1 - Resource Extraction

Asteroid resources are plentiful and valuable.

Greenspan 2016

Greenspan, Andy. Mr. Greenspan is a Ph.D. candidate in Applied Physics at the Harvard John A. Paulson School of Engineering and Applied Sciences. "Precious Metals in Peril: Can Asteroid Mining Save Us?" Science in the News, October 25, 2016. https://sitn.hms.harvard.edu/flash/2016/precious-metals-peril-can-asteroid-mining-save-us/.

While scientists study asteroids to better understand the formation of the solar system and humanity's origins on this rock we call home, asteroids could become economically valuable as well. **Asteroids** often **contain important metals such as iron, nickel, and cobalt**, **as well as** small amounts of **precious metals such as platinum** (Figure 2). Given these considerations, **a single asteroid with the right composition could be worth trillions** of dollars **in raw materials.**

Mining of resources in outer space is economically and technologically feasible, but hinges on adapting legal mechanisms.

Gilbert 2021

Gilbert, Alex. Alex Gilbert is a complex systems researcher and a PhD student in space resources at the Colorado School of Mines. "Mining in Space Is Coming." Milken Institute Review, April 26, 2021. https://www.milkenreview.org/articles/mining-in-space-is-coming.

While this may sound fantastical, some baby steps toward the goal have already been taken. Last year, **NASA awarded contracts to four companies to extract** small amounts of **lunar regolith by 2024**, effectively **beginning the era of commercial space mining. Whether this proves to be the dawn of a gigantic adjunct to mining on earth** — and more immediately, a key to unlocking cost-effective space travel — **will turn on the answers** to a host **of questions** ranging from what resources can be efficiently. As every fan of science fiction knows, the resources **of** the solar system appear virtually unlimited compared to those on Earth. There are whole other planets, dozens of moons, thousands of massive asteroids and millions of small ones that doubtless contain humungous quantities of materials that are scarce and very valuable (back on Earth). Visionaries including Jeff Bezos imagine heavy industry moving to space and Earth becoming a residential area. However, as entrepreneurs look to harness the riches beyond the atmosphere, access to space resources remains tangled in the realities of economics and **governance.**

Property specification is the only way to link to resource extraction, 2 warrants:

[1] First is resolving legal ambiguities.

Shaw 2013

Shaw, Lauren E, J.D. from Chapman University School of Law, ”Asteroids, the New Western Frontier: Applying Principles of the General Mining Law of 1872 to Incentive Asteroid Mining”, JOURNAL OF AIR LAW AND COMMERCE, Volume 78, Issue 1, Article 2, https://scholar.smu.edu/cgi/viewcontent.cgi?article=1307&context=jalc.

To some, the mining of asteroids might sound like the premise of a science fiction novel' or the solution to the heartwrenching, fictional scenario depicted in the film Armageddon.2 To others, it evokes a fantastical idea that may come to fruition in a distant reality. However, impressively funded companies have plans to send spacecraft to begin prospecting on asteroids within the next two years.' The issues associated with the mining of asteroids should be addressed before these plans are set in motion. Much has been written about the issues that might arise from allowing nations to own these space bodies and the minerals they contain; one such issue is the impact on international treaties.4 However, little has been written about the applicability of preexisting mining laws-which provide a basic property right scheme for the private sector-such as the General Mining Law of 1872 (Mining Law) to the management of asteroid mining.' The literature to date on how to legally address asteroid mining is minimal.' The articles that do address it propose the creation of different systems, such as a "property rights-based system that relies on the doctrine of first possession"7 or an international authority that would regulate mining operations.' Implementing **a scheme that offers ownership of extracted resources** without bestowing complete sovereignty **is necessary to avoid an impending legal limbo**-that is, an outer space "Wild West" equivalent where there is neither certainty nor security in who owns what.9 **If private sector miners of asteroids know this right already exists, they** will **have more incentive to extract resources**.' 0 **This, in turn, would increase** the chances of **successful missions, resulting in numerous** scientific and explorative **benefits**, along with the potential replenishment of key elements that are becoming increasingly depleted on Earth yet are still needed for modern industry. Scientists speculate that key elements needed for modern industry, including platinum, zinc, copper, phosphorus, lead, gold, and indium, could become depleted on Earth within the next fifty to sixty years." Many of these metals, such as platinum, are chemical elements that, unlike oil or diamonds, have no synthetic alternative.12 Once the reserves on Earth are mined to complete depletion, industries will be forced to recycle the existing supply of minerals, which will result in increased costs due to increased scarcity.' 3 However, evidence is accumulating that asteroids only a few hundred thousand miles away from Earth may be composed of an abundance of natural resources-including many of the minerals being mined to depletion on Earth-that could lead to vast profits." 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.'

[2] Second is increasing investment.

The CEA 2021

The Council of Economic Advisers. The CEA is the executive agency that advises the President on Economic Policy. “Exploring New Frontiers in Space Policy and Property Rights,” 2021. https://www.govinfo.gov/content/pkg/ERP-2021/pdf/ERP-2021-chapter8.pdf.

