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Resolution

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

1NC - PIC

CP: The appropriation of outer space by private companies is unjust with the exception of Copernicus Sentinel-1 and -2 Satellites + SBSP Satellites + Wifi LEOs + O'Neill Cylinders

That competes –

The resolution/plan is entirely of appropriation, but the PIC is mutually exclusive with the aff's plan because they get rid of ALL private space appropriation, but our counterplan does LESS than the affirmative.

We solve for the entirety of the affirmative's case.

CASE 1: The Sentinels save mangroves, which reduces tsunami impact by 90% ESA 21

European Space Agency (euro intergovernmental org that documents space advancement 7-26-2021, "How satellites save mangroves from space," European Space Agency, https://www.esa.int/Enabling_Support/Preparing_for_the_Future/Space_for_Earth/How_satellites_save_mangroves_from_space, // HW AW

After the 2004 Indian Ocean tsunami, Wetlands International saw that many lives had been spared by something surprising – mangroves. In response the non-profit organisation scaled up its work on protecting and restoring these complex ecosystems. One important tool in their arsenal is images from the Copernicus Sentinel-1 and -2 satellites. Mangroves make up only a small proportion of the world's forest but are vital for humans and nature. They are home to fish, shellfish, birds and mammals. They store more carbon per hectare than rainforests. And they protect coastal communities from extreme weather. As Wetlands International discovered, they can reduce the destructive force of a tsunami by up to 90%. Lammert is an information manager at Wetlands International. He explains: "After the 2004 tsunami we saw that areas with intact mangroves suffered far fewer deaths and less damage than those with lost or damaged mangroves." The Irrawaddy Delta in Myanmar, imaged by the Copernicus Sentinel-2A satellite. Green areas show dense mangrove forest Between 1996 and 2016, around 6.6% of mangroves were lost worldwide. This was down from 1% per year in the 1980s. "Historically, the biggest risk that mangroves face is from conversion to agriculture on the land side, and to aquaculture on the sea side," says Lammert. "But there is also growing pressure from climate change, with rising sea levels starting to overwhelm mangroves and changing rainfall patterns causing some to die off because of a lack of fresh water." The good news is that most can be restored. An online platform called Global Mangrove Watch is providing remote sensing data and tools for coastal and park managers, conservationists, policymakers and

practitioners to respond by pinpointing the causes of local mangrove loss and tracking restoration

progress. Screenshot from Global Mangrove Watch, showing the location of mangroves Together with Aberystwyth University, soloEO and The Nature Conservancy, Wetlands International is a key partner in Global Mangrove Watch, so Lammert explains how the platform works:

"We use satellite data to produce a map of all the mangroves around the world once a year. It currently goes to 2016 but later this year we will release maps up to 2020." But to detect destruction and stop it in time, park

managers, conservationists and policymakers need information more immediately. "We also use data from the Sentinel-1 and -2 and Landsat 8 satellites to provide what we call 'change alerts' for Africa. The Sentinels reimage the same location every few days, so once a month we compare their new images with a baseline map.

We send out alerts if we see a difference in mangrove cover." Change alerts in Guinea-Bissau The current baseline map was built using 2010 data from the US Landsat and Japanese ALOS satellites, but the team is currently updating it using 2021 data from the Copernicus Sentinels. This higher resolution data will give the new map a resolution of just 10 metres, compared to the current 25 metres resolution. Change alerts have already been used to catalyse action, including in Guinea-Bissau. In March 2019 a Sentinel-2 image showed that an area of mangrove in the country had been significantly destroyed. A closer look revealed that a new dam had been built and was blocking the tide from coming in and out. "We sent people on the ground to the site. They saw that the government had built the dam to turn the mangrove into rice fields. There was nothing that could be done to prevent the transformation, but often in these cases the rice fields are tended for a few years, then the mangroves grow back." Detected changes in the mangrove in Guinea-Bissau (inset: Global Mangrove Watch) overlaid on aerial photograph (Google Maps, 2019). Copernicus Sentinel-2 images showing the change in a mangrove in Guinea-Bissau between 21 March 2018 and 2 March 2021. On 21 March 2019, a dam is visible. Healthy mangrove is shown in orange. The mangrove area is getting steadily greener between 2019 and 2021, showing that mangroves are dying off. "Our change alerts currently cover Africa, but we will soon be providing them for five of the most mangrove-rich countries, including Mexico and Indonesia. We hope that the alerts will be available for the whole world in the next couple of years." "I want to emphasise how happy we are with the Sentinel images," concludes Lammert. "They are free, high resolution, and available almost immediately after they are taken. This means that we can act quickly to protect and recover mangroves worldwide."

