robust safety net for current space exploration entities,and but also creates a system that encourages new entities to enter into the field of private space exploration. Increased space exploration across the board would have nearly unlimited benefits in terms of societal, economical, and technological advancement.0 9 …Ultimately, a combination of an international agreement that establishes a responsible system of private property acquisition in outer space and domestic legislation that recognizes such private property rights provides a meaningful framework to encourage and facilitate the future of space exploration. Such a system would give way to further space exploration and vast economic, technological, and societal improvements. Ultimately, establishing a system of private property rights in outer space through international agreement and domestic legislation would lead to a world in which the final frontier is no longer restricted to the use and exploration of only the most technologically advanced nations. Essentially, such a system would allow for free space exploration and use by all. V. CO

Space innovation is key to solving climate change.

Greg Autry, Professor of Space Leadership at Thunderbird School of Global Management, writes in 2019:

Greg **Autry 19** (Greg Autry, Clinical Professor of Space Leadership, Policy and Business at Thunderbird School of Global Management, Tech startup founder, Researcher on entrepreneurship, commercial space and economics. Former NASA Presidential Appointee. Writer & regular Forbes contributor, 2021 Space Advocate of the Year.) Space Research Can Save the Planet—Again 7-20-2019 Foreign Policy https://foreignpolicy.com/2019/07/20/space-research-can-save-the-planet-again-climate-change-environment/ //DebateDrills TJ

Indeed, understanding the evolution of other planets' climates is essential for modeling possible outcomes on Earth. NASA probes revealed how, roughly 4 billion years ago, a runaway greenhouse gas syndrome turned Venus into a hot, hellish, and uninhabitable planet of acid rain. Orbiters, landers, and rovers continue to unravel the processes that transformed a once warm and wet Mars into a frigid, dry dust ball—and scientists even to conceive of future scenarios that might terraform it back into a livable planet. Discovering other worlds' history and imagining their future offers important visions for climate change mitigation strategies on Earth, such as mining helium from the moon itself for future clean energy.

Spinoff technologies from **space research, from GPS to semiconductor solar cells**, are already helping to reduce emissions; the efficiency gains of GPS-guided navigation shrink fuel expenditures on sea, land, and air by between 15 and 21 percent—a greater reduction than better engines or fuel changes have so far provided. Modern solar photovoltaic power also owes its existence to space. The first real customer for solar energy was the U.S. space program; applications such as the giant solar wings that power the International Space Station have continually driven improvements in solar cell performance, and NASA first demonstrated the value of the sun for powering communities on Earth by using solar in its own facilities.

Promisingly, space-based solar power stations could overcome the inconvenient truth that wind and solar will never get us anywhere near zero emissions because their output is inherently intermittent and there is, so far, no environmentally acceptable way to store their power at a global scale, even for one night. **Orbital solar power stations**, on the other hand, would **continually face the sun**, beaming clean power back through targeted radiation to Earth day or night, regardless of weather. They would also be free from clouds and atmospheric interference and therefore operate with many times the efficiency of current solar technology. Moving solar power generation away from Earth—already possible but held back by the current steep costs of lifting the materials into space—would preserve land and cultural resources from the blight of huge panel farms and **save landfills from the growing problem** of discarded old solar panels.

Sustainable energy advocates in the U.S. military and the Chinese government are actively pursuing space-based solar power, but just making solar cells damages the environment due to the **caustic chemicals employed**. Space technology offers the possibility of freeing the Earth's fragile biosphere and culturally important sites from the **otherwise unavoidable damage** caused by manufacturing and mining.

The U.S. start-up Made in Space is currently taking the first steps toward manufacturing in orbit. The company's fiber-optic cable, produced by machinery on the International Space Station, is orders of magnitude more efficient than anything made on Earth, where the heavy gravity creates tiny flaws in the material. Made in Space and others are eventually planning to build large structures, such as solar power stations, in space. As these technologies develop, **they will augment each other, bringing costs down dramatically; space manufacturing, for instance, slashes the cost of solar installations in space**.

Strong Innovation solves Extinction.