Losses from short-term decisionmaking. A growing concern for future space exploration activities arises from **a lack of property rights** security **leading to short-term decisionmaking**, which **may inhibit long-term human activity.** Many empirical studies show that **insecure property rights lead to investment decisions with lower values.** Many of these studies have come from analyses of water rights in the western United States. In what is known as the Prior Appropriation Doctrine, water rights are handed out based on a “first in time, first in right” principle. Given that the amount of water available changes each year due to precipitation patterns, water rights holders that were, earlier in time, known as senior rights holders are more likely to receive their water allocation each year than those that were later in time, known as junior rights holders. Leonard and Libecap (2019) argue that the Prior Appropriation Doctrine, with its clear rights for senior rights holders, allowed for investment in irrigation technologies. Given the climate of the western United States, large-scale investment in irrigation is required to maximize the productivity of large swaths of land. Leonard and Libecap estimate that 16 percent of western States’ income in 1930 is attributable to investments made in irrigation that would not have occurred without secure property rights. Another concern with insecure property rights is that owners of natural resources rush to extract them to ensure that they accrue the benefits of their investments. This rush to extract resources has a detrimental effect on the value obtained from those resources and other negative spillover effects on society. One example is the increase in the rate of deforestation that occurs when property rights for the land are insecure (Bohn and Deacon 2000). Ferreira (2004) finds that those **countries with clearly defined property rights experience less deforestation** than those with weaker protections. Kemal and Lange (2018) find that a reduced chance of oil well expropriation in Indonesia lowered the rate of extraction by up to 40 percent. If short-term decisionmaking prevails in the initial incursions into space, the future of the space economy could be seriously harmed. Depleting the resources necessary to sustain life in space would mean having to transport these resources from Earth at a prohibitive cost and complexity. Therefore, protecting and responsibly using the resources available in space is more efficient in the long term. If done prudently, **establishing property rights in space could diminish** the **risk** of short-term decisionmaking and strengthen the ability of humans to receive benefits from space. Enhanced investment and asset value. Frameworks such as the U.S. Commercial Space Launch Competitiveness Act and the Artemis Accords enhance property rights by providing clear expectations of the benefits one can receive from their investment and providing a list of principles that partner nations will follow as a way to encourage economic activity in space. One branch of the economics literature uses legal or legislative decisions that enhance or diminish property rights to determine how investment and asset values respond to a change in property rights specification. We discuss this literature here. Later in the chapter, we apply the conclusions of these studies to estimate the value of enhancing property rights in space. Alston and Smith (2020) measure the effect of uncertain property rights resulting from the manner in which Northern Pacific Railroad’s land grants were structured. The Federal Government provided generous land grants to railroad companies in hopes of ensuring the quick buildout of rail infrastructure. Northern Pacific was granted almost 16 percent of the land area in Montana, a State that requires coordination among its farmers and ranchers to irrigate any tract of land for productive use. Delays in the completion of the rail line in the 1870s led to uncertainty as to whether Northern Pacific owned (and could sell) land in its land grant or whether the land was the property of the Federal Government. As a result of this uncertainty, completed irrigation projects averaged delays of four years, while investment in irrigation projects decreased by 28 percent. Insecure property rights affected the landowners whose rights were secure, because irrigation projects often require coordination among many parcels due to their high capital costs. The delay in undertaking irrigation investments led to these landowners being more junior water rights holders and, subsequently, holding less secure water rights. In total, Montana’s economic activity was 6 percent lower in 1930 as a result of these insecure property rights. Grainger and Costello (2014) compare the value of more secure property rights for fisheries in the United States, Canada, and New Zealand. New Zealand’s regulations on quotas to operate in a given fishery explicitly state that these quotas are a property right, yet similar quota systems in the United States and Canada have regulations that explicitly state that the quotas are not property rights. The fact that the United States’ and Canada’s fishery quotas are not as secure as New Zealand’s quotas leads to a lower perpetuity value of the quotas relative to their current annual value. Because U.S. and Canadian firms have the potential for their quotas to be taken away without recourse, their assets have lower values relative to New Zealand’s firms. In an additional analysis, Grainger and Costello (2014) show that the increased security of property rights with the settling of an ownership dispute between native New Zealanders, known as the Maori, and New Zealanders of European descent improved the perpetuity value of fishing quotas by 50 percent. Ensuring