Climate change induced tsunamis outweigh – coastal agriculture and populations are disrupted, nuclear power plants melt down, mass migration, infrastructure is destroyed

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Virginia Tech article summarizing tsunami simulations done by Robert Weiss (director of the National Science Foundation-funded Disaster Resilience and Risk Management graduate education program), 8-15-2018, "Climate change sea level rises could increase risk for more devastating tsunamis worldwide: Even minor sea-level rise, by as much as a foot, poses greater risks," ScienceDaily, <https://www.sciencedaily.com/releases/2018/08/180815141444.htm>, // HW AW

As sea levels rise due to climate change, so do the global hazards and potential devastating damages from tsunamis, according to a new study by a partnership that included Virginia Tech. Even minor sea-level rise, by as much as a foot, poses greater risks of tsunamis for coastal communities worldwide. The threat of rising sea levels to coastal cities and communities throughout the world is well known, but new findings show the likely increase of flooding farther inland from tsunamis following earthquakes. Think of the tsunami that devastated a portion of northern Japan after the 2011 Tohoku-Oki earthquake, causing a nuclear plant to melt down and spread radioactive contamination. These findings are at the center of a new Science Advances study, headed by a multi-university team of scientists from the Earth Observatory of Singapore, the Asian School of the Environment at Nanyang

Technological University, and National Taiwan University, with critical support from Virginia Tech's Robert Weiss, an associate professor in the Department of Geosciences, part of the College of Science. "Our research shows that sea-level rise can significantly increase the tsunami hazard, which means that smaller tsunamis in the future can have the same adverse impacts as big tsunamis would today." Weiss said, adding that smaller tsunamis generated by earthquakes with smaller magnitudes occur frequently and regularly around the world. For the study, Weiss was critical in helping create computational models and data analytics frameworks. At Virginia Tech, Weiss serves as director of the National Science Foundation-funded Disaster Resilience and Risk Management graduate education program and is co-lead of Coastal@VT, comprised of 45 Virginia Tech faculty from 13 departments focusing on contemporary and emerging coastal zone issues, such as disaster resilience, migration, sensitive ecosystems, hazard assessment, and natural infrastructure. For the study, Weiss and his partners, including Lin Lin Li, a senior research fellow, and Adam Switzer, an associate professor, at the Earth Observatory of Singapore, created computer-simulated tsunamis at current sea level and with sea-level increases of 1.5 feet and 3 feet in the Chinese territory of Macau. Macau is a densely populated coastal region located in South China that is generally safe from current tsunami risks. At current sea level, an earthquake would need to tip past a magnitude of 8.8 to cause widespread tsunami inundation in Macau. But with the simulated sea-level rises, the results surprised the team. The sea-level rise dramatically increased the frequency of tsunami-induced flooding by 1.2 to 2.4 times for the 1.5-foot increase and from 1.5 to 4.7 times for the 3-foot increase. "We found that the increased inundation frequency was contributed by earthquakes of smaller magnitudes, which posed no threat at current sea level, but could cause significant inundation at higher sea-level conditions," Li said. In the simulated study of Macau -- population 613,000 -- Switzer said, "We produced a series of tsunami inundation maps for Macau using more than 5,000 tsunami simulations generated from synthetic earthquakes prepared for the Manila Trench." It is estimated that sea levels in the Macau region will increase by 1.5 feet by 2060 and 3 feet by 2100, according to the team of U.S.-Chinese scientists. The hazard of large tsunamis in the South China Sea region primarily comes from the Manila Trench, a megathrust system that stretches from offshore Luzon in the Philippines to southern Taiwan. The Manila Trench megathrust has not experienced an earthquake larger than a magnitude 7.8 since the 1560s. Yet, study co-author Wang Yu, from the National Taiwan University, cautioned that the region shares many of the characteristics of the source areas that resulted in the 2004 Sumatra-Andaman earthquake, as well as the 2011 earthquake in northern Japan, both causing massive loss of life. These increased dangers from tsunamis build on already known difficulties facing coastal communities worldwide: The gradual loss of land directly near coasts and increased chances of flooding even during high tides, as sea levels increase as the Earth warms. "The South China Sea is an excellent starting point for such a study because it is an ocean with rapid sea-level rise and also the location of many mega cities with significant worldwide consequences if impacted. The study is the first of its kind on the level of detail, and many will follow our example," Weiss said. Policymakers, town planners, emergency services, and insurance firms must work together to create or insure safer coastlines, Weiss added. "Sea-level rise needs to be taken into account for planning purposes, for example for reclamation efforts but also for designing protective measures, such as seawalls or green infrastructure." He added, "What we assumed to be the absolute worst case a few years ago now appears to be modest for what is predicted in some locations. We need to study local sea-level change more comprehensively in order to create better predictive models that help to make investments in infrastructure that are or near sustainable."

