### 1AC---Advantage

#### The advantage is mining.

#### Space mining coming now – lack of regulations makes conflicts likely.

Zeisl 19 [Yasemin Zeisl, MSc in International Relations and Affairs from the London School of Economics and Political Science (LSE), “Three Salient Risks of Mining in Space,” 05/03/19, *GlobalRiskIntel*, https://www.globalriskintel.com/insights/three-salient-risks-mining-space, EA]

The harvesting of natural resources from space objects is the goal of numerous companies such as Planetary Resources or Deep Space Industries in the United States, Asteroid Mining Corporation in Scotland, or iSpace in Japan. While some companies such as iSpace are focusing on resources inside the Moon, others are developing strategies to identify and extract resources from asteroids and extinct comets. Given that calculations evaluate space mining as a highly lucrative business with potential profits amounting to trillions in U.S.-dollars, it is unsurprising that investment into space mining rose from 534 million USD in 2014 to 3.1 billion USD in 2018.

Research institutions such as the Center for Near-Earth Object Studies (CNEOS) — which cooperates with the National Aeronautics and Space Administration (NASA) — detects, traces, and assesses risks of objects moving close to the Earth. Such calculations are relevant for future ventures into space mining, which will focus on metals such as platinum, gold, iron, rhodium, zinc, cobalt, and nickel, as well as water and carbon found in asteroids and extinct comets. Celestial ice would be particularly useful for generating rocket fuel by splitting it into hydrogen and oxygen. This may facilitate long space travel to destinations such as Mars. The usage of extinct comets as gas stations may bring engineers and scientists one step closer to the goal of colonizing Mars. While rocket fuel extraction may be a relatively feasible project for the near future, it is expected that harvesting metals from space may require several more decades to realize.

Spotting the potential profitability of space mining, the United States passed the Commercial Space Launch Competitiveness Act in 2015 to grant U.S. citizens the right to harvest natural resources from celestial bodies. Similarly, Luxembourg established a space mining law and provided investment opportunities in August 2017. In January 2019, Russia started negotiating a bilateral cooperation arrangement with Luxembourg.

The fact that there is no clearly defined international treaty on space mining poses a major risk. Although the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies of 1984 may provide some detail on the issue by asserting that no state, organization, or natural person can lay claim to any object in space, the fact that only 18 countries have committed to this multilateral treaty leaves the majority of states unbound by this regulation. An inconsistent legal landscape in regard to resource extraction of celestial bodies could lead to legal clashes between different countries and potential disadvantages for companies or organizations from certain countries. Mining in space could turn into a fierce competition among various private businesses and states. Therefore, licensing regulations will also have to be clearly defined. Licenses will help to clarify both ownership of yields and the relationships among miners, investors, and governments in order to avoid conflict in the future.

#### Scenario one is resources.

#### Successful mining unlocks crucial rare earth metal supplies for renewables and space colonization BUT legal uncertainty makes investment unviable.

Doshi 16 [Priyank D. Doshi, J.D., Notre Dame Law School; B.A., University of Illinois Urbana-Champagne, “Regulating The Final Frontier: Asteroid Mining and The Need For A New Regulatory Regime,” 2016, *Notre Dame Journal of International & Comparative Law*, Vol. 6, Issue 1, https://scholarship.law.nd.edu/cgi/viewcontent.cgi?article=1055&context=ndjicl, EA – OCR used]

C Benefits of Asteroid Mining

While Part I sought to show that asteroid mining is possible and will soon be a reality, it also raised the question of why asteroid mining might be something the international stage needs to pursue collectively and aggressively. The simple answer is two-fold: the need for the resources and future space exploration.

C.i The Need For Resources

Scientists posit that the key natural resources we will need to fuel and develop the modern economy will run out within the next fifty to sixty years.51 Key resources like platinum, zinc, copper, phosphorus, lead, gold, and indium, could become depleted on Earth very soon.52 As the push for more environmentally friendly solutions to things like energy surges, the actual replacement materials to support that dream grow more and more scarce. Wind turbines and solar panels use rare earth metals in their very construction, and the future of renewable energy will demand more of these resources.53 Even everyday items like batteries, jewelry, and computer chips use platinum, gold, and nickel, which are starting to become more and more expensive as their supplies decrease. The scarcity problem is exacerbated by the fact that a lot of these elements have no readily available alternative on Earth. Asteroid mining is the solution to the coming scarcity issues. Mining the asteroids isn’t just a capitalist dream; it is the average man’s necessity.

Most of the minerals being mined on Earth, including gold, iron, platinum, and palladium, originally came from the many asteroids that hit the Earth after the crust cooled during the planet’s formation.54 Asteroids are suspected to be filled with an abundance of natural resources like gold, cobalt, iron, manganese, molybdenum, nickel, osmium, palladium, platinum, rhenium, rhodium, ruthenium, and tungsten that are worth billions to trillions of dollars.55 Speaking to just one of the many examples,

Some of these Near-Earth Asteroids (NEAs) are metallic, composed of metals like iron and nickel, similar to the center of the Earth. One of these asteroids is 1986 DA, a metallic NEA 1.2 miles wide that is likely composed primarily of iron and nickel with significant amounts of gold and platinum. Estimates show 1986 DA contains approximately 10,000 tons of gold and 100,000 tons of platinum, which if completely recovered would be valued on today’s market at $460 billion and $5.6 trillion, respectively. Including the value of the iron and nickel, 1986 DA could be worth between $6 and $7 trillion.56

These NEAs are close enough to be mined and harvested for the development of human technology. John S. Lewis, professor of planetary science at the University of Arizona and author of Mining the Sky: Untold Riches from the Asteroids, Comets, and Planets, estimates that asteroid 3554 Amun is worth $20 trillion. Composed of platinum, iron, nickel, and cobalt, it has enough resources to pay off the U.S. national debt.57 It is estimated that there are about one to two million asteroids in the solar system that are large enough to consider for mining projects:58

Each of these asteroids is projected to weigh roughly two billion tons and “contain 30 million tons of nickel, 1.5 million tons of metal cobalt, and 7,500 tons of platinum.” The value of these items, for both private companies and governments around the world could be significant with the dollar value being somewhere in the trillions or higher. With nickel selling for $14,575 per ton, cobalt selling for $26,600 per ton, and platinum at $1,454 per ounce, mining one single asteroid could be more than profitable.59

Though these numbers presuppose that prices of the various resources would stay the same, they provide a telling picture of the potential wealth in wait and its ability to drastically alter the shape of the future.60

Providing more than a fix for natural resource shortages, asteroids also contain other elements that are scarce or practically nonexistent on Earth. One of these, helium-3, could be used as a low-cost, efficient energy source that gives only a fraction of the polluting effect of current practices.61 Helium-3 could potentially light the future, and that is just the beginning of the possibilities reaped from asteroid mining.

C.2 Future Space Exploration

The societal good that could be achieved from mining asteroids, which contain both rare-Earth minerals and scarce and/or non-existent resources, is self-explanatory. Similar is the resultant financial gain from these mining activities. There is extensive scholarship surrounding the potential value of asteroids, and this Note only scratches their proverbial surface. A large share of asteroids’ benefits is derived from their position in outer space. They will allow us to push further in space exploration and space colonization by drastically bringing down the cost of travel.

To those still reading this with an eye of incredulity about space, this section may seem the most unnerving, but it is by far the important use for asteroid mining. The largest barriers to space exploration and space colonization are the cost of shipping materials from Earth, and the fuel limitations inherent in travel. Asteroid mining has the potential to help with both of these problems and act as the catalyst for the modern space age. The mining of NEOs will yield great quantities of hydrogen, helium, and water.62 These materials could be used to fuel human spacefarers, untying them from the need to be refueled or resupplied from Earth.

More specifically, mined water could be extremely useful as rocket fuel or as a fuel for other power and propulsion systems.6’ If water can be found on asteroids (as many believe it can be) the water could also be broken down into its hydrogen and oxygen components, which can then be used to form the basic building blocks of rocket fuel.64 Mining water alone makes both space colonization and space exploration cheaper and consequently more feasible. Furthermore, sources of water have been identified: a 2006 announcement by the Kech Observatory claimed that 617 Patroclus, a Jupiter Trojan, was essentially an extinct comet that consists largely of ice. Similarly, Jupiter-family comets, and possibly NEAs that are extinct comets, might also economically provide water which through the process of in-situ resource utilization— using materials native to space for propellant, tankage, radiation shielding, and other high-mass components of space infrastructure—could lead to radical reductions in its cost for space exploration.65 Fuel tends to make up the greatest weight of rockets; the ability to produce fuel in space would provide much needed flexibility to survive in outer space and explore the depths of the solar system.66

Part I addressed the technology that is being developed by Planetary Resources and DSI for asteroid mining; that technology will help realize the benefits of asteroid mining for space travel.

Launches from Earth could be cheaper if the shuttles were able to refuel at a DSI Propellant Refinery. Planetary Resources’ ARKYD- 300 could scout ahead for possible colonization sites on both asteroids and planets. Imagine a scenario where a DSI Harvestor mines the minerals needed to create a colony, and then the shuttle takes those materials, along with a DSI Microgravity Foundry, to build the colony itself.67

Fuel for spaceships to go further and resources to build and re-equip space colonies unburdened by the high costs of Earth-to-colony transport could be the stepping stone we need to begin the new age space race.

Lastly, in addition to mining for supplies, we could also use asteroids as space stations. An asteroid-based space station could be highly beneficial to research and development. It has the potential to provide conditions that cannot easily be replicated on Earth, such as zero-gravity environments, freedom from atmospheric interference, and nearly continuous sunlight for solar power.68 While on the surface this may not seem like a large benefit, it will be invaluable as a place to test some of the radiation shielding problems that have historically stalled many long-term space exploration plans.69

Many people dismiss asteroid mining positing that the benefits are primarily financial ones that will do nothing more than further line already rich pockets. But the reality is far more layered than that simple assertion. Asteroid mining is a societal necessity for global advancement. Modern technology relies increasingly on rare and scarce resources; we will need to find a new source to continue the advancement. Any future with space exploration has to be grounded in the understanding that we will need a cheaper way to deliver materials in space. Asteroid mining is the answer.