Matthews 18 Dylan Matthews 10-26-2018 "How to help people millions of years from now" https://www.vox.com/future-perfect/2018/10/26/18023366/far-future-effective-altruism-existential-risk-doing-good (Co-founder of Vox, citing Nick Beckstead @ Rutgers University)//Re-cut by Elmer

If you care about improving human lives, you should overwhelmingly care about those quadrillions of lives rather than the comparatively small number of people alive today. **The 7.6 billion people now living**, after all, **amount to less than 0.003 percent of the population that will live in the future**. It's reasonable to suggest that those **quadrillions of future people have**, accordingly, **hundreds of thousands of times more moral weight than those of us living here today do**. That's the basic argument behind Nick Beckstead's 2013 Rutgers philosophy dissertation, "On the overwhelming importance of shaping the far future." It's a glorious mindfuck of a thesis, not least because Beckstead shows very convincingly that this is a conclusion any plausible moral view would reach. It's not just something that weird utilitarians have to deal with. And Beckstead, to his considerable credit, walks the walk on this. He works at the Open Philanthropy Project on grants relating to the far future and runs a charitable fund for donors who want to prioritize the far future. And arguments from him and others have turned "long-termism" into a very vibrant, important strand of the effective altruism community. But what does prioritizing the far future even mean? **The most literal thing it could mean is preventing human extinction**, to ensure that the species persists as long as possible. For the long-term-focused effective altruists I know, that typically means identifying concrete threats to humanity's continued existence — like unfriendly artificial intelligence, or a pandemic, or global warming/out of control geoengineering — and engaging in activities to prevent that specific eventuality. **But** in a set of slides he made in 2013, Beckstead makes a compelling case that **while that's certainly part of what caring about the far future entails, approaches that address specific threats to humanity** (which he calls "**targeted**" **approaches** to the far future) **have to complement** "**broad**" **approaches, where instead of trying to predict what's going to kill us all, you just generally try to keep civilization running as best it can, so that it is, as a whole, well-equipped to deal with potential extinction events in the future**, not just in 2030 or 2040 but in 3500 or 95000 or even 37 million. **In other words, caring about the far future doesn't mean just paying attention to low-probability risks of total annihilation; it also means acting on pressing needs now**. For example: **We're going to be better prepared to prevent extinction from AI or a supervirus or global warming if society as a whole makes a lot of scientific progress**. And a significant bottleneck there is that the vast majority of humanity doesn't get high-enough-quality education to engage in scientific research, if they want to, which reduces the **odds that we have enough trained scientists to come up with the breakthroughs** we need as a civilization to survive and thrive. **So maybe one of the best things we can do for the far future is to** improve school systems — here and now — to **harness** the group economist Raj Chetty calls "lost Einsteins" (**potential innovators** who are thwarted by poverty and inequality in rich countries) and, more importantly, the hundreds of millions of kids in developing countries dealing with even worse education systems than those in depressed communities in the rich world. What if living ethically for the far future means living ethically now? Beckstead mentions some other broad, or very broad, ideas (these are all his descriptions): Help make computers faster so that people everywhere can work more efficiently Change intellectual property law so that technological innovation can happen more quickly Advocate for open borders so that people from poorly governed countries can move to better-governed countries and be more productive Meta-research: **improve incentives and norms in academic work** to better advance human knowledge Improve education Advocate for political party X to make future people have values more like political party X "If you look at these areas (economic growth and technological progress, access to information, individual capability, social coordination, motives) a lot of everyday good works contribute," Beckstead writes. "An implication of this is that a lot of everyday good works are good from a broad perspective, even though hardly anyone thinks explicitly in terms of far future standards." Look at those examples again: It's just a list of what normal altruistically motivated people, not effective altruism folks, generally do. Charities in the US love talking about the lost opportunities for innovation that poverty creates. Lots of smart people who want to make a difference become scientists, or try to work as teachers or on improving education policy, and lord knows there are plenty of people who become political party operatives out of a conviction that the moral consequences of the party's platform are good. All of which is to say: Maybe effective altruists aren't that special, or at least maybe we don't have access to that many specific and weird conclusions about how best to help the world. **If the far future is what matters, and generally trying to make the world work better is among the best ways to help the far future, then effective altruism just becomes plain ol' do-goodery.**

Asteroid Mining DA/PIC

CP: States should guarantee property rights only on extracted minerals from asteroids, Macwhorter '15

MacWhorter, Kevin. "Sustainable mining: Incentivizing asteroid mining in the name of environmentalism." *Wm. & Mary Envtl. L. & Pol'y Rev.* 40 (2015): 645.