that property rights will be honored is very important for market participants in understanding the value of their asset. Galiani and Schargodsky (2010) use a court case in Argentina to estimate the effect of secure property rights for one’s home on household decisions. Their results show that households that gained secure property rights increased their investments in the home structure. Investment in walls and roofs increased by 40 percent and 47 percent, respectively, as a result of households being granted title to the home. Though not directly related to space assets, the available evidence demonstrates that more secure property rights lead to other spillover benefits that are not directly related to the assets on which a property rights are granted. Galiani and Schargodsky (2010) find that when households had increased property rights security, they increased investment in their children’s education. Children in households who obtained the secure property rights on their land achieved an extra 0.7 year of schooling on average. This is an important spillover effect given the large individual and societal benefits of extra years of education (see chapter 7 of this Report). Telecommunications satellites orbiting Earth provide an example of positive spillovers from ensuring secure property rights in space. The International Telecommunication Union (ITU) is an organization that standardizes rules and regulations for a wide range of communications. Through the ITU, the United States was able to operate satellites that used specific frequencies to transmit information to Earth, thereby allowing companies to invest in utilizing those signals for commercial purposes. Communications satellites in geosynchronous orbit rely on the ITU to secure access to specific orbital slots as well as specific frequencies. Protection against expropriation. A number of nongovernmental organizations produce indices that measure property rights protections or general institutional quality. The indices attempt to quantify the relative level of property rights characteristics, such as the rule of law or protection against expropriation risk, that are consistent across countries and time. A large body of economics literature uses these country-level indices of institutional quality to determine the extent to which improvements in property rights enforcement affect economic outcomes. Policies initiated under the Trump Administration would likely alter these indices in a measurable way if there were a property rights index for space. Seminal work by Acemoglu, Johnson, and Robinson (2001) shows that improving the enforcement of property rights, in this case property rights that protect against expropriation risk, has large effects on gross domestic product (GDP). In their analysis, the authors show that a one-unit improvement in the protection against expropriation risk would lead to more than doubling GDP per capita 10 years later. Similar results are found when researchers examine specific industries. For example, Cust and Harding (2020) show that firms drill for oil twice as often in countries with stronger property rights enforcement relative to their neighbors with weaker property rights. They also show that the effect of the enforcement of rights is most important for private international oil companies relative to national oil companies, highlighting the important role of stronger rights for harnessing private investment. Bohn and Deacon (2000) find a similar pattern for the effect on oil drilling as property rights security improves, with a 30 percent increase in security leading to a 60 percent increase in drilling per year. Some changes in property rights enforcement come through improvements in technology. Hornbeck (2010) uses the invention and widespread use of barbed wire as a technology advancement that reduced the costs of enforcing property rights in agriculture. Importantly, Hornbeck compares areas that had access to timber for wooden fences with those that did not and finds a 23 percent relative improvement in crop productivity when barbed wire came into use, as barbed wire lowered the relative cost of fencing. Most of the gain came from farmers altering the type of crop that they planted once they were confident that livestock would not destroy the crop. This increased ability to effectively enforce property rights led to investments that increased the total area of farmland that had been improved by 19 percentage points, while also increasing land values. In many ways, this example of marking off territory is similar to the Artemis Accords’ “Deconfliction of Activities” Principle. This principle prescribes setting “safety zones” to limit harmful interference and keep the probability of accidental loss to a minimum. The Effects of Policies on Investment in Space Industries The previous section detailed the expansive literature showing that more secure property rights increase both investment and economic activity. The examples discussed varied across time and space, leaving little doubt that the results are not driven by random chance; the studies as a whole reveal that the findings hold outside specific examples. Because the examples are numerous and varied, determining an average effect of more secure property rights on investment is difficult. Each study concerns a particular improvement in the security of property rights that is difficult to quantify. However, it is still a goal of this chapter to estimate the effect of the last year’s space policy developments on future investment, given the available evidence. Table 8-2 summarizes the effects of most of the studies discussed in the previous section. All these effects are large in magnitude. Another data point is the increase of investment in the space economy in the United States with the