CASE 2: Space Based Solar Power is necessary to reduce emissions and solve climate change

Shtivelman 12 - J.D., Boston University School of Law [Aleksey, 2012, *B. U. J. SCI. & TECH. L. Vol. 18:435*, "SOLAR POWER SATELLITES: THE RIGHT TO A SPOT IN THE WORLD'S HIGHEST PARKING LOT", Hein Online]

***edited for gendered language

Rather than spending millions on land-based solar power projects, it would be much more profitable if these nations invested in SBSP satellites for two reasons. First, although SBSP satellites are much more expensive at the outset, the cost of initial investment is returned in a period of time comparable to what it would take to recoup the investment cost of a land-based solar farm. 113 Second, SBSP satellites generate about eight to ten times as much power as land-based solar farms. "14 This means that after one and a half years, SBSP satellites would generate eight to ten times the revenue of a land-based solar farm. As a result, countries that currently rely on coal, nuclear or other types of non-clean,

non-renewable energy may look to SBSP for their energy needs, and consequently generate a **significant spike in demand** for orbital locations on the GSO. This increased demand will raise two issues: (1) whether a GSO orbital slot can be owned and (2) if not, whether there is a way to allocate the right to access GSO orbital slots for a period of time. A viable legal framework could address both of these issues in a clear and precise manner. The ITU currently allocates slots for telecommunications satellites, but the increased demand for slots in GSO for SBSP satellites may force countries to reevaluate ITU's authority to regulate SBSP satellites.

A. An unsuccessful attempt to appropriate GSO slots

The ITU allocation is one way to solve the problem, but given the physical limitations of the GSO, there is an underlying conflict between the goals of fair and equitable access on one side and the GSO's efficient use on the other.⁵ The conflict arises when developed countries receive priority to access the GSO because they have the demand, infrastructure, and funding to put satellites into orbit, while developing countries without viable satellites also want access to the GSO.¹¹⁶ This a posteriori approach to GSO property rights favors those who are first to apply for frequency and orbital slots and protects those applicants from interference by later users.¹¹⁷ At the same time, developing countries do not favor such a "free-market-approach" to GSO access; on the contrary, they would like a multilateral approach that distributes access to the GSO equitably among all nations.¹¹⁸ "As feared by the developing States, this a posteriori system [has] provided a few industrialized and rich States with the opportunity of temporarily unlimited use of registered frequencies and orbit positions."¹¹⁹ "Developing countries feel that they should have equal access to these frequencies and orbital slots."¹²⁰