Congress should pass a law including two components: a domestic provision and an international provision. First, the law should **guarantee property rights in extracted minerals on a first-in-time basis, within the borders of the United States**. This could be accomplished **by declaring all private claims to extracted minerals, brought from outer space, to be respected within the United States,** much like Truman declared when he established the 200-mile economic zone.241 This would protect United States' economic interests, as well as the interests of its private space companies. Further, such a law would attract more investment and spur technological development within the United States. Second, to comply with international obligations, **the law should direct the President to treat with OST signatories to guarantee private property rights in extracted minerals from asteroids.** Again, based on a first-in-time theory of possession, the private actors would come into ownership t**hrough converting real property into personal property** and bringing it back to Earth. This is necessary in order to clearly define the liability of individual nations with respect to their private companies that venture to asteroids. It will also allow private companies to register their minerals, providing them with security in their possession while in outer space. It further decreases the ambiguous limbo many companies see as a barrier to a viable asteroid mining operation.

Asteroid mining is affordable, cheap, and coming soon Hlimi 14 [Tina Hlimi, Canadian lawyer with a Bachelors and Masters Degrees in Environmental Sciences from McGill University, 2014, "THE NEXT FRONTIER: AN OVERVIEW OF THE LEGAL AND ENVIRONMENTAL IMPLICATIONS OF NEAR-EARTH ASTEROID MINING," ANNALS OF AIR AND SPACE LAW, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2546924]/Kanke II. NEAR EARTH ASTEROID: DESCRIPTION AND BENEFITS OF MINING A Near-Earth Asteroid (NEA), oftentimes mistaken for a meteoroid (e.g. a shooting star), a meteorite (e.g. meteoroid which enters Earth's atmosphere and lands on the surface) or a comet (e.g. a small object with ice which vaporizes creating a tail of dust and gas)14 is a rock formation, smaller than a planet. Accordingly, asteroids are occasionally considered minor planets, planetoids or space debris. They are often called the latter, as it is thought they are remnant fragments of the Solar System. It is alleged that the majority of asteroids are composed of "material which never accreted to form planets". 15 Hence, asteroids are ancient rock formations (up to 4.6 billion years in age), akin to ancient fossil fuels reserves on Earth, 16 and it is the antiquity of NEAs which heightens their mineral composition and economic value. Perhaps the most significant benefit of NEAs is the financial returns which commercial entities anticipate upon harvesting. For instance, fragments of the Chelyabinsk, Russia asteroid-meteorite, which entered the atmosphere on February 2013 at an astounding 66,000 km/hour and exploded over Russia's Ural region, have been sold to American laboratories17 for prices upwards of US $10,000.18 Around the same time, another asteroid, 2012 DA14, worth a staggering USD $195 billion came very close to the Earth's orbit. If such asteroids are harvested, the returns could be significant for commercial entities, notwithstanding the logistical costs of exploring and extracting the minerals. NEAs are also extremely sought after by commercial entities as they are closer to the Earth than other celestial bodies, including the Moon. Planetary Resources, one of the leading NEA exploration and mining entities asserts that "[S]ome near-Earth objects are the most accessible destinations in the Solar System". In addition to their prime location, NEAs often have minute gravitational fields, when compared to other celestial bodies. Thus, modest propulsion (e.g. as opposed to the Moon) is required to deploy and return mining spacecraft to and from NEAs, minimising costs for corporations looking to protect their bottom-line.19 Propulsion may also be circumvented; in the 1980s researchers developed a "mass driver" magnetic catapult which could launch recovered natural resources into the Earth's orbit from either the Moon or another celestial body (e.g. a NEA), thus making it a "[c]heap and efficient means of transporting mined resources". 20 Other benefits of NEA mining include accessibility to superior water resources and mineral ore as well as advancing and enhanced scientific knowledge and familiarity with asteroid composition. NEA exploitation will also inevitably spur economic development through job creation and business growth (e.g. terrestrial/extraterrestrial refineries, spacecraft construction, engineers, operators etc.) if and when legal ambiguities are settled.21At present, the technologies for NEA exploitation are also becoming economical and will continue to depreciate in time.22 The sole noteworthy repercussion of NEA mining emanates from environmental pollution and degradation as discussed in greater detail in the following sections. III. TECHNOLOGICAL AND ECONOMIC PROGRESS SPURRING THE NEW SPACE RACE The present world is driven predominantly by commercial interests, which are in turn driven by the demands of a global market economy. Accordingly, it is clear that sufficient developments in spacecraft design, propulsion systems and robotic mining systems [...] already exist to enable some form of robotic prospecting and mining of asteroids.23 Since the start of the Cold War era and the space rivalry between the Soviet Union and the United States,24 the world has entered the space age. Noteworthy developments have included: the launch of Sputnik-1 by the Soviet Union and the first artificial satellite, the enactment of the 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (OST), 25 the US moon landing, the 1979 adoption of the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (Moon Agreement), 26 the launch and inhabitation of the International Space Station, the use of unmanned devices to explore planets like Mars, space tourism for ordinary civilians, 27 and the recent exploration and imminent exploitation of NEAs for mineral and hydrologic resources.28 Space-faring activities were first tweaked in the 1970s and 1980s with