D Problems Surrounding Asteroid Mining

While the significant benefits described above show the impending need and the rewards of asteroids mining, many problems must be addressed before asteroid mining becomes a certain fixture of the future. The main issues confronting asteroid mining are the needs for a massive upfront investment and the economic and political implications of mining asteroids in the future.

The most obvious roadblock to asteroid mining is the high required upfront investment needed to participate. While Part I spoke to some of the plans that the NASA is supporting and the goals the agency has set, it omits an important point: the funding for NASA has decreased drastically over the last twenty years. Currently, it operates using the lowest percentage of the federal budget since I960.70 Just when we are on the cusp of cracking open the final frontier, the government is bowing out. According to a Collaborative Modeling for Parametric Assessment of Space Systems (COMPASS) team at NASA’s Glenn Research Center in Cleveland, the estimate for a successful asteroid capture endeavor is in the ballpark of $2.6 billion/1 while the government’s grant to NASA for its capture project is only around $100 million. 2 Private companies will have to take the lead and absorb the large costs associated with asteroid mining and space exploration. The costs only continue to increase beyond the creation of asteroid capture technology—from the harnessing technology, or the costs required for the transport and process of raw asteroidal material to Earth for use (on Earth or elsewhere). In this assessment, the administrative costs of running a company are not even taken into account. While the discussion of technology in Part I of this Note highlights a few successfully funded companies, the high costs operate as a roadblock for others. Even though the potential profits are massive, the initial risks of asteroid mining come close to swallowing the benefits. While both Planetary Resources and Deep Space Industries have been very tight-lipped about their costs, the list of big name investors and the ambitious plans insinuate investments in the hundreds of millions of dollars, at a minimum.

As it stands today, mining asteroids is too theoretical and not yet profitable enough to ask the private industry to continue to dump billions into the endeavor. It will require more relative financial certainties, rather than mere mirages of wealth, to propel the industry.

The current legal framework that is in place, as is described in the next section, is not adequate to incentivize investors for such a risky endeavor. These businesses want to be sure that the technology, funding, and efforts they put toward the development of space will be rewarded, and so a properly crafted property law regime, unique to outer space, must be developed to ensure that private space industry continues to invest in cosmic ventures and technologies.7’ The law needs to create a level of predictability and incentive structure that will actually make investors overlook the long path still ahead of them and see the end goal.

Assuming the substantial financial roadblocks that exist are overcome and private money pours into the industry, there are still other economic and political considerations that are sources of serious concern before asteroid mining can become a reality. The central problem is the issue of control. Once private companies get into space, after investing their own money and bearing all the risk, they will want to control how things operate. To have them take all the risk and then expect corporations to willingly subordinate themselves from their spoils is a fool’s dream. So far, the government has had a limited response. On July 10, 2014, two Congressmen proposed the Asteroids Act, intended to facilitate the commercial exploration and utilization of asteroid resources to meet national needs and to promote the right of US commercial entities to explore and utilize resources from asteroids.74 The Act seeks to create property rights in resources extracted from asteroids, stating: “Any resources obtained in outer space from an asteroid are the property of the entity that obtained such resources, which shall be entitled to all property rights thereto, consistent with applicable provisions of Federal law.”75 The legislation, while noting that no state can lay claim to the asteroids, and giving corporations some protections on their investments, is still the beginning of a scary trend; a trend where national governments are granting and recognizing property rights subject to their own rule. This bill essentially sets the stage for a showdown for when an American company and a foreign company (with their country’s support) lay claim to the same asteroid. What happens when a Chinese company subject to Chinese laws starts to mine an asteroid that an American company has rights to under American law? What happens to any company not based in a major superpower, do they just cede their rights when a company backed by a more powerful nation intervenes? Individual governments’ respective abilities to regulate, as seen by the Asteroids Act, will lead to conflicting laws and conflicting claims that have the potential to create serious political and military ramifications.

Putting aside the political chaos this could cause in the global system, the question of why corporations would even cede any control comes into question. With practically no governmental involvement in the initial stages of asteroid mining, why would corporations allow the government to share the benefits of something that they, in reality, have no jurisdiction over? Building on the conflict over control, who would control how much of the resource could be brought back? Markets already exist for a lot of the natural resources that would be mined on asteroids; bringing back a large load of the resource could wreak economic havoc on those existing markets and the political systems that rely on them. The social costs to resource-based countries alone would be catastrophic. Will the corporations care? Can any government really curb the corporation’s ability to flood the market? What stops them from creating a false market due to their ability to monopolize an asteroid? Is there a state interest in miner safety and other environmental considerations involved in extra-terrestrial mining? Who can really enforce any safety and protection regulations with only claimed jurisdiction?

This non-exhaustive catalog of questions is asked in an attempt to understand the wide breadth of problems that will arise under the current regulatory regimes that are in place. The problems surrounding asteroid mining are more than just the high costs of investment; there are also questions about control and global cooperation over corporate activities in space.

E Current Law

The problems posed in the last section rise in part due to lack of legal clarity in this area. The international community has no policy that directly speaks to asteroid mining. It has instead relied on the interpretation of a series of tangentially connected treaties and agreements to address the burgeoning industry. This section is focused on briefly introducing some of the international agreements and treaties that try to govern space.

The phrase “space law” draws a blank on most faces, as very little is actually known about the practice area. Still, despite the lack of public knowledge around international space law, there are quite a few guiding documents for asteroid mining, namely: the Outer Space Treaty of 1967, the Registration Convention of 1975, and the Moon Treaty of 1979.

E.i The Outer Space Treaty of 1967

The Outer Space Treaty of 1967 was the first real international agreement dealing with space. Created in the midst of the Space Race and the Cold War, it was drafted to ensure that space did not become the next battleground. Its legacy has long outlived that original purpose, and almost 50 years later, it still stands as the primary agreement on international space law, serving as the foundation for all agreements and treaties that followed. The most marked and deliberate feature of the agreement was its rejection of the traditional concept of res nullius, or treating outer space as unclaimed territory that, since unclaimed, was open for conquest by anyone.76 The policy laid out in the Treaty opted for the res communis theory, there by all entities, individual or corporate, and nations have common or open access to the resources that are contained within its realm and are precluded from making any claims of ownership.77 The strong tone of the document and the widespread agreement of the treaty has led some to assert that celestial bodies are res extra commercium as whole, and cannot be owned.78 This treaty stands at the center of international space law today, making a breakdown of its relevant articles essential.

Article I of the Treaty covers its general purpose. It states that, “the exploration and use of outer space, including the moon and other celestial bodies, shall be carried out for the benefit and interests of all countries...and shall be the province of all mankind.”79 It is important to recognize the lofty language in this international consensus, as it is the result of concessions given to developing nations. The developed, space-faring nations would have much preferred the open space principle to allow for them to stake their claim. However, they recognized that any international consensus had to take the opinions of developing countries into account, and developing nations refused any agreement that would impede their future rights to space exploration. That understanding still holds today, and any international cooperative agreement on space has to make some concession to the developing and non-space faring states to be workable long-term.

Article II reiterates the underlying purpose of the agreement by stating that outer space “is not subject to national appropriation by claim of sovereignty.” But its broad language in this article has created a large and very controversial loophole: nowhere in prohibiting claims of ownership does the treaty mention corporations, private entities, or individuals.80 In fact, the treaty lacks

[A]ny explicit mention of property rights. It does not, however, specifically reject individual or corporate property in space. The treaty only prohibits “national appropriation” of space by claim of sovereignty, use, occupation, or other means. The drafters of the Outer Space Treaty chose to limit this prohibition to nations, even though scholars at the International Institute of Space Law had suggested that the Treaty should prohibit “national and private appropriation.”81

This large loophole becomes extremely relevant given that the Outer Space Treaty is the only space-related treaty onto which the majority of the world has signed.

#### Renewables solve smart cities and critical infrastructure security.

Konstantinou 21 [Charalambos Konstantinou, Senior Member, IEEE, “Towards a Secure and Resilient All-Renewable Energy Grid for Smart Cities,” 2021, *arXiv*, https://arxiv.org/pdf/2101.10570.pdf, EA]

Electric energy systems constitute the backbone of critical infrastructure. National security and economic vitality rely on a safe, secure, and resilient power system. The American electric grid, once considered a marvel of 20th century engineering, has become obsolete in the face of 21st century threats. Our energy grid has numerous shortcomings and can no longer deliver (cyber) secure and (disaster) resilient electric power to businesses and households, leading to an urgent and enormous threat to our society and economy. Vertical power systems with rigid transmission and distribution system control hierarchy have failed repeatedly during extreme threats. Recent studies by the Federal Energy Regulatory Commission (FERC) found that knocking out as 9 of the 55,000 power substations could result in U.S. coast-to-coast blackouts lasting 18 months or more [1]. For example, the Hurricane Michael resulted in 1.7 million power outages along the U.S. Gulf and Atlantic coasts [2]. During June – September 2007, heat waves and forest fires occurred in Greece causing extensive damages to the medium-voltage distribution network and knocking out power in many areas of the country [3]. Recovery from such disasters also costs tens of billions of dollars including time, manpower, and lost economic productivity, and deepen social inequalities. These failures have taught utilities, regulators, and stakeholders that faults cascade across national and continental electric grids, and exacerbating a local phenomenon into a socioeconomic catastrophe. Traditional power systems are prone to such cascading power outages that last long periods of time and are complex and time-consuming to recover – in other words, not secure and resilient. Continuing to operate the electric energy system critical infrastructure using the traditional model is a well-recognized security and resiliency threat and the main barrier for the development of future smart cities.

