1NC Negative Case

Resolution

I negate Resolved: The appropriation of outer space by private entities is unjust.

Definitions

Firstly, I agree with my opponent's definitions

Framework

I will also concede to my opponent's value of justice and criterion of maximizing human well-being.

Contentions

Contention 1: Asteroid Mining

Private sector has more incentive to innovate than governments, making markets accessible and cost-effective to all.

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But the public sector will never deliver the full potential benefits and excitement of humans venturing forth from Earth. Instead, ongoing **government-driven space efforts will be expensive and limited** to a few, select individuals. **For 50 years, government-run space exploration has been subject to** ever-**shifting budget and political priorities**. The space shuttle and the space station sucked up the lion's share of resources, limiting exploration of alternative launch approaches or objectives beyond low-Earth orbit. In addition, given the high cost, only the most "deserving," appropriately vetted candidates are chosen. Ordinary people will have almost no opportunity to ever venture into space, except in long-shot publicity stunts intended to gin up support for additional spending. Finally, **in the absence of competitive pressures, government efforts face little incentive to explore long-shot options** for dramatically lowering costs. With little potential upside from risk-taking, program managers instinctively stick to defensible, consensus-driven (and typically higher-cost) solutions. But today's surge in space tourism is driven by market forces and has the potential to deliver(s) outsized benefits more affordably. These **private-sector space efforts are market driven, sustainable, broad-based and** increasingly **cost-effective.** While Branson and Bezos almost certainly enjoyed their trips to space, neither of them got wealthy by squandering their limited resources on products and services that had no hope of generating profits. Enduring prosperity has created a vast reserve of space and technology enthusiasts who also control enormous financial resources. The combination of dreams and resources provides the opportunity to build profitable space businesses. Developing this market is exorbitantly expensive. **Space entrepreneurs will continually** seek out opportunities to **expand the market** in order **to spread costs over the largest** possible **pool of** potential **consumers**. Finally, **private-sector competition is** primarily **a race to find** ever-**better ways to deliver higher-value services at** ever-**lower costs.** As initial entrants demonstrate, there is a market for space tourism and competitors will work relentlessly to deliver more affordable space services.

Space mining by private entities will be full-scale in a few years

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A Mars mission carrying 100 metric tons cargo in 2022 followed by a manned mission by 2024 are the immediate milestones of Elon Musk's SpaceX plan which aims to create a self sustaining Mars city by 2050. **Just a few decades back this would have sounded as fantasy, but today it looks as if this time frame may actually be bettered**. **Space missions are set to undergo revolutionary changes** and Elon Musk's vision **and timelines are indicators of this.** Space is increasingly being seen as a treasure trove of precious minerals and also a place for future human habitation beyond the earth. Global private space industry investors believe that space mining has the potential to shape and define the 21st Century. NASA estimates that the 'Asteroid belt' holds minerals worth quintillion of dollars. American astrophysicist Neil Degrasse Tyson believes, "The first trillioners will be those who mine asteroids". The "Main Asteroid Belt" is located between the orbits of Mars and Jupiter, about 450 to 650 million Kilometers from earth, with million asteroids in it. Over the decades, apart from Moon and Mars, governments and **private agencies have been** carrying out extensive research and **studying asteroids for their composition, possibility of mining them and their** mining **value** —Asteriod 'Bennu' has been assessed at $670 million and asteroid '2011 UW158' at $ 5.7 trillion. Transportation of the mined resources for utilisation, however, poses major hurdles. A 'BBC Future' report by Sarah Cruddas puts the cost of shipping a ton of