the emergence of intergovernmental players in the sphere of telecommunications, 29 thus shifting the playing field from State monopolised space exploits to intergovernmental organisations.30 Indeed, in the last 20 years, state-funded programmes like NASA have dramatically declined, and NASA is currently managing its lowest federal budget since the 1960s.31The private sector has accordingly assumed the lead in research and technology, with the objective of reaping profitable returns in the realm of NEA harvesting. NEA mining is an attractive opportunity for private sector commercial entities as terrestrial resources may only be reused a number of times due to purity loss, even with the most advanced recovery mechanisms. In 1955, Dr. Edward Price argued: [t]he thermodynamic law of entropy indicates that unavailability is the ultimate tendency of recurring mineral usage as they eventually become too dispersed or impure during each use to be recoverable. 32 Similar to reuse, recycling also results in lost purity and is also an energyintensive process utilizing fossil fuels.33 For this reason, there has been a surge of extraterrestrial technological advances to inhibit resource declination, thus stimulating a new space race amongst private entities; in contrast to the conventional and once dominant States. Jakhu and Buzdugan premise that NEA harvesting is economically feasible as some large-scale terrestrial projects (e.g. hydroelectricity and rare-Earth mineral mining) are more costly to operate or comparable in cost to launching a NEA spacecraft into space. The authors believe that NEA harvesting will occur if there is a market for the mineral and hydrologic resources (which is now emerging), practical payback times (e.g. usually less than five years in order to attract and sustain investors), controllable risks (e.g. environmental and legal) and the legal protection of property rights for commercial claims.34 In addition to the economic prerequisites, varying technological advances will permit NEA mining, including the simple identification and characterisation of viable NEAs and the anticipated use of powerful and enduring cosmic rays to fuel spacecraft and overcome propulsion and gravitational concerns. The private entity NEA contenders currently include US incorporated Deep Space Industries and Planetary Resources. Deep Space Industries' vision statement asserts that the corporation: [b]elieves the human race is ready to begin harvesting the resources of space both for their use in space and to increase the wealth and prosperity of the people of planet Earth. The rival start-up, Planetary Resources, has greater media presence due to its backing by Google Inc. founders Larry Page and Eric Schmidt and director James Cameron. 35 In June 2013, Planetary Resources managed to raise US $1 million through an online crowd funding campaign. The funds are to be allocated towards the construction of their ARKYD space telescope.36 The telescope will permit Planetary Resources to monitor and identify NEAs for future mining, in addition to developing the robotic spacecraft required to seize and return asteroids to Earth. 37 Hence, Deep Space Industries and Planetary Resources comprise the next generation of non-State entrepreneurs, which will soon compete for celestial resources, while swimming through pages of legal and regulatory requirements relating to property rights, liability and environmental law. IV. THE GENERAL LEGAL ATMOSPHERE AND NEA MINING