These countries have tried to gain leverage over the GSO resource by advocating for the creation of an administrative agency that would allocate a part of the GSO to each country. In 1976, eight developing countries above the equator claimed sovereign right over the parts of the GSO lying over their territories and called for the administration of the rest of the GSO.¹²¹ The Declaration of the First Meeting of Equatorial Countries (the "Bogota Declaration") asserted that these countries had the right to parts of the GSO because the orbit should be considered part of the earth and not outer space.¹²² These countries argued that the gravitational force that produces the GSO was deflected from their land.¹²³ Both developed and developing countries rejected the Bogota Declaration's arguments because its claims were weak: the gravity that produces the orbit (1) is produced by the entire earth, not just these eight nations and (2) produces all orbits, not just the GSO.¹²⁴

Another of the arguments in the Bogota Declaration was that there is no legally defined boundary as to where an atmosphere ends and space begins.¹²⁵ Furthermore, the Bogota Declaration declared that even the Outer Space Treaty, which provides the basic outline for the peaceful exploration and use of outer space, does not address the issue.¹²⁶ While there is no definition that all countries in the world accept regarding the boundary of space, the International Aeronautic Federation recognizes the Karman Line as the edge of the atmosphere and the beginning of space.¹²⁷ The International Aeronautic Federation is a non-governmental organization founded in 1905, for the purpose of encouraging aeronautical and astronautical activities worldwide.¹²⁸ It has 100 member countries, including the United States, United Kingdom, Spain, Sweden, South Africa, Mongolia, Korea, Israel, Iran, as well as many others.¹²⁹ For the preceding reasons, the International Aeronautic Federation portrays a widely held view concerning the definition of space. The Karman line is one hundred kilometers above sea level, and that is where the atmosphere becomes so thin that an airplane cannot fly and a spaceship is needed for flight.¹³⁰ The GSO lies more than 35,000 kilometers above sea level, which is approximately 34,900 kilometers higher than the Karman line. Therefore, GSO is well above the demarcation of space that is internationally recognized. For this reason and others, most countries did not accept the Bogota Declaration. Accordingly, the Bogota Declaration was an unsuccessful attempt to appropriate GSO slots.

B. Space law must allow appropriation of space for the good of everyone

The Bogota Declaration was ultimately a failure because it violated internationally accepted principles. According to the Outer Space Treaty of 1967, GSO orbital positions and frequencies cannot be appropriated because no country can appropriate or own space.¹³¹ Ninety-one states have signed this treaty, including the United States, the United Kingdom, Ukraine, Japan, Greece, Denmark, Spain, Uganda, Afghanistan, Iraq and many others.

¹³² The treaty specifies that outer space is the "province of mankind" and that all activity should be done for the benefit of all of humanity.¹³³ It would then seem that no country could have exclusive ownership over an orbital position in the GSO or any orbit.¹³⁴

Even if the Outer Space Treaty of 1967 prohibits countries from owning orbital slots in the GSO, the slots should still be allocated to countries that will use them on a first-come, first-served basis. SBSP has so much potential to benefit all of humankind that if even a single country uses a GSO slot to gather power, the advantage of developing the technology of SBSP may outweigh the argument that all nations should have equal access to space.¹³⁵

Countries like Tonga that have no capability of sending satellites into orbit should not be able to claim GSO slots because this would prohibit developed countries from placing satellites into orbit that can benefit the whole world.¹³⁶

The Outer Space Treaty of 1967 likely permits the allocation of GSO slots to individual countries on the condition that the slots are used for SBSP satellites that benefit all mankind.