The integration of photovoltaic (PV) solar systems and wind farms together with other renewable energy sources (RES) into the electric grid, as shown in Fig. 1, helps towards improving security and reliability of the power system during normal operations and enhancing resiliency during and after extreme events. In the first quarter of 2018, solar accounted for 55% of all new generating capacity brought online in the U.S. [4], and Florida alone is expected to add over 8.6 GW of solar generation by 2025. The inclusion of such distributed resources in the form of solar PV, battery-based storage, and demand resources can increase the resiliency to catastrophic events once research efforts would be able to address open system design questions. Examples include how to strategically locate and operate these resources to sustain smart cities infrastructure by guaranteeing continuity or rapid restoration of power to vital loads following large-scale disturbances by formation of adhoc self-contained microgrids in outage situations. In addition, as more and more RES are integrated into power systems, it is projected that offshore oil and gas platforms will be re-used at end-of-life stage for the production of renewable energy (e.g., offshore wind, wave and tidal energy, ocean current energy, ocean-based solar energy, deep-water source cooling, etc.). To thwart the existing problems, a transformational development approach needs to be established, able to develop and build a secure and resilient electric grid for future smart cities. Such development will lead to an electric energy system immune to extreme phenomena while supporting the integration of RES and reducing the dependency on oil drilling into power systems, such as those at the North Sea as well as the Gulf of Mexico and its coastal zone.

#### Smart cities solve sustainable development goals.

İkizer 22 [İhsan İkizer, Faculty of Economics, Administrative and Social Sciences, Nişantaşı University, “Smart Cities, Citizen Welfare, and the Implementation of Sustainable Development Goals | Do Smart City Solutions Contribute to the Achievement of the Sustainable Development Goals?: Case of Istanbul,” 2022, IGI Global, EA]

Sustainable development has been an indispensable concept in many disciplines ranging from economics to public administration nearly in the last thirty years. As the years pass, the destructive effects of climate change and environmental degradation are being felt more than ever, and especially policy makers realize that it is not a conceptual or theoretical issue far from the practical life, but a bitter reality. Many important steps have been taken till now in order to ensure that our economic development does not endanger the needs of the future generations, and it does not harm social and cultural development of communities. Among these steps, maybe the most significant one is the Sustainable Development Goals (SDGs), which were adopted by the Heads of States and Governments in the United Nations (UN) in 2015. Although there is no mandatory mechanism that enforces the implementation of the SDGs, the central governments have pledged to achieve them, and some of them have presented their national reviews that indicate their progress.

The problems that are referred in the 17 SDGs have not been caused by just one country, or different levels of governments, or business community, or consumers. Multiple actors in multiple countries have carried the stones that have led to the gigantic challenges that we face today. Therefore, the solution, or in other words the achievement of these 17 SDGs requires joint and coordinated action of the entire world, which means local, regional, national and global partnership among all stake holders, i.e. statutory bodies, NGOs, business community and science community. Partnerships organised at different levels are expected to ensure the participation of people, who are also responsible actors as consumers. After all, these goals have been set for the peace and prosperity of people of this generation and next generations, and awareness among people about the SDGs is a key factor to the success.

Among these actors, local governments emerge as extremely eminent actors for two reasons: more than half of the world population live in cities, and they are the closest statutory bodies to people. It is not realistic to expect full achievement of the SDGs without the active engagement of local governments, as nearly two third of the 169 targets of the SDGs fall directly under the realm of local governments (Sustainable Development Goals and Habitat III: Opportunities for a successful New Urban Agenda, 2015). Although, it is central governments that have designed the SDGs, and monitoring the progress of countries is conducted by the representatives of central governments at ‘High-level Political Forum on Sustainable Development (HLPF)’, local governments are expected to be active actors in the implementation of the SDGs, next to central governments, together with other stake holders.

In order for local governments to be effective actors in this challenging task, principles of good governance as well as translation of the SDGs and the targets into local context seem to be essential. Different cities with different size, development level, needs and features naturally have different strategies to achieve the localised SDGs. However, smart city technologies emerge as significant tools to be integrated into localised strategies for accelerating the achievement of the SDGs, especially the SDG 11, which is on sustainable cities and communities. The need for more effective and efficient use of information and communication technologies in cities has been better comprehended during the Covid-19 pandemic. Today, in many large urban areas, local governments use these technologies in various fields from transportation to waste management, in order to make their cities smarter, healthier and more sustainable. Istanbul, the largest city in Turkey, and a city that is bigger than more than 130 countries in the world, with a population of around 16 million, is among the cities where smart city technologies are being increasingly used day by day. In this chapter, the case of Istanbul will be analysed in terms of its smart city applications, and the contribution of these applications to the SDGs will be analysed. The chapter will start by setting the context of the SDGs and the concept of smart city, which will be followed by the discussion on the positive correlation between smart city technologies and sustainable development. The final part will concretize the discussion on the link between these two concepts through the case of Istanbul.

#### SDGs are leverage points that solve extinction BUT failure causes cascading risks that cumulatively outweigh any single risk, causing extinction

Cernev 20 [Tom Cernev and Richard Fenner “The importance of achieving foundational Sustainable Development Goals in reducing global risk,” 2020, *Futures*, Vol. 115, https://doi.org/10.1016/j.futures.2019.102492]

4. Risks from failure to meet the SDGs

4.1. Cascading failures

Fig. 3 demonstrates that cascade failures can be transmitted through the complex inter-relationships that link the Sustainable Development Goals. Randers, Rockstrom, Stoknes, Goluke, Collste, Cornell, Donges et al. (2018) have suggested that where meeting some SDGs impact negatively on others, this may lead to “crisis and conflict accelerators” and “threat multipliers” resulting in conflicts, instability and migrations. Ecosystem stresses are likely to disproportionately affect the security and social cohesion of fragile and poor communities, amplifying latent tensions which lead to political instabilities that spread far beyond their regions. The resulting “bad fate of the poor will end up affecting the whole global system"(Mastrojeni, 2018). Such possibilities are likely to go beyond incremental damage and lead to runaway collapse.

The World Economic Forums’ Global Risks Report for 2018 shows the top five global risks in terms of likelihood and impact have changed from being economic and social in 2008 to environmental and technological in 2018, and are closely aligned with many SDGs (World Economic Forum, 2018). The report notes “that we are much less competent when it comes to dealing with complex risks in systems characterised by feedback loops, tipping points and opaque cause-and-effect relationships that can make intervention problematic”. The most likely risks expected to have the greatest impact currently include extreme weather events natural disasters, cyber attacks, data fraud or theft, failure of climate change mitigation and water crises.

These are represented in Fig. 3 by the following exogenous variables. “Climate change” drives the need for Climate Action (SDG 13), “Cyber threat” may adversely impact technology implementation and advancement which will disrupt Sustainable Cities and Communities (SDG 11); Decent Work and Economic Growth (SDG 8) and the rate of introduction of Affordable and Clean Energy (SDG 7), with reductions in these goals having direct consequences in also reducing progress in the other goals which they are closely linked to. “Data Fraud or Threat” has the capacity to inhibit innovation and Industrial Performance (SDG 9), reducing competitiveness (and having the potential to erode societal confidence in governance processes). “Water Crises” (linked with climate change) have a direct impact on Human Health and Well Being (SDG 3) as well as reducing access to Clean Water and Sanitation (SDG 6) and reducing agricultural production which increases Hunger (SDG 2). The causal loop diagram also highlights “Conflict” as a variable (driven by multiple environmental-socio-economic factors) which together with regions most impacted by climate degradation will lead to an increase in migrant refugees enhancing the spread of disease and global pandemic risk, thus impacting directly on Human Health and Well Being (SDG 3)

4.2. Existential and catastrophic risk

The level and consequences of these risks may be severe. Existential Risks (ER) have a wide scope, with extreme danger, and are “a risk that threatens the premature extinction of humanity or the permanent and drastic destruction of its potential for desirable future development” (Farquhar et al., 2017,) essentially being an event or scenario that is “transgenerational in scope and terminal in intensity” (Baum & Handoh, 2014). With a smaller scope, and lower level of severity, global catastrophic risk is defined as a scenario or event that results in at least 10 million fatalities, or $10 trillion in damages (Bostrom & Ćirković, 2008). Global Catastrophic Risk (GCR) events are those which are global, but they are durable in that humanity is able to recover from them (Bostrom & Ćirković, 2008; Cotton-Barratt, Farquhar, Halstead, Schubert, & Snyder-Beattie, 2016) but which still have a long-term impact (Turchin & Denkenberger, 2018b).

Achieving the Sustainable Development Goals can be considered to be a means of reducing the long-term global catastrophic and existential risks for humanity. Conversely if the targets represented across the SDGs remain unachieved there is the potential for these forms of risk to develop. This association combined with the likely emergence of new challenges over the next decades (Cook, Inayatullah, Burgman, Sutherland, & Wintle, 2014) means that it is of great value to identify points within the systems representations of the Sustainable Development Goals that could both lead to global catastrophic risk and existential risk, and conversely that could act as prevention, or leverage points in order to avoid such outcomes. This identification in turn enables sensible policy responses to be constructed (Sutherland & Woodroof, 2009).

Whilst existential threats are unlikely, there is extensive peril in global catastrophic risks. Despite being lesser in severity than existential risks, they increase the likelihood of human extinction (Turchin & Denkenberger, 2018a) through chain reactions (Turchin & Denkenberger, 2018a), and inhibiting humanity’s response to other risks (Farquhar et al., 2017). It is necessary to consider risks that may seem small, as when acting together, they can have extensive consequences (Tonn, 2009). Furthermore, the high adaptability potential of humans, and society, means that for humanity to become extinct, it is most likely that there would be a series of events that culminate in extinction as opposed to one large scale event (Tonn & MacGregor, 2009; Tonn, 2009).

Whilst the prospect of existential risk, or global catastrophic risk can seem distant, the Stern Review on the Economics of Climate Change estimated the risk of extinction for humanity as 0.1 % annually, which accumulates to provide the risk of extinction over the next century as 9.5 % (Cotton-Barratt et al., 2016). With respect to identifying these risks, it is known that in particular, “positive feedback loops… represent the gravest existential risks” (Kareiva & Carranza, 2018), with pollution also having the potential to pose an existential risk.

#### Grid security is an impact filter.

Denkenberger 21 [David Denkenberger, Anders Sandberg, Ross John Tieman, and Joshua M. Pearce, \* assistant professor of mechanical engineering at University of Alaska Fairbanks, “Long-term cost-effectiveness of interventions for loss of electricity/industry compared to artificial general intelligence safety,” 2021, *European Journal of Futures Research*, Vol. 9, Issue 1, https://doi.org/10.1186/s40309-021-00178-z, EA]

Civilization relies on a network of highly interdependent critical infrastructure (CI) to provide basic necessities (water, food, shelter, basic goods), as well as complex items (computers, cars, space shuttles) and services (the internet, cloud computing, global supply chains), henceforth referred to as industry. Electricity and the electrical infrastructure that distributes it plays an important role within industry, providing a convenient means to distribute energy able to be converted into various forms of useful work. Electricity is one component of industry albeit a critical one. Industry provides the means to sustain advanced civilization structures and the citizens that inhabit them. These structures play a critical role in realizing various futures by allowing humanity to discover and utilize new resources, adapt to various environments, and resist natural stressors.