water into space at about $ 50 million. As per Chris Lewicki, president of Planetary Resources, an asteroid mining company, it takes more energy to escape the first 300 kilometers from the Earth than the next 300 million kilometers. Similarly, bringing back anything more than a few kilograms of samples from space to the Earth would be even more complex in terms of logistics. To start with, therefore, global space industry investors are focusing on keeping mined space resources in space itself for 'in situ resource utilisation'. Availability of water on the Moon, Mars and asteroids offer very attractive prospects; apart from being crucial for supporting life and growing food, it also opens the possibility of using its constituents, hydrogen and oxygen, for making rocket fuel. Today, the possibility of manufacturing tools and even building habitats on Moon or Mars with the help of 3D printers using iron, nickel, cobalt, gold, platinum, and iridium etc which are available on the Moon, Mars and asteroids seem within reach. Researchers are working on using regolith, the weathered rock particles found on lunar surface for making moon bricks using 3D printers. These bricks will form the basic construction material for the first moon station and even the first moon hotel. Space industry players believe that an investment of $ 4 billion in water mining in space can generate annual revenue worth about $2.4 billion. Similarly, there is a new community of customers who are already looking for buying propellant in space. American space launch provider, United Launch Alliance (ULA), a Lockheed Martin and Boeing joint venture that provides launch rockets, has made it known that, ULA is willing to pay about $ 3000 a Kg for propellant in low earth orbit. **Fast paced developments are taking place in** the field of **space mining** technology **with private players in the lead.** Optical mining **using concentrated sunlight, robotics, automated mining applications, advanced drilling machines etc are** just **a few examples. Participation of private players has reduced the investment burden and greatly enhanced the width and pace of innovation.** It is believed that launch of the first **asteroid mining** vehicle as well as setting up of the first fuelling stations on the Moon and in low earth orbit **could become a reality within a decade.** Japanese mission **'Hayabusa' was the first to bring samples from an asteroid** to earth **in 2010.** 'Hayabusa - 2' made its rendezvous with the near earth asteroid '162173 RYUGU' in June 2018, left the asteroid after collecting samples in November 2019 and will be back on earth on December 6, 2020. Similarly the NASA mission **OSIRIS-REx**, costing about $ 1 billion, launched in 2016 **is due to return to earth with samples of asteroid** '101955 Bennu' **on [in] September** 24, **2023**. The latest US space mission, 'Perseverance' launched on July 30, 2020 will land on Mars on February 18, 2021. It will be using a helicopter on Mars, set to be the first use of a helicopter outside the earth. Apart from collecting samples from Mars and search for signs of habitable conditions on Mars, it will also test the possibility of manufacturing molecular oxygen from the carbon dioxide-rich Mars atmosphere.

Extracting resources in space is preferable to Earth mining: private entities have the resources, support, and motivation of sustainability to make the transition

Britt 21, Hugo Britt is a freelance content writer and co-founder of content marketing agency Discontent. Britt, Hugo. "Companies Are Preparing for Space Mining." Thomasnet, Thomasnet, 19 Aug. 2021, https://www.thomasnet.com/insights/companies-are-preparing-for-space-mining/.

Rare Earth Materials Are Abundant **There are** around **two million near-earth asteroids brimming with rare earth minerals, precious metals, iron, and nickel.** The Moon contains helium-3, yttrium, samarium, and lanthanum, while Mars contains an abundance of magnesium, aluminum, titanium, **iron**, chromium, and trace amounts of **lithium, cobalt**, tungsten, and other metals. Importantly, many planetary bodies contain water, which through hydrolysis can be used as rocket fuel. It Helps with Sustainability **Earth's resources are finite. Non-renewable metal resources are** inherently **unsustainable**, and **mining causes environmental degradation all over the world. The answer is to source our minerals off-world**. Off-world minerals are exhaustible as well, but the argument is that **mining lifeless** rocks such as the Moon or **asteroids is infinitely preferable to continuing to damage Earth's fragile biosphere.** Discoveries May Be Made Opening space to commercial mining does not mean that science takes a back seat. Space-mining interests could drive scientific advancement by discovering extremely rare or unknown minerals on other planetary bodies. Robotics Would Do the Work **While countless lives have been lost on Earth over the centuries due to mining accidents** and disasters, it is likely that **humans will not have to risk their lives by traveling in-person to off-world mining** sites. **Regolith-sampling probes are already in use and provide an early glimpse of what a scaled-up robotic mining craft may one day look like.** Off-Earth Mining and Space Law The 1967 Outer Space Treaty is unclear in terms of whether any country — or private company — can claim