Non appropriation regulations wreck legal certainty required for investor confidence in asteroid mining Campo 21 [Jose A. Martin del Campo, J.D. Candidate at Texas A&M University School of Law, 3-23-2021, "Finders K Finders Keepers: Who Has Say Over Private Property in Space," Texas A&M Journal of Property Law, https://scholarship.law.tamu.edu/cgi/viewcontent.cgi?article=1155&context=journal-of-property-law] /Kankee

I. INTRODUCTION On October 4, 1957, the Space Age officially began when the Soviet Union launched Sputnik into orbit, the first successful, human-made satellite.1 A little more than a decade later, on July 20, 1969, American astronauts Neil Armstrong and Edwin "Buzz" Aldrin became the first humans to land and step foot on the moon.2 Neil Armstrong marked the completion of John F. Kenney's national goal of landing an astronaut on the moon when he radioed back to Earth "[t]hat's one small step for man, one giant leap for mankind."3 The launch of Sputnik, the moon landing, and other endeavors achieved by the scientific community, kick-started a chain of events leading to the current ambition of exploring outer space and mining resources throughout the solar system. The push for unlocking low-cost space travel and space industrialization by entrepreneurs, like Elon Musk and Jeff Bezos, propels the search for extraterrestrial materials such as water and minerals.4 According to NASA, minerals found in the asteroid belt between Mars and Jupiter contain an estimated value of approximately $100 billion for every person on Earth.5 However, uncertainty lingers because private entities are unsure that they will possess property rights to their payload or the mined celestial body.6 Celestial bodies refer to naturally occurring objects in space. The United States Commercial Space Transportation Advisory Committee ("COMSTAC"), an advisory body to the Federal Aviation Administration's ("FAA") Office of Commercial Space Transportation ("FAA-AST"), has undertaken review regarding the granting of private property licenses.7 COMSTAC expressed a desire to confirm that private entity resource extractions may be owned and utilized as it deems appropriate.8 The current framework of space law is a combination of agreements with the foundation of space law consisting of the 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies ("Outer Space Treaty").9 At the time of signing, the Outer Space Treaty hoped to foster cooperative and peaceful exploration of outer space without discrimination of any kind.10 However, Article II of the Outer Space Treaty contains the bane of private property rights in outer space, which forbids the national appropriation of the moon and other celestial bodies.11 While the Outer Space Treaty explicitly mentions the prohibition of public entities claiming celestial bodies, private enterprises risk failing to have their interest in property rights recognized by the global community. Private entities and investors grapple with the issues pertaining to their rights to mine and extract resources from outer space legally. Without further international recognition of their property rights, private entities may shy away from exploring the concept of celestial mining. The issue of not knowing what laws are applicable, or to whom private companies are accountable, impedes the progress private entities make in achieving their goal of harvesting extraterrestrial resources. Private entities fear that the non-appropriation clause of Article II of the Outer Space Treaty, the epicenter of the issue, will strip them of the right to transport their mined resources back to Earth. A new legal regime will likely need to be formed that facilitates the continuation of innovation and promotes the exploration of outer space. Whether or not past private and public international doctrines, i.e., the law of the sea, may provide guidance in creating a new doctrine of space law is yet to be determined. The advancement in modern technology, along with the depletion of natural resources, creates a unique opportunity for private entities to resolve this issue through the exploitation of outer space. Space law is once again relevant due to its inadequacies in protecting the property rights of said entities in space. Part II will explore the different treaties and principles that gave rise to space law, and Part III will analyze whether the application of such principles should continue, or if the establishment of a new regime offers a more beneficial long-term solution. Part IV will then explore the structure of a new outer space regime and the enforcement of property rights. II. LEGAL PRINCIPLES INFLUENCING THE DEVELOPMENT OF SPACE LAW