Though industry is capable of resisting small stressors, a sufficiently large event can precipitate cascading failure of CI systems, resulting in a collapse of industry. If one does not temporally discount the value of future people, the long-term future (thousands, millions, or even billions of years) could contain an astronomically large amount of value [18]. Events capable of curtailing the potential of civilization (existential risks, such as human extinction or an unrecoverable collapse) would prevent such futures from being achieved, implying reducing the likelihood of such events is of the utmost importance [100]. Reducing the prevalence of existential risks factors; events, systemic structures, or biases which increase the likelihood of extinction but do not cause extinction by themselves is also highly valuable. Complete collapse or degraded function of industry would drastically reduce humanity’s capacity to coordinate and deploy technology to prevent existential risks, representing an existential risk factor. Consequently, interventions preventing loss of industry, reducing the magnitude of impacts, or increasing speed of recovery could be extremely valuable.

Existential risk research is, by nature, future focused, requiring the investigation of events that have not yet occurred. Futures studies methodologies are often applied to uncover salient trends or events, and explore potential causal structures [54, 123]. Probabilistic modeling techniques can then be used to determine the likelihood of such events occurring, including adequate treatment of uncertainty [101]. The cost-effectiveness modeling approach outlined in this paper is an example of this, attempting to assess the marginal utility of losing industry interventions on improving the long-term future. This approach could guide future efforts to assess the relative cost-effectiveness of interventions for different risks, existential or otherwise. More practically, this research can inform prioritization efforts of industrialized countries by providing estimates of the cost of global industrial collapse, and the utility of resilience interventions. This is relevant to the European Union which has a highly industrialized economy, providing $2.3 Trillion USD of the $13.7 Trillion USD global total of value add manufacturing [122]. The EU has shifted toward a more proactive foresight approach about natural and man-made disasters, noting the importance of rare high-impact events, systemic risks, and converging trends requiring better data and forecasting to drive a more ambitious crisis management system [47]. Still, it is clear that most academic and institutional emphasis has been on “ordinary” rather than extreme disasters, and risks from industry to the public and environment rather than widespread failures of industrial services causing harm.

The integrated nature of the electric grid, which is based on centralized generation makes the entire system vulnerable to disruption.1 There are a number of anthropogenic and natural catastrophes that could result in regional-scale electrical grid failure, which would be expected to halt the majority of industries and machines in that area. A high-altitude electromagnetic pulse (HEMP) caused by a nuclear weapon could disable electricity over part of a continent [16, 48, 66, 93]. This could destroy the majority of electrical grid infrastructure, and as fossil fuel extraction and industry is reliant on electricity [49], industry would be disabled. Similarly, solar storms have destroyed electrical transformers connected to long transmission lines in the past [117]. The Carrington event in 1859 damaged telegraph lines, which was the only electrical infrastructure in existence at the time. It also caused Aurora Borealis that was visible in Cuba and Jamaica [70]. This could potentially disable electrical systems at high latitudes, which could represent 10% of electricity/industry globally. Though solar storms may last less than the 12 h that would be required to expose the entire earth with direct line of sight, the earth’s magnetic field lines redirect the storm to affect the opposite side of the earth [117].

Lastly, both physical [6, 8, 69, 89, 111] and cyber attacks [3, 63, 90, 96, 118, 128, 130] could also compromise electric grids. Physical attacks include traditional acts of terrorism such as bombing or sabotage [130] in addition to EMP attacks. Significant actors could scale up physical attacks, for example by using drones. A scenario could include terrorist groups hindering individual power plants [126], while a large adversary could undertake a similar operation physically to all plants and electrical grids in a region.

Unfortunately, the traditional power grid infrastructure is simply incapable of withstanding intentional physical attacks [91]. Damage to the electric grid resulting in physical attack could be long lasting, as most traditional power plants operate with large transformers that are difficult to move and source. Custom rebuilt transformers require time for replacement ranging from months and even up to years [91]. For example, a relatively mild 2013 sniper attack on California’s Pacific Gas and Electric (PG&E) substation, which injured no one directly, was able to disable 17 transformers supplying power to Silicon Valley. Repairs and improvements cost PG&E roughly $100 million and lasted about a month [10, 102]. A coordinated attack with relatively simple technology (e.g., guns) could cause a regional electricity disruption.

However, a high-tech attack could be even further widespread. The Pentagon reports spending roughly $100 million to repair cyber-related damages to the electric grid in 2009 [57]. There is also evidence that a computer virus caused an electrical outage in the Ukraine [56]. Unlike simplistic physical attacks, cyber attackers are capable of penetrating critical electric infrastructure from remote regions of the world, needing only communication pathways (e.g., the Internet or infected memory sticks) to install malware into the control systems of the electric power grid. For example, Stuxnet was a computer worm that destroyed Iranian centrifuges [73] to disable their nuclear industry. Many efforts are underway to harden the grid from such attacks [51, 63]. The U.S. Department of Homeland Security responded to ~ 200 cyber incidents in 2012 and 41% involved the electrical grid [103]. Nations routinely have made attempts to map current critical infrastructure for future navigation and control of the U.S. electrical system [57].

The electric grid in general is growing increasingly dependent upon the Internet and other network connections for data communication and monitoring systems [17, 112, 118, 127, 135]. Although this conveniently allows electrical suppliers management of systems, it increases the susceptibility of the grid to cyber-attack, through denial of webpage services to consumers, disruption to supervisory control and data acquisition (SCADA) operating systems, or sustained widespread power outages [3, 72, 118, 120]. Thus global or regional loss of the Internet could have similar implications.

#### Cyberattacks trigger nuclear retaliation.

Klare 19 [Michael T. Klare, professor emeritus of peace and world security studies at Hampshire College, “Cyber Battles, Nuclear Outcomes? Dangerous New Pathways to Escalation,” November 2019, *Arms Control Today*, https://www.armscontrol.org/act/2019-11/features/cyber-battles-nuclear-outcomes-dangerous-new-pathways-escalation, EA – ability edited]

Yet another pathway to escalation could arise from a cascading series of cyberstrikes and counterstrikes against vital national infrastructure rather than on military targets. All major powers, along with Iran and North Korea, have developed and deployed cyberweapons designed to disrupt and destroy major elements of an adversary’s key economic systems, such as power grids, financial systems, and transportation networks. As noted, Russia has infiltrated the U.S. electrical grid, and it is widely believed that the United States has done the same in Russia.12 The Pentagon has also devised a plan known as “Nitro Zeus,” intended to ~~immobilize~~ the entire Iranian economy and so force it to capitulate to U.S. demands or, if that approach failed, to pave the way for a ~~crippling~~ air and missile attack.13

The danger here is that economic attacks of this sort, if undertaken during a period of tension and crisis, could lead to an escalating series of tit-for-tat attacks against ever more vital elements of an adversary’s critical infrastructure, producing widespread chaos and harm and eventually leading one side to initiate kinetic attacks on critical military targets, risking the slippery slope to nuclear conflict. For example, a Russian cyberattack on the U.S. power grid could trigger U.S. attacks on Russian energy and financial systems, causing widespread disorder in both countries and generating an impulse for even more devastating attacks. At some point, such attacks “could lead to major conflict and possibly nuclear war.”14

#### Renewables remove leverage – staves off global conflict.

Roman Vakulchuk 20, PhD in economics, senior research fellow at the Norwegian Institute of International Affairs, and adjust professor at Nord University, “Renewable energy and geopolitics: A review,” 1/07/2020, Renewable And Sustainable Energy Reviews, [https://www.sciencedirect.com/science/article/pii/S1364032119307555#](https://www.sciencedirect.com/science/article/pii/S1364032119307555)!, cc

By contrast, the reduced conflict camp sees geopolitical tensions as less likely in a world that has renewables as its main source of energy (Peters [91], Verrastro et al. [92], Lacher and Kumetat [93], Kostyuk et al. [94], Escribano et al. [95], Johansson [96], Hoggett [97], Sweijs et al. [70], Månsson [72], Paltsev [98], Scholten and Bosman [54], Smith Stegen [99], Escribano [84], Freeman [85]). This camp emphasises that it is more difficult to control, cut the supply or manipulate the price of renewable energy than of fossil fuels and the expansion of renewables will therefore lead to greater energy self-sufficiency and less conflict. It shifts the focus from the external to the internal supply of energy, reducing the scope for conflict among states.

An argument frequently used by this camp is that renewables are more difficult than fossil fuels to manipulate as they are less dense and more evenly distributed geographically. Månsson [72] holds the view that due to its geographic and technical characteristics, renewable energy creates few geopolitical motivations for states to start conflicts in order to control it. Peters [91], Tsao et al. [100] and Kostyuk et al. [94] similarly note that developing renewable energy would lead to a more equitable energy distribution and energy-based economic power, in turn leading to reduced geopolitical tensions. Also Overland et al. [101] found that geopolitical power will be more evenly distributed after a complete transition to renewable energy. In a related vein, Krewitt et al. [61] argue that the creation of international solar energy partnerships would have geopolitical advantages because they could “reduce economic imbalances between the North and the South and create global markets for future-oriented energy technologies without having to fear conflicts over scarce resources” (p. 23).

The application of a resource scarcity perspective to the geopolitics of oil triggers energy-insecurity anxiety among states and implicitly or explicitly justifies aggressive behaviour in resource conflicts (Jaffe and Soligo [102], Stern [103]). This perspective is not simple to transpose onto renewables, as they are both non-exhaustible and abundant, except for the critical materials used in the production of renewable energy technologies (see Section 3.4 for more on this). Fischhendler et al. [104,105] exemplify how geopolitical arguments have been used to convince Israeli decision-makers to adopt renewable energy to reduce the country's energy dependence and improve its security. These arguments have led others to draw further conclusions. Compared to an energy system based on fossil fuels, in a system dominated by renewables, access to resources is less important than distribution and infrastructure management (Scholten and Bosman [54]). Escribano [84] implies the same when he writes that “[e]nergy dependence and security of supply lose geopolitical relevance, whereas technical and regulatory aspects gain weight” (p. 7).