mineral rights in space. It states that "exploration and use of outer space shall be carried out for the benefit and in the interests of all countries and shall be the province of all mankind." The 1979 Moon Treaty was an attempt to declare the Moon and its natural resources to be CHM (Common Heritage of Mankind). Significantly, it called for "an equitable sharing [by all countries] in the benefits derived from these resources." Most nations, including the U.S., did not ratify this treaty. Recently, the U.S. has accelerated its efforts to create a legal framework for the exploitation of resources in space. The Obama administration signed **the U.S.** Commercial Space Launch Competitiveness Act of 2015, **allow**ing **[allows]** U.S. **citizens to "engage in the commercial** exploration and **exploitation of space resources."** In April 2020, the Trump administration issued an executive order supporting U.S. **mining on the Moon and asteroids.** In May 2020, **NASA** unveiled the Artemis Accords, which **included the development of safety zones around lunar mining sites**. Former NASA administrator Jim Bridenstine said: "It's time to establish the regulatory certainty to extract and trade space resources," and clarified in a separate statement that: "We do believe we can extract and utilize the resources of the moon, just as we can extract and utilize tuna from the ocean." NASA planned an Asteroid Redirect Mission which involved collecting a multi-ton boulder from an asteroid and redirecting it into a stable orbit around the moon, but the mission was canceled in 2017. What Companies Are Preparing for a Future of Space Mining? One thing that is becoming clear is that **off-earth mining is unlikely to be a state-run activity.** Instead, several **private companies are jockeying to be first in line to access minerals in space. iSpace** (Japan) **has a mission to "help companies access new business opportunities on the moon,"** including the **extraction of water and mineral resources to spearhead a space-based economy**. Planetary Resources (defunct) was founded in 2009 with the goal of developing a robotic asteroid mining industry. Despite having high-profile founding investors including Alphabet's Larry Page, Eric Schmidt, and Virgin Group founder Richard Branson, Planetary ran into financial trouble in 2018 and was gone by 2020. Deep Space Industries (defunct) was another early mover that intended to explore, examine, sample, and harvest minerals from asteroids. DSI was acquired by Bradford Space in 2019. **Offworld is an AI company building** "universal industrial **robots to do the heavy lifting** [including mining] **on** Earth, the Moon, **asteroids**, and Mars." **The Asteroid Mining Corporation** (UK) **is a venture** currently **crowdfunding for a 2023 satellite mission** called "El Dorado," **which will conduct a** spectral **survey of 5,000 asteroids to identify the most valuable** for mining. Alongside the U.S., the tiny European nation of Luxembourg has also developed a space mining framework and has subsequently emerged as a European hub for the fledgling industry.

Mining on Earth is the biggest waste producer – space mining solves, while making resources more accessible on Earth

MacWhorter 16, Kevin MacWhorter is a J.D. Candidate, William & Mary Law School, 2016; B.A. History, College of William & Mary, 2012. MacWhorter, Kevin. "Sustainable Mining: Incentivizing Asteroid Mining in the Name of Environmentalism ." William & Mary Environmental Law and Policy Review, William & Mary Environmental Law and Policy Review, Feb. 2016, https://scholarship.law.wm.edu/cgi/viewcontent.cgi?article=1653&context=wmelpr.

A. Rare Element Mining on Earth In the next sixty years, scientists predict that certain elements crucial to modern industry such as platinum, zinc, copper, phosphorous, lead, gold, and indium could be exhausted on Earth. 12 **Many of these have no** synthetic **alternative**, unlike chemical elements such as oil or diamonds.13 Liquid-crystal display (LCD) televisions, cellphones, and laptops are among the various **consumer technologies** that **use precious metals**.14Further, green technologies including wind turbines, solar panels, and catalytic converters require these rare elements. 15 **As demand rises** for both types of technologies, **and** as **reserves** of rare metals **fall, prices skyrocket**.16 Demand for nonrenewable resources creates conflict, and consumerism in rich countries results in harsh labor treatment for poorer countries.17 In general, **the mining industry is extremely destructive to Earth's environment**.18 In fact, depending on the method employed, mining can destroy entire ecosystems by **polluting water sources and contributing to deforestation**.19 **It is by** its **nature an unsustainable practice, because it involves the extraction of a finite and non-renewable resource.**20 Moreover, by extracting tiny amounts of metals from relatively large quantities of ore, **the mining industry contributes the largest portion of solid wastes in the world**.21 The Environmental Protection Agency (EPA) describes the industry as **the source of more toxic and hazardous waste than any other industrial sector** [in the United States], costing billions of dollars to