passage of the U.S. Commercial Space Launch Competitiveness Act in 2015 relative to investments in other countries. Using the Space Capital data discussed in the second section, and the historical examples given above, the CEA estimates the increase in investment in the United States due to the improved property rights specification in 2015. **Controlling for country and time period effects, the data show a** statistically significant **increase in investment of 92 percent**—or roughly double—**in the U**nited **S**tates **since passage of the** U.S. **Commercial Space Launch Competitiveness Act relative to countries that did not improve property specification.** Together, these small improvements in the security of property rights have the potential to lead to large increases in investment. As an approximation, the CEA assumes that these improvements in property rights security will double the amount of investment in space. This number is in line with the evidence that has been discussed here.

There's 2 impacts:

[1] First is stopping warming.

There's multiple avenues:

[A] Resource extraction in outer space is cleaner.

Hein et al. 2018

Hein, Andreas, Michael Saidani, and Hortense Tollu. All authors work at the Laboratoire Genie Industriel at the Université Paris-Saclay. "Exploring Potential Environmental Benefits of Asteroid Mining. 69th International Astronautical Congress," 2018. https://hal.archives-ouvertes.fr/hal-01910090/document.

For the case of platinum, **Earth-mining is the reference and the impact of returning platinum to Earth needs to be taken into consideration**. It is known that during re-entry a spacecraft releases H2O and NOx in the Earth's upper atmosphere via the re-entry shock wave and material released via ablation [48], [49]. N2O has a global warming potential of between about 265–298, 310 times CO2 [39], [50]. Park and Rakich [51] estimate that about 17.5±5.3% of the Space Shuttle mass is released in the form of NOx during re-entry. As a conservative estimate, we use 20% and assume that predominantly N2O is released. Furthermore, we assume that for 1 kg of platinum, about 1 kg of additional mass is required for reentry (heatshield, GNS, parachute etc.). Hence, roughly 0.2 kg of N2O is released per kg of platinum returned to Earth, which translates into roughly an equivalent of 60 kg of CO. As a result, we get a total kg CO2eq per kg Pt of 150 kg. Given various uncertainties, we see that the total CO2eq of an asteroid mining mission is on the order of dozens to hundreds of kg CO2eq per kg of platinum returned. If we compare these rough estimates with the CO2eq values for Earth-based platinum mining, we immediately see that **the global warming effect of Earthbased mining is several orders of magnitude larger, even for secondary platinum.** Table 2 shows the ratio between the Earth-based platinum mining emissions and the space-based mining emissions. A difference of two orders of magnitudes for primary platinum and one order of magnitude for secondary platinum is observed. For a mixture of primary and secondary platinum, we get values with two orders of magnitude difference.

[B] Space resources are key to earth-based climate change mitigation efforts.

Mills 2022

Mills, Mark P. Mr. Mills is a Manhattan Institute senior fellow and faculty fellow at Northwestern University's McCormick School of Engineering, is a strategic partner in Montrose Lane, an energy-tech venture fund. "The Hard Math of Minerals." Issues in Science and Technology, January 27, 2022. https://issues.org/environmental-economic-costs-minerals-solar-wind-batteries-mills/?mod=djemMER_h.

Today's **plans to decarbonize global energy systems center on** a massive expansion in the use of **solar, wind, and battery tech**nologies, with the goal of these becoming the dominant means to power society. But scaling up these energy sources entails a radically heavier materials footprint than is associated with fossil fuels, paradoxical though it may seem. The unavoidable scale of materials demand will have significant impacts on commodities markets and prices, as well as on the environment. Most policy formulations fail to account for these implications. The country is long overdue for thoughtful and realistic planning that honestly acknowledges the tradeoffs and consequences arising from the materials needed to accelerate what is being called the energy transition. It has long been known that building solar and wind systems requires roughly a tenfold increase in the total tonnage of common materials—concrete, steel, glass, etc.—to deliver the same quantity of energy compared to building a natural gas or other hydrocarbon-fueled power plant. Beyond that, **supplying** the same quantity of **energy** as conventional sources **with solar and wind** equipment, **along with** other aspects of the energy transition such as **using** electric vehicles **(EVs), entails an enormous increase in the use** of **specialty minerals** and metals like copper, nickel, chromium, zinc, cobalt: in many instances, **it's far more than** a **tenfold** increase**.** As one World Bank study noted, the "technologies assumed to populate the clean energy shift … are in fact significantly MORE material intensive in their composition than current traditional fossil-fuel-based energy supply systems." Today, the material intensity of solar and wind systems and EVs is still of minimal consequence because those technologies account for only a few percentage points of the global energy system. But the material demands will become hard to ignore if the world's economies all simultaneously pursue similarly ambitious policies to displace the fossil fuels that currently supply over 80% of all energy. The vision plan from the International Energy Agency (IEA), which has been adopted and even exceeded by some policymakers, has solar and wind providing some 60% of net new global energy supply over the coming two decades. The country is long overdue for thoughtful and realistic planning that honestly acknowledges the tradeoffs and consequences arising from the materials needed to accelerate what is being called the energy transition Installing so much wind and solar generation capacity worldwide has profound materials implications, not to mention land requirements, which will soon become problematic. Replacing the energy output from a single 100 megawatt (MW) natural gas-fired turbine (producing enough electricity for 75,000 homes) requires at least 20 wind turbines, each about 500 feet tall and collectively requiring some 30,000 tons of iron ore and 50,000 tons of concrete, as well as 900 tons of nonrecyclable plastics for the turbine blades. The gas turbine, by contrast, requires only about 300 tons of iron ore and some 2,000 tons of concrete. The 20 wind turbines also require 1,000 tons of specialty metals and minerals such as copper, chromium, zinc, etc., versus about 100 tons embodied in the gas turbine. Moreover, the gas turbine is about the size of a residential house, while those 20 wind turbines require 10 square miles of land. And although a solar installation would require one-third as much land as wind, the aggregate tonnage of cement, steel, and glass used is about 150% greater than wind. And if solar and wind are to become the primary sources of power, then utility-scale electricity storage and additional generating capacity will be required to meet demand and to produce excess energy to be stored. Thus, replacing a 100 MW gas turbine would necessitate at least 200 MW of solar or wind capacity, more than doubling the hardware and materials requirements—along with yet more materials associated with building about 10,000 tons of batteries for energy storage. Scaling up solar, wind, and batteries also means scaling up the mining of the refined minerals they require. There is a significant environmental impact associated with the sheer tonnage of earth that must be moved and processed to produce these refined minerals. To produce one ton of a purified element, a far greater quantity of ore must be extracted and processed. Copper ores, for example, typically contain only about 0.5% by weight of the element itself: roughly 200 tons of ore are dug up, moved, crushed, and refined to produce 1 ton of copper. The rare earth element neodymium, which is used in wind turbines, requires mining from 20 to 160 tons of ore to obtain 1 ton. Cobalt (used in most batteries) occurs at a grade typically lower than 1 ton of the element per 1,500 tons of ore. The calculus of the upstream environmental footprint should also include the overburden—the necessary removal of even more tons of rocks and dirt to access a single ton of the buried mineral-bearing ore. The energy transition, as it's being conceived today, will create a need for tens of gigatons of materials for solar and wind generation, grid storage, and car batteries. The IEA terms this a "shift from a fuel-intensive to a material-intensive energy system." The agency estimates that **an energy plan** more ambitious than implied by the 2015 Paris Agreement, but one **that remains far short of eliminating the use of fossil fuels, would increase demand for minerals such as lithium, graphite, nickel, and cobalt** rare earths **by 4,200%, 2,500%, 1,900% and 700%, respectively, by 2040**.