Many publications share an understanding that the location of renewable energy resources is as important as that of fossil fuels (Skeet [106], Criekemans [67], Criekemans [107]). However, location as a geopolitical concern is mainly relevant for the large-scale and not for the small-scale domestically-oriented production and transmission of electricity from renewable energy. O'Sullivan et al. [75] argue that if renewable energy is deployed on a large scale and cross-border trade in electricity grows, then the principle of territorial control will be similar to that for oil and gas pipelines: “[c]ountries like Algeria, Mexico or Morocco, or transit countries, or actors such as the Islamic State, could still try to leverage their geographical position and in case of conflict they could threaten to interrupt electricity supplies” (p. 41). Several authors also ask whether an external supply of electricity can be used as an “energy weapon” (e.g. Escribano et al. [95]). Renewable energy infrastructure, such as the ambitious but failed Desertec project, can also be an easy target for terrorists (Smith Stegen et al. [108]). The same logic can be applied to the location of biofuels.

On the other hand, if countries produce electricity from domestic renewable energy sources, geopolitical tensions and risks might recede due to falling energy imports and reduced interdependence between countries (Strunz and Gawel [66]). Escribano et al. [95] and Scholten and Bosman [54] argue that the geopolitical risks associated with domestically produced renewable energy are close to zero if we apply the energy-security standards of IEA. Hoggett [97] similarly notes that small-scale photovoltaics (and nuclear power) technologies are likely to promote a secure low-carbon transition with reduced geopolitical risks. Some believe that it is likely that the consumption of renewable energy at the location of production will prevail over large-scale regional production and distribution as it is seen as much more efficient and cost-effective when compared to the long-distance distribution of electricity (Proedrou [109], Sovacool [110]). These authors therefore see geographical location as less important for renewable energy resources than for fossil fuels from a geopolitical perspective. Nevertheless, there is a risk of local conflicts involving non-state actors that could potentially be caused by increased global competition for the land required for renewable energy installations (Capellan-Perez et al. [82], Månsson [72], Johansson [96], Walker [111]).

One issue seems to be stuck between the two camps: new interdependencies among states as a result of electricity interconnectors. Hache [81] discusses the possible emergence of new and unfamiliar inter-state interdependencies. Similarly, Westphal and Droege [64] argue that more electricity interconnectors between countries will lead to greater interdependence, which may translate into reduced international security. Pierri et al. [112] examine this question in the context of the European Union. Konstantelos et al. [113] discuss the division of costs and benefits among members of an integrated North Sea grid, making it similar to the difficulties caused by major pipeline projects. By contrast, Smith Stegen [99] argues that international affairs should benefit from renewables in many ways because their distribution will not be exposed “to the political and strategic dilemmas wrought by dependence on hydrocarbons” (p. 92). In a similar vein, IRENA [76] notes that electricity cut-offs and the use of hegemonic power to cut off transport bottlenecks will be greatly reduced due to increased rerouting possibilities, decentralised power generation and the absence of global electricity connections. But Smith Stegen [99] acknowledges that some tensions are possible due to increased interdependencies in such areas as high-voltage direct current (HVDC) transmission lines, biofuels and rare earth elements. Similarly, Verrastro et al. [92] and Lacher and Kumetat [93] see that renewable energy may strengthen energy security while facilitating the emergence of new interdependencies among states.

#### SpaceCol prevents other-wise inevitable extinction.

Green 21 [Brian Patrick Green, director of technology ethics at the Markkula Center for Applied Ethics, Santa Clara University, “Space Ethics,” 2021, Rowman, pp. 5, EA]

Another reason that humans may want to explore space would be to create a “backup Earth” to hedge against global catastrophic and existential risks (risks that may cause widespread disaster or human extinction, respectively) on our home planet. 8 Earth has always been a dangerous place for humans, with asteroid impacts, supervolcanic eruptions, pandemic disease, and other natural hazards threatening civilization. Now, in addition to these natural threats, human-made hazards such as nuclear weapons, climate change, biotechnology, nanotechnology, and artificial intelligence may threaten not only the viability of technological civilization but perhaps the survival of human life itself. A serious global-scale catastrophe could set back civilization many decades or centuries, and the worst disasters could cause human extinction. In one scenario, in which 100 percent of humanity dies, all of human effort for all of history would be for nothing. However, were the same global catastrophe to happen to Earth, yet humans were a multiplanetary species with just one self-sustaining settlement off-Earth, it would not result in the end of human civilization or human extinction. Instead while the same unimaginable fate would befall the Earth (certainly no mere triviality, with perhaps the deaths of 99.999 percent of all humans and possibly the destruction of the ecosphere and everything in it), at least all of human and planetory history would not be for nothing. Human life and culture would go on elsewhere, as well as other Earth species. This is a dire fate, but less terrible than the first.

#### Immeasurable expected value also outweighs.

Baum 16 [Seth D. Baum, Executive Director of the Global Catastrophic Risk Institute, “The Ethics of Outer Space: A Consequentialist Perspective,” 2016, Springer, pp. 115-116, EA]

Space colonization is notable because it may be able to bring utterly immense increases in intrinsic value. Early colonies might start small, given that other planets and moons have inhospitable environments. However, it may be possible to build large indoor colonies or create more hospitable outdoor environments (i.e., terraforming). Even just on other planets and moons in the Solar System, space colonies could multiply the total area available for human habitation. And there are many more planets around other stars, as ongoing research on exoplanets is now learning. One recent study estimates 22 % of Sun-like stars have Earth-like exoplanets (Petigura et al. 2013), implying billions to tens of billions of potentially habitable planets across the galaxy.

Opportunities at any given star may also be quite a bit greater than those available only on planets. Earth only receives about one two-billionth of the Sun’s radiation. To collect all the Sun’s radiation, humanity would need a Dyson swarm (named after Dyson 1960), which is a series of structures that surrounds a star, collecting its radiation to power a civilization. A Dyson swarm around the Sun could potentially enable a civilization a billion times larger than is possible on Earth. Likewise, Dyson swarms around one billion stars would bring humanity approximately 1018 (one billion–billion) times more energy per unit time.

Space colonies could also increase the amount of time available for human civilization. Earth will remain habitable for a few billion more years (O’Malley-James et al. 2014). Stars will continue shining for about 1014 more years (Adams 2008). That gives us an additional 105 times more energy, for a total of 1023 times more energy than is available on Earth. After the stars fade, other energy sources may be available. And even if our current universe eventually becomes uninhabitable, it may be possible to move to other universes (Kaku 2005). The physics here is speculative, but it cannot be ruled out, and hence there is a nonzero chance of a literally infinite opportunity for space colonization (Baum 2010a).

Whether the opportunity is infinite or merely, say, 1023 times larger than what can be done on Earth, the opportunity is clearly immense. As long as space colonization is an improvement (Sect. 8.3.1), then it would seem that the consequentialist should prioritize space colonization. The sooner space colonization begins, the more of its immense opportunity can be gained. Indeed, Ćirković (2002) estimates 5 × 1046 human lifetimes are lost for every century in which space colonization is delayed.

There can also be large value for space colonization under ecocentric intrinsic value. It is sometimes argued that Earth would be better off without humans. For example, the Voluntary Human Extinction Movement states that “Phasing out the human race by voluntarily ceasing to breed will allow Earth’s biosphere to return to good health” (http://vhemt.org, accessed 25 October 2015). However, this makes sense only if extraterrestrial locations are not intrinsically valued. Otherwise, exterminating humanity ruins the opportunity for humans to bring flourishing ecosystems into outer space. Terraforming other planets or bringing ecosystems into Dyson swarms could bring immense amounts of ecosystem flourishing.

#### Nuclear war causes extinction.

Starr ’17 (Steven; director of the University of Missouri’s Clinical Laboratory Science Program, senior scientist at the Physicians for Social Responsibility, Associate member of the Nuclear Age Peace Foundation, expert in the environmental consequences of nuclear war; 1/9/17; “Turning a Blind Eye Towards Armageddon — U.S. Leaders Reject Nuclear Winter Studies”; <https://fas.org/2017/01/turning-a-blind-eye-towards-armageddon-u-s-leaders-reject-nuclear-winter-studies/>; Federation of American Scientists; accessed 11/24/18; TV) [AV]