address the public health and environmental threats to communities. 22 Poor regulations and oxymoronic corporate definitions of sustainability, however, make it unclear as to just how much waste the industry actually produces.23 **Platinum** provides an excellent case study of the issue, because it **is an extremely rare and expensive metal—an ore expected to exist in vast quantities in asteroids**.24 Further, production of platinum has increased sharply in the past sixty years in order to keep up with growing demand for use in new technologies.25 In fact, despite their high costs, platinum group metals are so useful that **[one] of [four] industrial goods on Earth require them** in production. 26 Scholars do not expect **demand to [won't] slow any time soon.**27 Among other technologies, industries use platinum in products such as catalytic converters, jewelry production, various catalysts for chemical processing, and hydrogen fuel cells.28 While there is no consensus on how far the Earth's reserves of platinum will take humanity, many scientists agree that platinum ore reserves will deplete in a relatively short amount of time.29 With the rate of mining at an all-time high,30 it is increasingly clear that historical patterns of mineral resources and development cannot simply be assumed to continue unaltered into the future. 31 The platinum mining industry, however, has a strong incentive to increase its rate of extraction as profits grow with the rate of demand. **Without any alternative, this destructive practice will continue into the future.**32 So-called platinum-group metal (PGM) ores are mined through underground or open cut techniques.33 Due to these practices, all but a very small fraction of the mined platinum ore is disposed of as solid waste.34 **The environmental consequences of platinum production are thus quite significant,** but like the mining industry in general, the amount of waste is typically under-reported.35 While this is due to high production levels at the moment, those levels will only increase given the estimated future demand of platinum.36 In spite of the negative consequences, mining continues unabated because it is economically important to many areas.37 The future environmental costs provide a major challenge in creating a sustainable system. **Relegating at least some mining companies to near-Earth asteroids would reduce the negative effects of future mining levels on Earth. The economic benefits of mining need not be sacrificed for the sake of the environment.**38 B. Privatization of the Space Industry For most of the Space Age, the role of private companies has been as that of government contractors.39 During the past fifteen years, however, space flight has become increasingly the realm of private industry.40 Space tourism is on the rise,41 and private companies have been launching their own satellites into orbit for decades.42 In May 2012, SpaceX docked with the International Space Stationthe first private company to do so. 43 While the National Aeronautics and Space Administration's (NASA) federal outlay has increased since 1958, NASA s budget as a percentage ofUS spending has decreased dramatically.44The private space industry has seen dramatic growth as a result.45 Since NASA retired its shuttle fleet in 2011, the agency has turned to private actors to design and build spacecraft.46 That year, NASA awarded four private space companiesSpaceX, Blue Origin LLC, Boeing Co., and Sierra Nevada Corp.contracts worth a combined total of $269.3 million to transport cargo and crew to and from the International Space Station.47 More companies, such as Orbital Sciences, have followed suit.48 **Space mining in particular has been a focus of private investment.49 The promise of abundant rare Earth resources creates the possibility of vast wealth for intrepid investors.**50 For example, Google founders Larry Page and Eric Schmidt have invested heavily in private space flight.51 Google is offering the Lunar X Prize: $30 million in prizes to any team who is able to safely land a robot on the surface of the Moon, have that robot travel 500 meters [1,640 feet] over the lunar surface, and send video, images, and data back to the Earth before 2016. 52 The purpose behind the contest should be apparent: investors think private space flight and mining could be extremely lucrative.53 **Rare metals, such as platinum, could become far more accessible.**54

The impact is climate change and the extinction of humankind – the timeframe is soon

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Life on this planet has gone through many extinction-level events over time. Most of these phenomena were caused by natural, cataclysmic forces beyond the control of any of the lifeforms existing at that time. The current cataclysmic forces are anything but natural and they are well within our control. The question is not, "will global warming cause extinction?"— it's, "how can we prevent that inevitability from happening?" Will global warming cause extinction? Eventually, yes. **Global warming will invariably result in the mass extinction of millions of different species, humankind included.** In fact, the Center for Biological Diversity says that **global warming is currently the greatest threat to life on this planet.**