Failures to stop warming trigger a laundry list of high probability AND high magnitude impacts - we outweigh.

Parry in 2019

Parry, Emyr. Mr. Parry has been Permanent Representative of the United Kingdom to the United Nations since July 2003, after serving as Permanent Representative to the North Atlantic Council in Brussels. He also served as Political Director of the Foreign and Commonwealth Office and as Director at the European Union. Sir Emyr completed his PhD in Polymer Physics at Cambridge University. “The Greatest Threat to Global Security: Climate Change Is Not Merely an Environmental Problem | United Nations.” United Nations, 2019. https://www.un.org/en/chronicle/article/greatest-threat-global-security-climate-change-not-merely-environmental-problem.

Recent scientific evidence has reinforced, and in some cases exceeded, our worst fears about the physical impacts facing us. It has become increasingly clear that **climate change has consequences** that reach the very heart of the security agenda: **flooding, disease and famine,** resulting in **migration on an unprecedented scale** in areas of already high tension; **drought and crop-failure,** leading to **intensified competition for** food, water and energy in regions where **resources** are already stretched to the limit; and **economic disruption** on the scale predicted in the 2006 Stern Review on the Economics of Climate Change, and not seen since the end of the Second World War. **This is** not about narrow national security, but **about collective security** in a fragile and increasingly interdependent world. And tragically, once again, **it will be the most vulnerable** and the least able to cope who will be **hit first.** There is no choice between a stable climate and the fight against poverty -- without the first, the second will certainly fail. Anyone still convinced that climate change is purely an environmental problem should read the report published on 16 April by the Military Advisory Board, a group of highly respected retired Admirals and Generals in the United States. During these retired military officers' careers, they have stood face to face with everything, from containment and deterrence of the Soviet nuclear threat during the cold war to the more recent struggle against terrorism and extremism. And yet they categorically state in their report that projected **climate change** poses a serious threat to America's national security. They say it **is "a threat multiplier for instability in some of the most volatile regions of the world"**. In other words, an unstable climate will create the very kind of tensions and conflicts that the Security Council deals with, day in and day out, yet more frequent and even more severe.

[2] Second is resource wars

Mineral *shortages* empirically link to war on earth, look to the DRC's cobalt reserves.

Searcey 2021

Searcey, Dionne, Michael Forsythe, Eric Lipton, and Ashley Gilbertson. "A Power Struggle over Cobalt Rattles the Clean Energy Revolution." *The New York Times*, November 20, 2021, sec. World. https://www.nytimes.com/2021/11/20/world/china-congo-cobalt.html.

Now, with **more than two-thirds of the world's cobalt** production **coming from Congo**, the country is once again taking center stage as major automakers commit to battling climate change by transitioning from gasoline-burning vehicles to battery-powered ones. The new automobiles rely on a host of minerals and metals often not abundant in the United States or the oil-rich Middle East, which sustained the last energy era. But the quest for Congo's cobalt **has demonstrated how the clean energy revolution**, meant to save the planet from perilously warming temperatures in an age of enlightened self-interest, **is caught in a familiar cycle of exploitation**, greed and gamesmanship that often puts narrow national aspirations above all else, an investigation by The New York Times found.

These minerals are bought with millions of lives.

The Enough Project 2017

The Enough Project. Enough conducts research in conflict zones, engages governments and the private sector on potential policy solutions, and mobilizes public campaigns focused on peace, human rights, and breaking the links between war and illicit profit. "Progress and Challenges on Conflict Minerals: Facts on Dodd-Frank 1502." The Enough Project, 2017. https://enoughproject.org/special-topics/progress-and-challenges-conflict-minerals-facts-dodd-frank-1502.