The detonation of an atomic bomb with this explosive power will **instantly ignite fires** over a surface area of three to five square miles. In the recent studies, the scientists calculated that the **blast**, **fire**, and **radiation** from a war fought with 100 atomic bombs could produce **direct fatalities** comparable to all of those worldwide in World War II, or to those once estimated for a “**counterforce**” **nuclear war** between the superpowers. However, the **long-term environmental effects** of the war **could** significantly disrupt the global weather for at least a decade, which would likely **result in** a vast **global famine**. The scientists predicted that **nuclear firestorms** in the burning cities would cause at least five million tons of **black carbon smoke** to quickly rise above cloud level into the stratosphere, where it could not be rained out. The smoke would circle the Earth in **less than two weeks** and would form **a** global **stratospheric smoke layer** that **would remain for** more than **a decade**. The smoke would absorb warming sunlight, which would **heat the smoke** to temperatures near the boiling point of water, producing **ozone losses of** 20 to **50 percent** over populated areas. This would almost double the amount of UV-B reaching the most populated regions of the mid-latitudes, and it would create UV-B indices unprecedented in human history. In North America and Central Europe, the time required to get a painful sunburn at mid-day in June could decrease to as little as six minutes for fair-skinned individuals. As the smoke layer blocked warming sunlight from reaching the Earth’s surface, it would produce the **coldest** average **surface temperatures** in the last 1,000 years. The scientists calculated that global **food production would decrease** by 20 to **40 percent** during a five-year period following such a war. Medical experts have predicted that the shortening of growing seasons and corresponding decreases in agricultural production could cause up to **two billion** people to perish from **famine**. The climatologists also investigated the effects of a nuclear war fought with the vastly more powerful modern **thermonuclear** weapons possessed by the United States, Russia, China, France, and England. Some of the thermonuclear weapons constructed during the 1950s and 1960s were 1,000 times more powerful than an atomic bomb. During the last 30 years, the average size of thermonuclear or “strategic” nuclear weapons has decreased. Yet today, each of the approximately 3,540 strategic weapons deployed by the United States and Russia is seven to **80 times** more powerful than the atomic bombs modeled in the India-Pakistan study. The smallest strategic nuclear weapon has an explosive power of **100,000 tons of TNT**, compared to an atomic bomb with an average explosive power of 15,000 tons of TNT. Strategic nuclear weapons produce much larger nuclear firestorms than do atomic bombs. For example, a standard Russian 800-kiloton warhead, on an average day, will ignite fires covering a surface area of 90 to 152 square miles. A **war** fought with hundreds or thousands of U.S. and Russian strategic nuclear weapons would **ignite immense** **nuclear firestorms** covering land surface areas of many thousands or **tens of thousands** of square miles. The scientists calculated that these fires would produce up to **180 million tons** of black carbon soot and **smoke**, which would form a dense, **global stratospheric smoke layer**. The smoke would remain in the stratosphere for 10 to **20 years**, and it **would block** as much as **70 percent of sunlight** from reaching the surface of the Northern Hemisphere and 35 percent from the Southern Hemisphere. So much sunlight would be blocked by the smoke that the noonday sun would resemble a full moon at midnight. Under such conditions, it would only require a matter of days or weeks for daily minimum **temperatures** to **fall below freezing** in the largest agricultural areas of the Northern Hemisphere, where freezing temperatures would occur every day for a period of between one to more than two years. Average surface temperatures would become colder than those experienced 18,000 years ago at the height of the last Ice Age, and the prolonged cold would cause average rainfall to decrease by up to 90%. Growing seasons would be completely eliminated for more than a decade; it would be **too cold and dark** to grow food crops, **which would doom the** majority of the **human population.** NUCLEAR WINTER IN BRIEF The profound cold and darkness following nuclear war became known as nuclear winter and was first predicted in 1983 by a group of NASA scientists led by Carl Sagan. During the mid-1980s, a large body of research was done by such groups as the Scientific Committee on Problems of the Environment (SCOPE), the World Meteorological Organization, and the U.S. National Research Council of the U.S. National Academy of Sciences; their work essentially supported the initial findings of the 1983 studies. The idea of nuclear winter, published and supported by prominent scientists, generated extensive public alarm and put political pressure on the United States and Soviet Union to reverse a runaway nuclear arms race, which, by 1986, had created a global nuclear arsenal of more than 65,000 nuclear weapons. Unfortunately, this created a backlash among many powerful military and industrial interests, who undertook an extensive media campaign to brand nuclear winter as “bad science” and the scientists who discovered it as “irresponsible.” Critics used various uncertainties in the studies and the first climate models (which are primitive by today’s standards) as a basis to criticize and reject the concept of nuclear winter. In 1986, the Council on Foreign Relations published an article by scientists from the National Center for Atmospheric Research, who predicted drops in global cooling about half as large as those first predicted by the 1983 studies and described this as a “nuclear autumn.”

### 1AC---Solvency

#### We affirm: The appropriation of outer space by private entities is unjust.

#### Plan: states ought to recognize that the appropriation of outer space by private entities is unjust through an implementation of a global public trust doctrine regulating outer space.

#### The doctrine solves – its flexibility means it can adapt to deficits and new environments and bypass enforcement.

Babcock 19 [Hope M. Babcock, Professor of Law, Georgetown University Law Center, “The Public Trust Doctrine, Outer Space, and the Global Commons: Time to Call Home ET,” 2019, *Syracuse Law Review*, Vol. 69, https://lawreview.syr.edu/wp-content/uploads/2019/09/H-Babcock-Article-Final-Document-v2.pdf, EA]

F. The Public Trust Doctrine (PTD) as a Gap Filling, Place-Holding Management Approach506

The PTD offers both an approach for managing an open access commons and a gap-filling tool until a regulatory regime is adopted.507 The doctrine is based on the idea that the “sovereign holds certain common properties in trust in perpetuity for the free and unimpeded use of the general public.”508 The public’s right to access and use trust resources is never lost, and neither the government nor private individuals can alienate or otherwise adversely affect those resources unless for a comparable public purpose.509 The resources the doctrine protects “have long been part of a ‘taxonomy of property’ [that recognizes] the division of natural wealth into private and public property.”510

“The doctrine places on governments ‘an affirmative, ongoing duty to safeguard the long-term preservation of those resources for the benefit of the general public,’”511 thus limiting the sovereign’s power on behalf of both present and future individuals.512 It directs the government to manage trust resources for public benefit, not private gain.513 It applies to private as well as public resources and is used to preserve the public’s access to CPRs.514 Government agencies have the non-rescindable power to revoke uses of trust resources that are inconsistent with the doctrine.515 This effectively places a permanent easement over trust resources that burdens their ownership with an overriding public interest in the preservation of those resources.516 However, trust resources can be alienated in favor of private ownership, if the alienation will still serve the public’s interest in those resources and not interfere with trust uses of the remaining land.517 The PTD, therefore, protects the “people’s common heritage,”518 just as Article 11 of the Moon Treaty protects outer space as part of the common heritage of mankind.519

The doctrine also appears to be infinitely malleable. Original uses of the doctrine were restricted to only that “aspect of the public domain below the low-water mark on the margin of the sea and the great lakes, the waters over those lands, and the waters within rivers and streams of any consequence,”520 and covered only traditional uses of those lands, like fishing and navigation.521 Over time, the scope and application of the doctrine broadened to protect more public resources and different uses.522 Thus, the doctrine expanded to protect new trust resources, such as dry sand beaches, inland lakes, groundwater, dry riverbeds, and wildlife,523 and passive uses of those resources, like scientific study.524 The original link to navigable water and tidelands disappeared.525 Supporters of the doctrine successfully advocated that it be applied to “wildlife, parks, cemeteries, and even works of fine art,”526 while arguing more recently its application to the atmosphere.527

A doctrine that imposes a perpetual duty on the sovereign to preserve trust resources, prevents their alienation for private benefit, assures public access to them, and can be invoked by anyone seems particularly useful as a management tool in outer space.528 The fact that public access to trust resources is so central to the doctrine makes it reflective, not contradictory, of international space law’s bar against appropriation of outer space and of the principle of space being the “province of all mankind.”529 [BEGIN FN 529] 529. See Babcock, supra note 509, at 892 (internal footnote omitted) (“Since property containing trust lands is conveyed subject to the doctrine, absolute private dominion over property impressed with the public trust can never be granted unless it is in the public interest to do so.”); see also Ill. Cent. R.R. Co. v. Illinois, 146 U.S. 387, 453 (1892). [END FN 529] It avoids the problems of alienation and exclusion associated with any of the management approaches associated with some form of private property and requires neither the creation of a new administrative authority nor the presence of a close-knit group of like-minded people.530 Members of the public, both rich and poor, can invoke and enforce the doctrine as easily as the sovereign.531 It is cost effective to the extent that no separate apparatus is required to implement it, and the doctrine has shown itself to be highly adaptable and innovative as different needs arise.532 It could also fill the gap in international law with respect to managing celestial property. Therefore, of all the management approaches studied here, the PTD seems the most suited to keep order in space until a regulatory regime is imposed.

#### The alternative is an ad-hoc CIL regime that decks legal reliability – certainty and immediacy is key for a leasing regime implemented through an OST amendment.

Pershing 19 [Abigail D. Pershing, J.D., Yale, “Interpreting the Outer Space Treaty’s Non-Appropriation Principle: Customary International Law from 1967 to Today,” 2019, *The Yale Journal of International Law*, Vol. 44, https://openyls.law.yale.edu/bitstream/handle/20.500.13051/6733/Pershing.pdf?sequence=2&isAllowed=y, EA]

B. A New Property Rights Proposal: Leasing Space

One promising proposal that does not appear to have received much attention in the literature is the concept of leasing space to nations, private individuals, or companies rather than allocating it as permanently-owned property. It appears that the only authors who have even tangentially considered the possibility of leasing property rights in space beyond rights to mineral extraction are Marcel Williams and G.S. Sachdeva. Williams’ writing is limited to a thought experiment in which he imagines renting out up to one percent of the moon’s surface. This property would be directly leased to national governments, which in turn would be vested with the power to sublease sections of this territory to private companies or individuals.134 This proposal is not elaborated any further and is left as a broad-strokes outline. The second mention of leasing or renting space comes from G.S. Sachdeva, who argues that a U.N. Space Superintendence Authority could grant leases to those able to pay.135 Yet this theory is limited to a discussion of renting property rights in particular orbits to allow for hovering geostationary space hotels and does not delve into questions of renting land on celestial bodies.

The concept of leasing outer space deserves greater consideration by space law scholars. This Section sketches a brief outline of how such a system might operate via an internationally-run space property rental system modeled on UNCLOS. Although UNCLOS itself is deeply problematic in its potentially devastating environmental consequences and negative impacts on indigenous peoples as it regulates deep-sea mining,136 the UNCLOS model may nonetheless be the best option for preserving non-space-faring nations’ rights with regard to outer space, given its success in providing developing nations with a voice in the regulation of the high seas and the seabed beyond national jurisdiction.137 It is worth noting that although very few scholars appear to have considered the possibility of renting space, several have examined the similarities between UNCLOS and space law.138 The approach advanced here differs from the conventional approach to this comparison in that it suggests that the international community move beyond merely authorizing nations or individuals to extract a certain quantity of minerals and instead consider the possibility of leasing out actual tracts of space land.