Global warming causes a number of detrimental effects on the environment that many species won't be able to handle long-term. **Extreme weather patterns are** shifting climates across the globe, **eliminating habitats and altering the landscape**. As a result, **food and fresh water sources are being drastically reduced**. Then, of course, **there are the rising global temperatures** themselves, **which many species are physically unable to contend with**. Formerly frozen arctic and antarctic regions are melting, increasing sea levels and temperatures. Eventually, these effects will create a perfect storm of extinction conditions. What species will go extinct if global warming continues? The melting glaciers of the arctic and the searing, unmanageable heat indexes being seen along the Equator are just the tip of the iceberg, so to speak. The species that live in these climate zones have already been affected by the changes caused by global warming. Take polar bears for example, whose habitats and food sources have been so greatly diminished that they have been forced to range further and further south. **Increased carbon dioxide levels in the atmosphere and oceans have** already **led to ocean acidification**. This has caused many species of crustaceans to either adapt or perish and has led to the mass bleaching of more than 50 percent of Australia's Great Barrier Reef, according to National Geographic. According to the Center for Biological Diversity, the current trajectory of global warming predicts that **more than 30 percent of Earth's plant and animal species will face extinction by 2050. By the end of the century,** that number could be as high as **70 percent**. Will global warming cause humanity's extinction? We won't try and sugarcoat things, **humanity**'s own prospects aren't looking that great either. According to The Conversation, our species **has just under a decade left** to get our CO_2 emissions under control. **If we don't cut** those **emissions by half before 2030, temperatures will rise to** potentially **catastrophic levels.** It may only seem like a degree or so, but the worldwide ramifications are immense. The human species is resilient. We will survive for a while longer, even if these grim global warming predictions come to pass, but **it will mean less food,** less **water,** and **increased hardship** across the world — **especially in low-income areas and developing countries**. This increase will also mean **more pandemics,** devastating **storms, and** uncontrollable **wildfires**. It's difficult to calculate the numbers in these cases or to assess precisely what risks we will all be facing, but this is because we have never experienced anything like it before.

Contention 2: Off-World Colonies

Private companies such as Elon Musk's SpaceX are spearheading the development of off-world colonies and infrastructure

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READY TO LIVE on Mars? It may not happen for a while, as Elon Musk recently revealed that **astronauts on** the red planet **[Mars] could** finally **become reality by 2029**. The SpaceX CEO has a long-standing vision of establishing a city on **the Red Planet**. It **would be self-sustaining,** would be **home to one million people, and would transform humanity into a multi-planet species. It** is perhaps Musk's most ambitious goal, one that could keep him occupied for the next three decades. "Why are we doing this?" Musk said at the company's February 2022 Starship progress update. "I think this is an incredibly important thing for the future of life itself ... **there's always some chance that something could go wrong on Earth.** Dinosaurs are not around anymore!" Musk also explained how, being a simple insurance policy, the plan is aimed at building something inspiring. "Life can't just be about solving problems," Musk said. "There have to be things that inspire you, that move your heart. When you wake up in the morning, you're excited about the future." But while fans originally expected to see the first humans reach March by the mid-2020s, Musk revealed on his Twitter page this week that an image with astronauts on the red planet would more likely come to life sometime in 2029. And as recent research shows, the landscape of Mars is pretty treacherous. Astronauts will face surprise obstacles like dust collecting on solar panels, as well as tiny Mars rocks that have caused havoc with NASA's Curiosity mission. Here is what you need to know about Musk's mission. WHAT IS THE MARS CITY? **Musk plans to build a full-size city on the surface of Mars.** This would be a city open to regular people, not just scientists and researchers. People interested in moving to Mars could pay for their flight with a loan. Once there, people would be able to pay off the loan by working in anything from iron foundries to pizzerias. Musk declared at a 2016 conference that there would be labor shortages for a long time. **This city would be free to govern itself on its own terms**, as indicated by the Starlink internet service terms and conditions released in October 2020. This appears to stand in contradiction to the 1967 Outer Space Treaty, which states that the launch origin country is responsible for subsequent space activities. David Anderman, who served as SpaceX's general counsel when the terms were released, suggested to Inverse in 2021 that the two documents may be set on a collision course. Musk estimated in 2019 that **it would take around one million tons of cargo to build a self-sustaining city on Mars. Assuming it costs $100,000 per ton to send cargo to Mars with the upcoming Starship, that would put a Mars city's price at around [for] $100 billion.** At the high end, Musk estimates it could cost around $10 trillion. SpaceX may not stop with just one city, however. Paul Wooster, principal Mars development engineer for SpaceX, said at the 21st Annual International Mars Society Convention in August 2022 that **SpaceX** could build multiple cities: "The idea **would** be to **expand out**, start off not just with an outpost, but **grow into a larger base,** not just like there are in Antarctica, but really a village, a town, growing into a city **and then multiple cities on Mars.**"