Asteroid mining solves climate change, resource shortages, and environmental degradation Hlimi 14 [Tina Hlimi, Canadian lawyer with a Bachelors and Masters Degrees in Environmental Sciences from McGill University, 2014, "THE NEXT FRONTIER: AN OVERVIEW OF THE LEGAL AND ENVIRONMENTAL IMPLICATIONS OF NEAR-EARTH ASTEROID MINING," ANNALS OF AIR AND SPACE LAW, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2546924]/Kankee

THE ENVIRONMENTAL BENEFITS OF NEAR EARTH ASTEROID HARVESTING Let us recapitulate what we have already found. Shortage of resources is not a fact; it is an illusion born of ignorance. Scientifically and technically feasible improvements in launch vehicles will make departure from Earth easy and inexpensive. Once we have a foothold in space, the mass of the asteroid belt will be at our disposal, permitting us to provide for the material needs of a million times as many people as Earth can hold. Solar power can provide all the energy needs of this vast civilisation (10,000,000 billion people) from now until the Sun expires. Using less than one percent of the helium-3 energy resources of Uranus and Neptune for fusion propulsion, we could send a billion interstellar arks, each containing a billion people, to the stars. There are about a billion Sun-like stars in our galaxy. We have the resources to colonise the entire Milky Way. 122 In addition to demystifying the legal doctrine governing outer space natural resource appropriation it is also necessary to weigh the benefits and detriments of space-faring activities. Foremost, States around the world are developing at unprecedented rates and the human population is mounting in conjunction with demand for natural resources to sustain the current and newly established western standard of living. One of the fastest growing nations, China, is experiencing unhindered growth facilitated by fossil fuel use from coal and extensive mining. This has caused substantial water, soil and air degradation. In the face of these troubles, NEA mining could be the key to preserving the Earth's bounty and replenishing contaminated water supplies. The influx of natural resources could thwart the burning of dirty coal and fossil fuels, thereby mitigating the effects of climate change, such as, rising sea level, atmospheric pollution, melting of sea ice and rising temperatures. NEA harvesting could also protect the ocean and the fragile and largely unexplored deep seabeds 123 from oil and gas drilling. It could furthermore protect ecosystems from rare-earth mineral mining predominantly used to fuel the electronics sector. 124 NEA mining is especially pertinent as China restricted its global exports of rare-earth minerals in 2009, incongruously citing the need to protect the environment. Unfortunately, the supply cuts have forced dependent States like Japan, the United States and South Korea to heighten rare-Earth mineral exploration. This accordingly led to Japan's 2011 discovery of rare-earth minerals in the ocean-bed deposits of the Pacific Exclusive Economic Zone (PEEZ) thereby necessitating risky, deep-sea mining techniques, which may result in marine pollution if not carefully designed and developed. Other States, which have joined the environmentally destructive rare-earth mineral exploration movement include India, Canada, Tanzania, Australia, Brazil and Vietnam., There is accordingly much competition and exploration for rare-earth minerals which could result in significant exploitation of untouched areas like the PEEZ seabed and Mongolia.125 Other regions which may soon be targeted for mineral and hydrological resources include Antarctica and the Arctic. With the advent of technological advances, environmentally destructive practices such as refining may soon occur in outer space, sparing the Earth of pollution. 126 Accordingly, NEA mining is a viable technology for preserving the Earth's environment by curbing atmospheric and marine pollution, enhancing water supply and quality and mitigating the effects of climate change; all while allowing humankind to maintain and even improve their standard of living through increased technologies, consumption and population growth. B. THE ENVIRONMENTAL CONSEQUENCES OF NEAR EARTH ASTEROID MINING

Warming causes extinction, escalatory conflicts, and mass suffering Melton 19 [Michelle Melton is a 3L at Harvard Law School. Before law school, she was an associate fellow in the Energy and National Security Program at the Center for Strategic and International Studies, where she focused on climate policy. Climate Change and National Security, Part II: How Big a Threat is the Climate? January 7, 2019. https://www.lawfareblog.com/climate-change-and-national-security-part-ii-how-big-threat-climate]

At least until 2050, and possibly for decades after, climate change will remain a creeping threat that will exacerbate and amplify existing, structural global inequalities. While the developed world will be negatively affected by climate change through 2050, the consequences of climate change will be felt most acutely in the developing world. The national security threats posed by climate change to 2050 are likely to differ in degree, not kind, from the kinds of threats already posed by climate change. For the next few decades, climate change will exacerbate humanitarian crises—some of which will result in the deployment of military personnel, as well as material and financial assistance. It will also aggravate natural resource constraints, potentially contributing to political and economic conflict over water, food and energy.