Countries with orbiting SBSP satellites could meet such conditional requirements in three ways. First, they could be required to provide power to less developed countries. Second, launching countries can help decrease global warming because SBSP satellites provide clean energy. Third, launching countries can lower the cost of solar power systems as they become cheaper and more affordable with time so that many less developed countries around the world will be able to access solar power from space. By satisfying any of these conditions, deployment of SBSP satellites would qualify under the treaty as "use of outer space ... carried out for the benefit and in the interests of all countries."¹³⁷

The universal benefits provided by SBSP satellites would therefore be consistent with the treaty's requirement that the use of outer space "shall be the province of all mankind."¹³⁸ Thus, while the Outer Space Treaty of 1967 may prohibit ownership of GSO slots, the temporary allocation of GSO slots for the use of SBSP satellites would be compatible with the goals of the treaty. "

As a result of the need to allow SBSP to have access to the GSO, there will need to be some sort of regulatory structure to GSO slot allocation. If a regulatory organization, such as the ITU, allows licensees to use a particular GSO position and microwave frequency, for a limited period of time, this would appear to satisfy the current international regime under the Outer Space Treaty of 1967. In order to comply with the treaty, countries would not have to surrender their slot or frequency, as they could simply allow other countries to lease the power satellites from them for a period of time. SBSP satellites in GSO would fall within the "province of mankind" requirement of the Outer Space Treaty of 1967 because SBSP can decrease global warming and help less developed countries by providing them with electricity in areas lacking infrastructure Furthermore, SBSP satellites in GSO would satisfy the "peaceful purposes" requirement of the Outer Space Treaty of 1967 because the satellites are used for commercial power production and cannot be converted into weapons 139

CASE 3: Wifi LEOs

Low Earth Orbit Satellite constellations.

Solves broadband internet access which is key for Native communities.

Venkatesan et al 20 (Aparna Venkatesan is a Professor in the Department of Physics and Astronomy at the University of San Francisco. James Lowenthal is a professor of Astronomy at Smith College. Parvathy Prem is a Planetary Scientist specializing in Planetary research at Johns Hopkins University Applied Physics Laboratory. Monica Vidaurri works as a research scientist at NASA Goddard Space Flight Center, specializing in astrobiology, policy, and ethics. "The impact of satellite constellations on space as an ancestral global commons". November 06, 2020.)

Satellite constellations could greatly improve communications and ongoing monitoring of Earth phenomena ranging from weather and climate to disaster management. Such large constellations also have the potential to offer global connectivity through low-cost high-speed broadband internet. In principle, this could be the critical leap needed to bridge the very real digital divide², especially for the world's most minoritized populations, including Indigenous communities.

This divide has been exposed as a chasm during this pandemic year, affecting many millions of students and low-income workers.

Broadband internet has become essential for daily life, especially during a pandemic year when remote forms of learning, teaching, work and even health (for example, telemedicine) have become the norm. In 2019, the FCC offered US\$20 billion in subsidies over ten years to address the digital divide in rural communities in the United States, which was quickly followed by a number of filings for LEOsats. LEOsat broadband may benefit rural communities more than urban areas—these 'last mile' connections are still challenging to complete relative to concentrated (urban) populations where ground-based cable/fibre internet infrastructure is cheaper. Large satellite constellations thus have the potential to bridge the digital chasm, but time will tell whether the promise of low-cost high-speed internet worldwide is achieved, and what the financial costs to customers are. This potential democratization of space is worth noting, even if it may not lead to fair participation in space.

Case 4: O'Neill Cylinders

O'Neill Cylinders are on the way, but funding and companies like SpaceX and Blue Origin are key because governments are insufficient.