Opened for signature on December 10, 1982, UNCLOS establishes the international rules that govern the use of the world’s oceans and their resources. An examination of UNCLOS is especially apt because it deals with resources— the high seas—that, like space, are not subject to national appropriation. In language strikingly similar to Article II of the Outer Space Treaty, Article 137 of UNCLOS reads:

No State shall claim or exercise sovereignty or sovereign rights over any part of the Area [resources of the seabed and ocean floor beyond the limits of national jurisdiction] or its resources, nor shall any State or natural or juridical person appropriate any part thereof.139

Although there are clear similarities between the two treaties, there are substantial differences as well, many of which would be useful in informing an update to the Outer Space Treaty. In addition to extending the prohibition on sovereignty to individuals as well as to nations, UNCLOS goes far beyond the Outer Space Treaty in detailing the limits of the non-appropriation principle. All of Part XI of UNCLOS, totaling fifty-eight Articles, gives a detailed description of how States can negotiate within the bounds of the non-appropriation principle to exploit ocean resources. Of particular relevance for purposes of crafting a parallel space law proposal is UNCLOS Part XI, Section 4, which lays out the rules governing the International Seabed Authority—the main mechanism through which States and private companies can legally exploit ocean resources, including mining of the deep seabed.140

Using UNCLOS as a model, a similar system may prove promising for the evolution of space law. However, the new space system should allow for rental of space land instead of merely allowing for the extraction of space resources. As with UNCLOS, any such space leasing system should be run through the United Nations. Situating such a system in this forum would help the international community stay true to the intentions of the Outer Space Treaty, which provides, in the words of one author, a “philosophical roadmap for the future development of the outer space legal regime.”141 Although a new committee within the United Nations could be formed for this purpose, the existing Committee on the Peaceful Uses of Outer Space (UNCOPUOS) would be an ideal environment for the creation and operation of such a system. UNCOPUOS is composed of eighty-seven geographically and economically diverse member States (including all the major space-faring States). Additionally, intergovernmental organizations and non-governmental organizations have observer status.142 Given its central mission to maintain space as a peaceful arena of international cooperation, as well as its representative composition,143 it would be an ideal body to bring a space leasing system to fruition.

UNCOPUOS, in turn, should operationalize the leasing system by establishing a new International Outer Space Authority. This Outer Space Authority should parallel the International Seabed Authority described above.144 There should be similar provisions for the International Outer Space Authority relating to the makeup and functioning of the Authority (with each country getting one vote and decisions made by a two-thirds majority);145 the power of the Outer Space Authority to exercise control over space generally;146 the ability to decide how much rent to charge nations or individual corporations;147 and how to use these funds,148 among other provisions.

For this proposed Outer Space Authority to be useful as well as operational, it is critical that it have jurisdiction over property rights in space beyond mining rights. Having rights to property in addition to rights to extracted minerals would add an extra layer of legal security for companies considering venturing into space for mining purposes. And, although businesses currently seem most interested in the possibilities of mining space resources, in the long term, questions of space tourism and the potential development of space colonies may arise. Having a flexible system in place that can adequately handle these concerns is therefore desirable. Instead of just focusing on mining, an Outer Space Authority with broader jurisdiction will have longer staying power and will require less reworking in the near future.

Part of the appeal of this rental model is that it works so seamlessly with the current Outer Space Treaty. Turning again to the language of the Treaty and beginning with the non-appropriation principle, Article II lays out that “[o]uter space, including the moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means.”149 Because no State or individual would ever own land in space under a leasing system, this proposed leasing regime would not be in contravention to Article II. And yet, despite this, a leasing regime would establish enough legal security that exploitation of space resources would not be impeded—the main rationale for those who argue that the Treaty (or at least Article II) should be rescinded.

Moreover, the principle established in Article I of the Outer Space Treaty, that “[t]he exploration and use of outer space, including the moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind,” is also upheld under this leasing regime.150 Leasing not only allows nations and private companies to exploit space resources and reap the benefits of their labor, but also directly benefits developing countries not yet able to tap into the resources of space by redistributing some of the space-going nations’ profits via a leasing fee and a tax on extracted resources.

A potential argument against this rental system, as well as any other international legal system that would seek to regulate property rights in space, is that the United States never signed on to UNCLOS and there is nothing different about this situation that would cause the United States to join an international treaty regulating property in space either. However, space law has a fairly different history than the law of the sea. These differences make it more likely (though unfortunately not certain) that a proposal for an International Outer Space Authority would be adopted by the United States despite the fact that the facially similar UNCLOS proposal failed to garner a two-thirds majority vote in the Senate.

The major difference between UNCLOS and this proposed International Outer Space Authority is that the United States has self-interested reasons for supporting an International Outer Space Authority, whereas it did not have similar reasons to join UNCLOS. The United States has maintained that under customary international law, deep seabed mining is already permissible.151 Since the United States does not recognize limitations of deep seabed mining established in UNCLOS, it may legally undertake deep sea mining under customary international law—a right that is codified in domestic U.S. law in the Deep Seabed Hard Mineral Resources Act:

[I]t is the legal opinion of the United States that exploration for and commercial recovery of hard mineral resources of the deep seabed are freedoms of the high seas subject to a duty of reasonable regard to the interests of other states in their exercise of those and other freedoms recognized by general principles of international law . . . .152

The United States therefore already has access to what it wants without having to join UNCLOS. As an additional point, there is also not much pressure from American companies to ratify UNCLOS, in part because the American Exclusive Economic Zone (recognized by the United States under customary international law)153 and the continental shelf is hugely rich in the resources companies might otherwise have hoped to gain by joining the Treaty and gaining access to minerals from deep sea mining in other areas. Finally, not only does the United States stand to gain very little by ratifying the Treaty, there is an argument that ratification would disadvantage the United States. Under UNCLOS, “coastal States are required to make payments to the International Seabed Authority based on a percentage of revenues derived from the exploitation of the resources found within the continental margin beyond two hundred miles from the coast.”154 Notably, customary international law creates no such obligation.155

In stark contrast to UNCLOS, the new rental system proposed would directly benefit the United States. Unlike with deep sea mining, the United States and its citizens currently are bound by a treaty that prohibits appropriation of space: the Outer Space Treaty. Unlike the UNCLOS analogy, the United States has already relinquished rights in this arena. Agreeing to a leasing amendment would expand the scope of its rights, not infringe upon them. Additionally, the United States does not have access to an outer space “exclusive economic zone” in the same way that it does for the sea. Without some sort of agreement, the United States simply may not legally appropriate any in situ property in outer space.

One final consideration increases the likelihood that the United States would in fact become a signatory to an amendment to the Outer Space Treaty. Such an amendment would likely have the support of businesses, environmental groups, and the military, an unlikely combination of key constituencies that would help push an amended treaty forward. Businesses would advocate for the change because it would provide a clearer mechanism for establishing property rights.156 Environmental groups might push for the amendment’s ratification because of the environmental protections that could be included in such an agreement.157 Finally, the military would also likely be a proponent of the system because having access to property in space gives strategic advantages158 and because it is likely that certain Cold War-era concerns that prompted spacefaring nations to sign the original Outer Space Treaty remain relevant—most notably, concerns over the weaponization of space.159

CONCLUSION

The brief history of outer space law since the adoption of the Outer Space Treaty in 1967 highlights the ease with which customary international law shifts in this arena. Despite an original broad interpretation of the non-appropriation principle during the Treaty’s drafting, customary international law has since carved out an exception to this principle for extracted space resources. A second shift could be similarly underway. Driven by economic incentives, States may reinterpret the non-appropriation principle to allow for private appropriation of space property.

Currently, States have an incentive to cooperate to establish a new international agreement concerning the use of outer space because international law, as it is presently understood, prohibits private property rights in space. A new amendment could broaden these rights, providing an enticing carrot to encourage State cooperation. But this enticement may soon disappear. Given the flexibility of the current outer space legal regime, customary international law could easily shift to interpret the non-appropriation principle as allowing private appropriation of property in space. Whatever the international community decides is the optimal solution regarding outer space property rights, it is vital that action be taken now to preserve the principles advanced by the Outer Space Treaty, such as equitable access and peaceful use of outer space. As the original drafters of the Outer Space Treaty recognized, these principles are best protected through a formal agreement and not merely through customary international law, which is often driven by the most powerful States. Regardless of whether a rental system similar to the one described above is established or some other method is used, the international community will have to act quickly if it wants to maintain shared international control over space. Pursuing an amendment to the Treaty as described also provides certainty and timeliness, two elements that would likely appeal to constituencies that might otherwise be supposed to be content with waiting for customary international law to shift.

#### No turns – Public Trust threads the needle by allowing sustainable exploitation without appropriation – solves debris and resource wars.

Pastorius 13 [Claudia Pastorius, J.D., Barry University School of Law, “Law and Policy in the Global Space Industry's Lift-Off,” 2013, *Barry Law Review*, Vol. 19, Issue 1, https://lawpublications.barry.edu/cgi/viewcontent.cgi?article=1007&context=barrylrev, EA]

C. The Public Trust Doctrine

Rooted in Roman law, the public trust doctrine, whereby a state actor holds and manages property in trust for the benefit of the public, is now regularly applied through common law and statutory regulations around the world.280 The origins of the public trust doctrine are found in the Justinian Institute’s declaration that the air, running water, and the seas (and seashores) were common to mankind, and as such, are resources to be protected by the sovereign.281 Virgiliu Pop, a Romanian Space Agency researcher, postulates that the Outer Space Treaty essentially creates a public trust in the agreement by stating: “for the benefit of and in the interest of all countries” in Article I.282 The missing piece of the puzzle, he claims, is the undesignated trustee(s).283 The sovereign or state is traditionally the trustee in a public trust.284

In a public trust holding property ownership rights, the bundle of property rights285 is thus divided between the trustee (the State) and the beneficiaries (the Public).286

There are two co-existing interests to trust lands: the jus publicum which is the public’s right to use and enjoy trust lands; and the jus privatum which is the private property rights that may exist in the use and possession of trust lands. The State may convey the jus privatum to private owners, but this private interest is subservient to the jus publicum, which is the State’s inalienable interest that it continues to hold in the trust land or water.287

The ownership of the property thus remains with the trustee; but, the rights to exclude, use, and enjoy could be allocated to a group, an individual, or an entity.288

The United Nations created a Trusteeship Council in the hopes of applying the common heritage of mankind doctrine, but its operations centered on work with post-war decolonization territories and were suspended in 1994..289 In its inception, it was conceived that the Trusteeship Council would operate as the “trustee of the common heritage of humankind to ensure the necessary coordinated approach to this concern” and manage the jus privatum rights of common heritage properties.290 The board of trustees consisted of: China, France, Russia, the United Kingdom and the United States—the five permanent members of the Security Council.291 Proposals to utilize the Trusteeship Council to address management of “global commons” have made little progress.292 One contributing factor to the ineffectiveness of the Trusteeship Council may be that the political differences between Security Council members often leads to a stalemate in decisionmaking.293