The question for the next 30 years is not "can humanity survive as a species with 1.5°C or 2°C of warming," but, "how much will the existing disparities between the developed and developing world widen, and how long (and how successfully) can these widening political/economic disparities be sustained?" The urgency of the climate threat in the next few decades will depend, to a large degree, on whether and how much the U.S. government perceives a widening of these global inequities as a threat to U.S. national security.

By contrast, if emissions continue to creep upward (or if they do not decline rapidly), by 2100 climate-related national security threats could be existential. The question for the next hundred years is not, "are disparities politically and economically manageable?" but, "can the global order, premised on the nation-state system, itself based on territorial sovereignty, survive in a world in which substantial swathes of territory are potentially uninhabitable?"

National Security Consequences of Climate Change to 2050

Scientists can predict the consequences of climate change to 2050 with some measure of certainty. (Beyond that date, the pace and magnitude of climate change—and therefore, the national security threat posed by it—depend heavily on the level of emissions in the coming years, as I have explained.) There is relative agreement across modeled climate scenarios that the world will likely warm, on average, at least 1.5°C above pre-industrial levels by about 2050—but perhaps as soon as 2030. This level of warming is likely to occur even if the world succeeds in dramatically reducing greenhouse gas emissions, as even the recent Intergovernmental Panel on Climate Change (IPCC) report implicitly admits. In other words, a certain amount of additional warming—at least 1.5°C, and probably more than that—is presumptively unavoidable.

Looking ahead to 2050, it can be said with relative confidence that the national security consequences of climate change will vary in degree, not in kind, from the national security threats already facing the United States. This is hardly good news. Even small differences in global average temperatures result in significant environmental changes, with attendant social, economic and political consequences. By 2050, climate change will wreak increasing havoc on human and natural systems—predominantly, but not exclusively, in the developing world—with attenuated but profound consequences for national security.

In particular, changes in temperature, the hydrological cycle and the ranges of insects will impact food availability and food access in much of the world, increasing food insecurity. Storms, flooding, changes in ocean pH and other climate-linked changes will damage infrastructure and negatively impact labor productivity and economic growth in much of the world. Vector-borne diseases will also become more prevalent, as climate change will expand the geographic range and intensity of transmission of diseases like malaria, West Nile, Zika and dengue fever, and cholera. Rising public health challenges, economic devastation and food insecurity will translate into an increased demand for humanitarian assistance provided by the military, increased migration—especially from tropical and subtropical regions—and geopolitical conflict.

Long-term trends such as declining food security, coupled with short-term events like hurricanes, could sustain unprecedented levels of migration. The 2015 refugee crisis in Europe portends the kinds of population movements that will only accelerate in the coming decades: people from Africa, Southwest and South Asia and elsewhere crossing land and water to reach Europe. For the United States, this likely means greater numbers of people seeking entry from both Central America and the Caribbean. Such influxes are not unprecedented, but they are unlikely to abate and could increase in volume over the next few decades, driven in part by climate change-related food insecurity, climate change-related storms and also by economic and political instability. Food insecurity, economic losses and loss of human life are also likely to exacerbate existing political tensions in the developing world, especially in regions with poor governance and/or where the climate is particularly vulnerable to warming (e.g., the Mediterranean basin). While the Arab Spring had many underlying causes, it also coincided with a period of high food prices, which arguably contributed to the protests. In some situations, food insecurity, economic losses and public health crises, combined with weak and ineffectual governance, could precipitate future conflicts of this kind—although it will be difficult to know where and when without more precise local studies of both underlying political dynamics and the regionally-specific impacts of climate change.

2100 and Beyond

While the national security impacts of climate change to 2050 are likely to be costly and disruptive for the U.S. military—and devastating for many people around the world—at some point after 2050, if warming continues at its current pace, changes to the climate could fundamentally reshape geopolitics and possibly even the current nation-state basis of the current global order.