Kanchwalla 21

Hussain Kanchwalla (scholar at the indian institute of technology), 11-13-2021, "What is an O'Neill Cylinder?," Science ABC, <https://www.scienceabc.com/nature/universe/what-is-oneill-cylinder.html>, // HW AW

Many people believe that the Earth will soon be in danger and the sprawling nature of humanity is the undeniable cause. With the rapid technological progress and advancement of the past few centuries, we're quickly exhausting the resources from planet Earth in order to power our industrial needs and global commerce. Many futurists feel that we will be left with no option but to explore and colonize space if we intend to survive into a future when resources on Earth can no longer meet our requirements. Overpopulation is an imminent challenge that makes the need for interstellar travel and colonization even more urgent. That being said, building a space habitat is no easy pursuit and is loaded with daunting challenges, such as the need for construction facilities in space, the recreation of livable communities in space, the recycling and processing of waste, the simulation of artificial gravity, and most importantly—convincing governments and global organizations that this venture is worth pursuing. The prospect of space colonization paves the way for devising methods to extract energy from resources on other planets. On Earth, harnessing energy from the Sun using solar panels isn't particularly efficient, and faces inevitable barriers caused by the atmosphere and the daily occurrence of darkness (e.g., nighttime). However, in space, solar constructs can perpetually harness energy from the Sun without interruption. Utilizing this copious amount of energy would permit us to travel throughout our solar system without worrying about energy expenditure. Moreover, chemical resources would be in great supply in our solar system. To begin with, NASA has recently embarked on a project to generate fuel, water, and oxygen from resources present on the Moon. Given these foundations for why organizations should foray into developing a space habitat, allow me to introduce the O'Neill cylinder—a space settlement design consisting of two counter-rotating cylinders proposed by renowned physicist Gerard O'Neill a few decades ago. Aside from being a physicist, O'Neill was also a professor at Princeton University and a space enthusiast. Although he is most widely acclaimed for his work in physics, where he developed new concepts to explore particle physics at higher energies, his work on space colonization turned out to be his truly long-lasting legacy. Origin of the Idea for the O'Neill Cylinder While teaching physics to his students at Princeton University, O'Neill assigned them the task of designing a megastructure in space in order to demonstrate that living and surviving in space is actually a possibility. His students came up with numerous designs to accommodate human habitation in space. After a long session of brainstorming, O'Neill boiled their theories down to the idea of a cylinder-like space settlement design. Later, additional details and the functioning of this design were published in Physics Today in 1974; the cylinder was aptly called the O'Neill cylinder. Design of the O'Neill Cylinder The O'Neill cylinder design consists of two cylinders rotating in opposite directions on a bearing to mitigate the gyroscopic effect. Each cylinder was proposed to be 20 miles long and 5 miles in diameter, with 6 broad stripes along its length (3 habitable spaces and 3 windows). O'Neill envisioned industrial processes and recreational facilities to be located on the central axis in a virtually zero-gravity environment. Gravity Simulation One key difference between living on Earth and living in space (or on any other astronomical body) is the difference in gravity. Artificial gravity is needed for stability, and the O'Neill cylinder has a provision to achieve exactly that. As the two giant cylinders rotate on their axis, they would leverage the centripetal force of any object in the inner surface to create artificial gravity. Considering the cylinder's dimensions, the acceleration equation: $a=v^2/r$, and substituting the acceleration value of Earth (i.e., 9.81), we can deduce that the cylinder would need to rotate roughly 28 times per hour to simulate an appropriate gravitational force. Earthly Environment Simulation Maintaining an atmosphere with a constitution similar to that of Earth is the next challenge when building a space habitation. The O'Neill cylinder is prudently designed with a ratio of gases similar to what is found on Earth. However, there is a caveat; the pressure is half of that at sea level. This would not impact our breathing substantially, but

this minor trade-off would translate into a handful of benefits, such as bringing down the need for gas and the construction of thick walls. The proposed O'Neill cylinder also has provisions wherein the habitat would be able to control its own micro-climate using an arrangement of mirrors and by altering the ratio of gases in the cylinder. Day and Night Simulation With the human habitat situated in a vacuum (space), the cylinder essentially turns into a huge thermos! The theoretical O'Neill cylinder tried to overcome this issue by using a series of mirrors hinged on each of the three windows. This way, direct sunlight could be directed into the cylinder to simulate day time. Similarly, by turning the mirror away, a night-like ambience could be created. This simulated 'night' would also permit the heat produced biologically to radiate out of the cylinder. **Despite the design of the O'Neill cylinder being technically sound, the idea is too sophisticated to be implemented with our present technology** Thus far, its implementation has been confined to the realm of science fiction. However, **given the efforts of organizations like SpaceX and Mars One, perhaps some day O'Neill cylinders will actually help humanity settle in the great vastness of space!**