Despite the dissolution of the Trusteeship Council, there are utilitarian reasons why the formation of a trust for outer space resources would minimize economic detriments to all nation-states and optimize economic benefits of outer space development for all, particularly for spacefaring pioneer nations.294 The common heritage of mankind and public trust doctrine’s proposals and applications have been met with resistance due to the tension between the “haves” and the “have-nots,” or the developed and developing nations.295 However, the successful application of public trusts to environmental resource management could be changing perspectives on the utility of the doctrine.296 Where there are common preservation and conservation goals for a given resource, the public trust is more likely to succeed as the means for managing the benefits and responsibilities relative to the resource.297

Two successful applications of the public trust principles that could influence the management of outer space resources are the International Telecommunications Union (ITU) and the United States Bureau of Land Management (BLM).298 The ITU issues licenses for orbital allocations of satellites and the use of radio frequencies.299 By necessity, the nation-states of the world have peaceably participated in the licensing regime.300 A true tragedy of the commons would result if our telecommunications channel appropriations were chaotic, and, if entities placed satellites into orbit unilaterally with no precautionary coordination.301 Without coordination and commitment to the rules, the overlapping noises would prevent people from hearing each other on the radio, and millions of dollars of satellite equipment, as well as our communication systems, would be at risk.302

The BLM raises an incredible amount of revenue for the government by selling leases of publicly managed lands for oil and natural gas exploration and exploitation to the United States.303 The BLM raised $233 million through leases of public lands in 2012 alone.304 Methods the BLM employs that could be adopted for use with outer space leaseholds are: (1) the auctioning of leases; (2) relative pricing per acre of lease payments depending on whether or not the land is producing; (3) imposing environmental resource management limits on resource exploitation, and (4) issuing fixed term leases with conditions for renewal.305 Some space law academics have noted that United Nations’ treaties and other space law accords will need to distinguish surface property rights on celestial bodies and extraction rights.306 Some even argue that asteroids should be treated as chattel and not land.307 The BLM legal property rights management is an excellent model to look to for establishing the legal property rights that will be needed in outer space for mining minerals, extracting water, and harvesting Helium-3.

If leasehold estates held in trust were conferred in outer space, then measures could be taken to ensure optimal and equitable allocation of outer space leaseholds, and rules could be imposed to manage the sustainable exploitation of space resources.308 Problems such as space debris pollution could be avoided by reviewing development plans to ensure measures to prevent pollution, exit strategies of endeavors, or plans of relative permanence are in place before the projects take-off.309 Controversies regarding planned celestial land use and competing claims to more lucrative territories could be arbitrated and resolved on Earth. From an economic perspective, even though the possibility of “free” appropriation of outer space resources might encourage more space exploration initiatives, development with consistent and reliable rules would provide the stronger incentive of protecting the commercial investments in space exploration.310

An outer space public trust can also be more economically beneficial for nation-states and the people within them. Lease payments for outer space exploration, exploitation, and building rights could be very lucrative for spacefaring nation-states.311 A different form of income from the global space industry may help re-capture lost economic benefits of space program investments that may occur because of the transferability of financial benefits within the globalized economy.312 Beneficiaries do not have to benefit equally in a trust; in fact, the principles of the common heritage of mankind doctrine assert that the benefits should be shared “equitably.”313 Distributions could be made equitably by establishing pro rata criteria for nation-state “shares” in the trust such as space program budget investments, the value of nationally incorporated space technology firms, and a nation-state’s stake in a given venture. Non-spacefaring nations could have nominal shares in the trust with the option of increasing their number of shares when they invest in the global space industry. Spacefaring nations could economically benefit in proportion to their investments in the global space industry and in particular ventures. In this manner, the benefits of space activities could be commonly shared by nation-states in a more equitable manner while also encouraging investments in infrastructure and funding to benefit the commercial space corporations.

#### No PICs – decks the whole regime.

Hickman 2 [John Hickman and Everett Dolman, \* associate professor in the Department of Government and International Studies at Berry College, “Resurrecting the Space Age: A State-Centered Commentary on the Outer Space Regime,” 2002, *Comparative Strategy*, Vol. 21, Issue 2, https://www.tandfonline.com/doi/abs/10.1080/014959302317350855]

Is the collectivization of all of outer space under international law a permanent disability? Fortunately, the answer is no. Under international law, state parties to a treaty may withdraw from its obligations through negotiation, novation, substitution, cancellation, or, rebus sic stantibus, when events overcome the intent of the original treaty, such as when one or more of the other state parties has ceased to exist. Moreover, Article 17 of the OST articulates a straightforward mechanism for withdrawal:

“Any state party to this treaty may give notice of its withdrawal from the treaty one year after its entry into force by written notification to the Depositary Governments. Such withdrawal shall take effect one year from the date of receipt of this notification.”

Thus a state party need merely announce its intention to withdraw and then wait one year. Withdrawal of a single state party to the treaty, however, would not necessarily terminate the treaty between the other state parties. Yet, the decision of an important state not to be bound by a regime–creating treaty obviously endangers the entire treaty. The decision of the United States or China to withdraw from the OST would have far greater implications for the survival of the international space regime than the same decision by Bangladesh, Burkina Faso, or Papua New Guinea—the equality of states under international law remains nothing more than a useful fiction. For the OST to remain good international law, it must be accepted as such by the major space faring states of the 21st Century: the United States, Russia, the European Union, Japan, and China. One defection from the regime by a member of this group would no doubt lead to its effective collapse, as the remaining space faring states are unlikely to use the kind of coercion necessary to enforce the regime. A more likely response to such a defection is a scramble to make similar claims to sovereignty, based on historical precedent and effective occupation. Similar rushes to stake claims for territory sovereignty in other celestial bodies might follow.

### 1AC---Framework

#### The standard is maximizing expected wellbeing.

#### 1] Actor spec – governments must use util because they don’t have intentions and are constantly dealing with tradeoffs—takes out calc indicts since they are empirically denied.

#### 2] Death is bad and outweighs – a] agents can’t act if they fear for their bodily security which constrains every ethical theory, b] it destroys the subject itself – kills any ability to achieve value in ethics since life is a prerequisite which means it’s a side constraint since we can’t reach the end goal of ethics without life

#### 3] Pleasure and pain are the starting point for moral reasoning – they’re our baseline desires and the only things that explain the intrinsic value of objects or actions.

Moen 16 [Ole Martin Moen, Professor of Ethics at Oslo Metropolitan University, “An Argument for Hedonism,” 2016, *The Journal of Value Inquiry*, Vol. 50, pp. 267-281, https://link.springer.com/article/10.1007/s10790-015-9506-9]

Let us start by observing, empirically, that a widely shared judgment about intrinsic value and disvalue is that pleasure is intrinsically valuable and pain is intrinsically disvaluable. On virtually any proposed list of intrinsic values and disvalues (we will look at some of them below), pleasure is included among the intrinsic values and pain among the intrinsic disvalues. This inclusion makes intuitive sense, moreover, for there is something undeniably good about the way pleasure feels and something undeniably bad about the way pain feels, and neither the goodness of pleasure nor the badness of pain seems to be exhausted by the further effects that these experiences might have. ‘‘Pleasure’’ and ‘‘pain’’ are here understood inclusively, as encompassing anything hedonically positive and anything hedonically negative.2

The special value statuses of pleasure and pain are manifested in how we treat these experiences in our everyday reasoning about values. If you tell me that you are heading for the convenience store, I might ask: ‘‘What for?’’ This is a reasonable question, for when you go to the convenience store you usually do so, not merely for the sake of going to the convenience store, but for the sake of achieving something further that you deem to be valuable. You might answer, for example: ‘‘To buy soda.’’ This answer makes sense, for soda is a nice thing and you can get it at the convenience store. I might further inquire, however: ‘‘What is buying the soda good for?’’ This further question can also be a reasonable one, for it need not be obvious why you want the soda. You might answer: ‘‘Well, I want it for the pleasure of drinking it.’’ If I then proceed by asking ‘‘But what is the pleasure of drinking the soda good for?’’ the discussion is likely to reach an awkward end. The reason is that the pleasure is not good for anything further; it is simply that for which going to the convenience store and buying the soda is good.3 As Aristotle observes: ‘‘We never ask [a man] what his end is in being pleased, because we assume that pleasure is choice worthy in itself.’’4 Presumably, a similar story can be told in the case of pains, for if someone says ‘‘This is painful!’’ we never respond by asking: ‘‘And why is that a problem?’’ We take for granted that if something is painful, we have a sufficient explanation of why it is bad.

If we are onto something in our everyday reasoning about values, it seems that pleasure and pain are both places where we reach the end of the line in matters of value.

#### 4] Specifically, extinction outweighs – magnitude, irreversibility, uncertainty.

MacAskill 14 [William MacAskill, Associate Professor in Philosophy and Research Fellow at the Global Priorities Institute, University of Oxford, “Normative Uncertainty,” 2014, University of Oxford PhD Thesis, http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.677.4121&rep=rep1&type=pdf]

However, even if we believe in a moral view according to which human extinction would be a good thing, we still have strong reason to prevent near-term human extinction. To see this, we must note three points. First, we should note that the extinction of the human race is an extremely high stakes moral issue. Humanity could be around for a very long time: if humans survive as long as the median mammal species, we will last another two million years. 188 On this estimate, the number of humans in existence in the future, given that we don’t go extinct anytime soon, would be 2×10^14. 189 So if it is good to bring new people into existence, then it’s very good to prevent human extinction.

Second, human extinction is by its nature an irreversible scenario. If we continue to exist, then we always have the option of letting ourselves go extinct in the future//

(or, perhaps more realistically, of considerably reducing population size). But if we go extinct, then we can’t magically bring ourselves back into existence at a later date.

Third, we should expect ourselves to progress, morally, over the next few centuries, as we have progressed in the past. So we should expect that in a few centuries’ time we will have better evidence about how to evaluate human extinction than we currently have.