To be clear, both the ultimate level of warming and its attendant political consequences is highly speculative, for the reasons I explained in my last post. Nonetheless, we do know that the planet is currently on track for at least 3-4°C of warming by 2100. The "known knowns" of higher levels of warming—say, 3°C—are frightening. At that 3°C of warming, for example, scientists project that there will be a nearly 70 percent decline in wheat production in Central America and the Caribbean, 75 percent of the land area in the Middle East and more than 50 percent in South Asia will be affected by highly unusual heat, and sea level rise could displace and imperil the lives hundreds of millions of people, among other consequences.

But even higher levels of warming are physically possible within this century. At these levels of warming, some regions of the world would be literally uninhabitable, likely resulting in the depopulation of the tropics, to say nothing of the consequences of sea-level rise for economically important cities such as Amsterdam and New York. Even if newly warmed regions of the far north could theoretically accommodate the resulting migrants, this presumes that the political response to this unprecedented global displacement would be orderly and conflict-free borders on fantasy.

The geopolitical consequences of significant levels of warming are severe, but if these changes occur in a linear way, at least there will be time for human systems to adjust. Perhaps more challenging for national security is the possibility that the until-now linear changes give way to abrupt and irreversible ones. Scientists forecast that, at higher levels of warming—precisely what level is speculative—humanity could trigger catastrophic, abrupt and unavoidable consequences to the ecosystem. The IPCC has considered nine such abrupt changes; one example is the potential shutting down of the Indian summer monsoon. Over a billion people are dependent upon the Indian monsoon, which provides parts of South Asia with about 80 percent of its annual rainfall; relatively minor changes in the monsoon in either direction can cause disasters. In 2010, a wetter monsoon led to the catastrophic flooding in Pakistan, which directly affected 20 million people; a drier monsoon in 2002 led to devastating drought. Studies suggest that the Indian summer monsoon has two stable states: wet (i.e., the current state) and dry (characterized by low precipitation over the subcontinent). At some point, if warming continues, the monsoon could abruptly shift into the second, "dry" state, with catastrophic consequences for over a billion people dependent on monsoon-fed agriculture. The IPCC suggests that such a state-shift is "unlikely"—that is, there is a 10 to 33 percent chance that a state-shift will happen in the 21st century—but scientists also have relatively low confidence in their understanding of the underlying mechanisms in this and other large-scale natural systems.

The consequences of abrupt, severe warming for national security are obvious in general, if unclear in the specifics. In 2003, the Defense Department asked a contractor to explore such a scenario. The resulting report outlined the offensive and defensive national security strategies countries may adopt if faced with abrupt climate change, and highlighted the increased risk of inter- and intra-state conflict over natural resources and immigration. Although the report may be off in its imagined timeframe (positing abrupt climate change by 2020), the world it conjures is improbable but not outlandish. If the Indian monsoon were to switch to dry state, and a billion people were suddenly without reliable food sources, for example, it is not clear how the Indian government would react, assuming it would survive in its current form. Major wars or low-intensity proxy conflicts seem likely, if not inevitable, in such a scenario.

This is not to say that a parade of climate horribles is certain—or even likely—to come to pass. Scientific understanding of the sensitivities in the climate system are far from perfect. It is also possible that emissions will decline more rapidly than anticipated, averting the worst consequences of climate change. But this outcome is far from guaranteed. And even if global emissions decline precipitously, humanity cannot be sure when or whether the planet has crossed a climate tipping point beyond which the incremental nature of the current changes shifts from the current linear, gradual progression to a non-linear and abrupt process.

Within the next few decades, the most likely scenario involves manageable, but costly, consequences on infrastructure, food security and natural disasters, which will be borne primarily by the world's most impoverished citizens and the members of the military who provide them with humanitarian assistance and disaster relief. But while the head-turning national security impacts of climate change are probably several decades away, the nature of the threat is such that waiting until these changes manifest is not a viable option. By the time the climate consequences are severe enough to compel action, there is likely to be little that can be done on human timescales to undo the changes to environmental systems and the human societies dependent upon them.