Conflict **minerals have fueled and continue to** help **sustain** armed **violence in** eastern Democratic Republic of **Congo** (Congo), **linking them to the deadliest conflict** globally **since World War II.** The four conflict minerals (gold, along with the 3Ts – tin, tantalum, and tungsten) are not the only sources of income to armed groups, but they are some of the most lucrative. The illegal exploitation of natural resources today is a manifestation of grand corruption linked to violence that has plagued Congo for the past 130 years. The U.N. Group of Experts on Congo found in 2016 that gold "provides the most significant financial benefit to armed groups" [1] and "is the most lucrative and easily smuggled of the natural resources in the eastern Democratic Republic of the Congo."[2] A study from the Enough Project found that armed groups made an estimated $185 million from conflict minerals in 2008.[3] In 2007 the Pole Institute noted "minerals are a major source of income and of conflict in North Kivu as in the whole of the DRC,"[4] A mortality study by the International Rescue Committee looking at

conflict-related deaths **between** August **1998 and** April **2007** estimated that **more than 5.4 million people died as a result of armed conflict in Congo.**[5] There has been continuing violence since that study, but no definitive follow up has been conducted on the mortality toll.

2 - Orbital Slots

Private satellites and orbital solar power are critical to understanding and solving climate change.

The EDF's Methane Sat proves

EDF 2021

Environmental Defense Fund. The EDF is one of the world's leading environmental groups.

> "This Space Technology Can Cut Climate Pollution on Earth." Environmental Defense Fund, 2019. https://www.edf.org/climate/space-technology-can-cut-climate-pollution-earth.

Like EDF's efforts using technological innovation to drive environmental change, the **MethaneSAT** mission **is about turning data into action.** That **data will be available to the public** free of charge, so that stakeholders and the public can see and compare methane emissions by country or company. This unprecedented **transparency will both enable and motivate faster reductions. And** it will give the public objective assurance that both industry and government are delivering reductions. Fred Krupp, EDF's president, unveiled the idea for MethaneSAT in a 2018 TED Talk at TED's flagship event, as part of The Audacious Project, successor to the TED Prize. The purpose of MethaneSAT is to **serve as a critical resource for** realizing our goal of **reducing methane emissions** from a diversity of sources, especially global oil and gas. A 45 percent reduction in oil and gas methane emissions by 2025 would deliver the same 20-year climate benefit as closing one-third of the world's coal-fired power plants. **Cutting these emissions is the fastest, cheapest thing we can do to slow the rate of warming** today, even as we continue to attack carbon dioxide emissions.

Next is space-based solar power.

Autry 2019

Autry, Greg. Dr. Greg Autry is an educator, space policy wonk, writer and tech entrepreneur. He researches and publishes on space commerce, entrepreneurship, technology innovation and trade policy. Greg is a Clinical Professor of Space Leadership, Policy and Business with the Thunderbird School of Global Management at Arizona State University. He also serves as Chair of the Safety Working Group on the Commercial Space Transportation

Advisory Committee (COMSTAC) at the FAA. He was nominated by the President to serve as the Chief Financial Officer at NASA, and holds a BA in history from Cal Poly Pomona as well as an MBA and a PhD (policy-econ & strategy comps) from the Merage School of Business at UC Irvine. “Space Research Can Save the Planet—Again.” Foreign Policy. Foreign Policy, July 20, 2019. https://foreignpolicy.com/2019/07/20/space-research-can-save-the-planet-again-climate-change-environment/.

Today conservationists and other critics are more likely to see space programs as militaristic splurges that squander billions of dollars better applied to solving problems on Earth. These well-meaning complaints are misguided, however. Earth’s problems—most urgently, **climate change—can be solved only from space.** That’s where the tools and data already being used to tackle these issues were forged and where the solutions of the future will be too. Space research has already been critical in averting one major environmental disaster. It was NASA satellite data that revealed a frightening and growing hole in the ozone layer over the South Pole, galvanizing public concern that, in 1987, produced the Montreal Protocol: the first international agreement addressing a global environmental problem. Since then, thanks to worldwide restrictions on damaging chlorofluorocarbons, the ozone situation has stabilized, and a full planetary recovery is expected. As this case showed, space can provide the vital information needed to understand a problem—and a surprising range of ways to solve it. Climate change is a poster child for the critical role of space data. Trekking across the globe to measure ice sheets with drills and gauge sea temperatures from the sides of ships is an expensive, slow, and insufficient way to assay the state of the planet. Satellites operated by NASA, the U.S. National Oceanic and Atmospheric Administration, and an increasing number of commercial firms provide a plethora of multispectral imaging and radar measurements of developments such as coral reef degradation, harmful plankton blooms, and polar bears negotiating thinning ice. Much of the technology involved in observing the Earth today was initially developed for probes sent to explore other planets in our solar system. IT WAS NASA SATELLITE DATA THAT REVEALED A FRIGHTENING AND GROWING HOLE IN THE OZONE LAYER OVER THE SOUTH POLE, GALVANIZING PUBLIC CONCERN THAT, IN 1987, PRODUCED THE MONTREAL PROTOCOL: THE FIRST INTERNATIONAL AGREEMENT ADDRESSING A GLOBAL ENVIRONMENTAL PROBLEM. Indeed, understanding the evolution of other planets’ climates is essential for modeling possible outcomes on Earth. NASA probes revealed how, roughly 4 billion years ago, a runaway greenhouse gas syndrome turned Venus into a hot, hellish, and uninhabitable planet of acid rain. Orbiters, landers, and rovers continue to unravel the processes that transformed a once warm and wet Mars into a frigid, dry dust ball—and scientists even to conceive of future scenarios that might terraform it back into a livable planet. Discovering other worlds’ history and imagining their future offers important visions for climate change mitigation strategies on Earth, such as mining helium from the moon itself for future clean energy. Spinoff technologies from space research, from GPS to semiconductor solar cells, are already helping to reduce emissions; the efficiency gains of GPS-guided navigation shrink fuel expenditures on sea, land, and air by between 15 and 21 percent—a greater reduction than better engines or fuel changes have so far provided. Modern solar photovoltaic power also owes its existence to space. The first real customer for solar energy was the U.S. space program; applications such as the giant solar wings that power the International Space Station have continually driven improvements in solar cell performance, and NASA first demonstrated the value of the sun for powering communities on Earth by using solar in its own facilities. Promisingly, **space-based solar power stations** could **overcome the inconvenient truth that wind and solar will never get us anywhere near zero emissions because their output is inherently intermittent** and there is, so far, no environmentally acceptable way to store their