By betting everything on one planet, we cannot ensure humanity's survival, especially when faced with unpredictable extinction events

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You've likely heard the justifications. The space program brings us useful innovations and inventions. Space exploration delivers perspective, inspiration, and understanding. Because it's the final frontier. Because it's there. What you haven't heard is anything to inspire a sense of urgency. Indeed, **NASA's struggle to defend its existence and funding testifies to how weak these justifications sound to a public that cares less about space than seemingly more pressing needs.** Presumably, this is why SpaceX founder Elon Musk, in a fascinating

interview with Ross Andersen, skipped all the usual arguments in favor of something else entirely. **Space exploration**, he says, **is** as **urgent** as easing poverty or disease—**it's our insurance policy against extinction.** As we extend our gaze back through geologic time and out into the universe, it's clear we aren't exempt from nature's carelessly terrifying violence. **We** simply **haven't experienced its full wrath yet because we've only been awake for the cosmological blink of an eye.** Musk says an extinction-level event would, in an existential flash, make our down-to-earth struggles irrelevant. "Good news, the problems of poverty and disease have been solved," he says, "but the bad news is there aren't any humans left.'" We've got all our eggs in one basket, and that's a terrible risk-management strategy. We should diversify our planetary portfolio to insure against the worst—and soon. Musk's line of reasoning isn't completely novel. It's what led science fiction writer Larry Niven to say, "**The dinosaurs became extinct because they didn't have a space program.**" And it drives Ed Lu's quest to save humanity from a major asteroid hit. But while we may spot and potentially derail asteroids, **not every cosmic threat can be so easily predicted or prevented—a blast from a nearby supernova; a gamma ray burst aimed at Earth; a period of extreme volcanism. Any of these could wipe us out.**

The Aff has no way to save humanity if high magnitude extinction is a high probability within the next thousand years – solve by allowing the fast-paced private appropriation of outer space

Rincon 18, Stephen Hawking did research on general relativity and black holes, having a Oxford (BA) and Cambridge (PhD). Paul Rincon is a science editor for BBC News. Rincon, Paul. "Stephen Hawking's Warnings: What He Predicted for the Future." BBC News, BBC, 15 Mar. 2018, https://www.bbc.com/news/science-environment-43408961.

Hawking was clearly troubled that **we were putting all our eggs in one basket** - that basket being Earth. For decades, Hawking had been calling for humans to begin the process of permanently settling other planets. It made news headlines again and again. Hawking's rationale was that **humankind would eventually fall victim to an extinction-level catastrophe** - perhaps sooner rather than later. What worried him were so-called low-probability, high impact events - a large asteroid striking our planet is the classic example. But **[Stephen] Hawking perceived a host of other potential threats: artificial intelligence, climate change, GM viruses and nuclear war** to name a few. In 2016, he told the BBC: "Although **the chance of a disaster to planet Earth in a given year may be quite low, it adds up over time, and becomes a near certainty in the next thousand or 10,000 years.** He was confident that humans would spread out into the cosmos by that time (given the chance), but added: "We will not establish self-sustaining colonies in space for at least the next hundred years, so we have to be very careful in this period." Here, **Hawking's views dovetailed with those of** entrepreneur **Elon Musk**, another science superstar whose cogitations attract widespread attention. In 2013, Musk told a conference: "**Either we spread Earth to other planets, or we risk going extinct. An extinction event is inevitable and we're increasingly doing ourselves in."**