power at a global scale, even for one night. **Orbital solar power stations**, on the other hand, **would** continually face the sun, beaming clean power back through targeted radiation to Earth day or night, regardless of weather. They would also be free from clouds and atmospheric interference and therefore **operate with many times the efficiency of current solar tech**nology. Moving solar power generation away from Earth—already possible but held back by the current steep costs of lifting the materials into space—would preserve land and cultural resources from the blight of huge panel farms and save landfills from the growing problem of discarded old solar panels. Sustainable energy advocates in the U.S. military and the Chinese government are actively pursuing space-based solar power, but just making solar cells damages the environment due to the caustic chemicals employed. **Space tech**nology **offers the possibility of freeing the Earth's fragile biosphere** and culturally important sites **from the otherwise unavoidable damage caused by manufacturing and mining.** The U.S. **start-up Made in Space is currently taking the first steps toward manufacturing in orbit**. The company's fiber-optic cable, produced by machinery on the International Space Station, is orders of magnitude more efficient than anything made on Earth, where the heavy gravity creates tiny flaws in the material. Made in Space and others are **eventually planning to build** large structures, such as **solar power stations, in space.** As these technologies develop, they will augment each other, bringing costs down dramatically; space manufacturing, for instance, slashes the cost of solar installations in space.

The environmental impact analysis is the same - apply Parry 2019 - either DA outweighs case.

3 - CP

COUNTERPLAN: The United Nations should immediately create the U.N. Space Exploitation Registry, or UNSER, which will both enable and mandatorily govern all private appropriation of outer space, requiring project approval, environmental impact analysis, publicly available project plans, debris mitigation and/or cleanup plans, and funding by states in proportion to national income derived from space projects.

Reinstein 1999 [solvency advocate for the CP minus debris mitigation requirements]

Reinstein, Ezra. J.D. from Harvard Law. "Owning Outer Space." *Northwestern Journal of International Law & Business* 20, no. 1 Fall (1999). https://scholarlycommons.law.northwestern.edu/cgi/viewcontent.cgi?article=1500&context=njilb.

To summarize, **UNSER wards off** much **litigation and potentially dangerous competition by imposing** a system of **prioritized registration**. This is necessary, in any property regime based on the right of the first comer, to ward off sabotage. Space must be developed, but not at the expense of civil relations. **It will** also **eliminate private space races.** In a space race, two companies vie for the same site. One company inevitably must arrive second and return empty-handed, with nothing to show for its massive resource expenditures. **The** UNSER **approval process would prevent such waste.** The UNSER **approval** process **screens for environmental violations**, reduces waste and lawsuits, **and provides necessary control to protect longterm growth.** Since project plans, once submitted, are public documents, **information about sites and projects spreads.** This is an economically significant point. A major element of transaction costs is imperfect information. Specifically, when it's difficult for parties who want to purchase sites to unearth information about the sites, or even who it is that owns the sites, they will not necessarily be able to purchase the site they would find most valuable. When knowledge about the properties for sale in a real estate market is less than perfect, the costs of property transfer rise and real estate tends to end up in less efficient hands. **UNSER** acts as a sort of clearing-house. It **centralizes information about sites and owners.** This would lower the cost of finding the right property. **And** that means **we get closer to an efficient allocation of resources.** And by requiring launch processes to be described in publicized project plans, developing nations will be better able to design and build spaceships of their own.

4 - Framing

The standard is cost-benefit analysis. This is presumed internally in moral judgements including their framing and the only way to rationally make policy decisions.

Greene in 2002

Greene, Joshua. Mr. Green has a BA from Harvard College and a PhD in Philosophy from Princeton University; he is now a Professor of Psychology at Harvard. "The Terrible, Horrible, No Good, Very Bad Truth about Morality and What to Do about It," 2002. https://emilkirkegaard.dk/en/wp-content/uploads/Joshua-D.-Greene-The-Terrible-Horrible-No-Good-Very-Bad-Truth-about-Morality-and.pdf.

Some people who talk of balancing rights may think there is an algorithm for deciding which rights take priority over which. If that's what we mean by 302 "balancing rights," then we are wise to shun this sort of talk. **Attempting to solve moral problems using a complex deontological algorithm is dogmatism** at its most esoteric, but dogmatism all the same. However, it's likely that **when** some **people talk about "balancing competing rights and obligations" they are already thinking like consequentialists** in spite of their use of deontological language. Once again, what deontological language does best is express the thoughts of people struck by strong, emotional moral intuitions: "It doesn't matter that you can save five people by pushing him to his death. To do this would be a violation of his rights!"19 That is why angry protesters say things like, "Animals Have Rights, Too!" rather than, "Animal Testing: The Harms Outweigh the Benefits!" Once again, rights talk captures the apparent clarity of the issue and absoluteness of the answer. But sometimes rights talk persists long after the sense of clarity and absoluteness has faded. One thinks, for example, of the thousands of children whose lives are saved by drugs that were tested on animals and the "rights" of those children. **One finds oneself balancing the "rights" on both sides** by asking how many rabbit lives one is willing to sacrifice in order to save one human life, and so on, **and at the end of the day one's underlying thought is as thoroughly consequentialist as can be**, despite the deontological gloss. And what's wrong with that? Nothing, except for the fact that **the deontological gloss adds nothing** and furthers the myth that there really are "rights," etc. **Best to drop it.** When deontological talk gets sophisticated, the thought it represents is either dogmatic in an esoteric sort of way or covertly consequentialist.

Under framing, you prefer environmental impacts above all their scenarios, 2 reasons:

1. **All their impacts get checked by intervention from policymakers and diplomats at a later stage, deterrence should make you at least HIGHLY skeptical of any of their scenarios.**
2. **Climate change is an extinction impact that is occurring and worsening now.**

Barrie in 2019

Spratt, David, Ian Dunlop, and Chris Barrie. Admiral Chris Barrie, AC RAN Retired, is Honorary Professor, Strategic & Defence Studies Centre, Coral Bell School of Asia Pacific Affairs, Australian National University, Canberra. He is a member of the Global Military Advisory Council on Climate Change and was Chief of the Australian Defence Force from 1998 to 2002. "Existential Climate-Related Security Risk: A Scenario Approach," 2019. https://docs.wixstatic.com/ugd/148cb0_a1406e0143ac4c469196d3003bc1e687.pdf.

In 2017-18, the Australian Senate inquired into the implications of climate change for Australia's national security. The Inquiry found that **climate change is "a current and existential** national **security risk**", one **that "threatens** the **premature extinction of** Earthoriginating **intelligent life or the permanent and drastic destruction of its potential for desirable future development**". I told the Inquiry that, after nuclear war, humaninduced global warming is the greatest threat to human life on the planet. Today's 7.5 billion human beings are already the most predatory species that ever existed, yet the global population has yet to peak and may reach 10 billion people, with dire implications absent a fundamental change in human behaviour. This policy paper looks at the existential climate-related security risk through a scenario set thirty years into the future. David Spratt and Ian Dunlop have laid bare the unvarnished truth about the desperate situation humans, and our planet, are in, painting a disturbing picture of the real possibility that human life on earth may be on the way to extinction, in the most horrible way. In Australia recently we have seen and heard signals about the growing realisation of the seriousness of our plight. For example, young women speak of their decisions to not have children, and climate scientists admitting to depression as they consider the "inevitable" nature of a doomsday future and turn towards thinking more about family and relocation to "safer" places, rather than working on more research

3. **Cross-apply Parry 2019 from DA1 - climate change increases the probability of all their impacts, so even if you buy that their impacts are extinction level you vote for us on them.**

Yes, the resolution requires policymaking - that's because governments assume moral responsibility for inaction.

Sunstein 2005

Sunstein, Cass R., and Adrian Vermeule. Cass Sunstein is Karl N. Llewellyn Distinguished Service Professor of Jurisprudence, The University of Chicago Law School, Department of Political Science and the College. Adrian Vermeule is Bernard D. Meltzer Professor of

Law, The University of Chicago. “Is Capital Punishment Morally Required? The Relevance of Life-Life Tradeoffs.” *SSRN Electronic Journal* 58, no. 3 (2005). https://doi.org/10.2139/ssrn.691447.

In our view, both the argument from causation and the argument from intention go wrong by overlooking the distinctive features of government as a moral agent. Whatever the general status of the act-omission distinction as a matter of moral philosophy,38 the distinction is least impressive when applied to government.39 The most fundamental point is that **unlike individuals, governments always and necessarily face a choice** between or among possible policies **for regulating third parties. The distinction between acts and omissions** may not be intelligible in this context, and even if it is, the distinction **does not make a morally relevant difference.** Most generally, **government is in the business of creating permissions and prohibitions.** When it explicitly or implicitly authorizes private action, it is not omitting to do anything, or refusing to act.40 Moreover, the distinction between authorized and unauthorized private action—for example, private killing—becomes obscure when the government formally forbids private action, but chooses a set of policy instruments that do not adequately or fully discourage it.