This permanently solves extinction, which outweighs the affirmative.

Haynes 19, 5/17, Korey "O'Neill colonies: A decades-long dream for settling space," Astronomy, <https://astronomy.com/news/2019/05/oneill-colonies-a-decades-long-dream-for-settling-space>

Last week, Amazon founder Jeff Bezos revealed his spaceship company's new lunar lander, dubbed Blue Moon, and he spelled out a bold and broad vision for humanity's future in space. Faced with the limits of resources here on Earth, most fundamentally energy, he pointed to life in space as a solution. "If we move out into the solar system, for all practical purposes, we have unlimited resources," Bezos said. "We could have a trillion people out in the solar system." And while colonies on other planets would be plagued by low gravity, long distances to Earth (leading to communication delays), and further limits down the road, those weaknesses are avoided if the colonies remain truly in space. To that end, Bezos instead suggested people consider taking up residence in O'Neill colonies, a futuristic concept for space settlements first dreamed up decades ago. "These are very large structures, miles on end, and they hold a million people or more each." Gerard O'Neill was a physicist from Princeton University who teamed up with NASA in the 1970s on a series of workshops that explored efficient ways for humans to live off-world. Beyond influencing Bezos, his ideas have also deeply affected how many space experts and enthusiasts think about realistic ways of living in space. "What will space colonies be like?" O'Neill once asked the Space Science Institute he founded. "First of all, there's no point in going out into space if the future that we see there is a sterile future of living in tin cans. We have to be able to recreate, in space, habitats which are as beautiful, as Earth-like, as the loveliest parts of planet Earth — and we can do that." Of course, neither O'Neill nor anyone since has actually made such a habitat, but in many ways, the concepts he helped developed half a century ago remain some of the most practical options for large-scale and long-term space habitation. While NASA has mostly focused on exploring the moon and Mars in recent years, **O'Neill colonies** offer an option untethered to any planetary body. Instead, **people would live in enormous circular structures in space that would be capable of hosting many thousands of people — or even millions** according to Bezos — **on a permanent basis**. You may have seen these kinds of colonies in science fiction, from Star Trek, to the movie Interstellar. But in real life, researchers have thought up a few variations: either a sphere, a cylinder, or a ring-shaped torus. All of these are designed to rotate and create a centrifugal force that mimics gravity for the inhabitants. While the sizes and specifications of the colonies vary, there are a few staples. In general, **O'Neill colonies were designed to be permanent, self-sustaining structures. That means they would use solar power for electrical energy and for growing crops.** The outer walls of an O'Neill colony are generally pictured as a transparent material, so that mirrors can aim sunlight through its walls as needed to provide light and energy — or to allow darkness, a feature humans also need, especially while we sleep. But building these colonies is a challenge beyond any humans have accomplished so far in space, and Bezos acknowledged that. He referred to two "gates" in his announcement, which he clarified as challenges that humans need to overcome. The first, which his company **Blue Origin and other space entrepreneurs have been tackling, is to reduce the cost and difficulty of getting to space at all.** But the second involves using resources from space, rather than hauling them from Earth. Bezos isn't alone in such thinking. Most of **NASA's long-term plans for the Moon and Mars involve rely on harvesting materials and manufacturing products locally, using lunar and martian regolith to build and repair structures.** And in the shorter term, three of the dozen experiments NASA selected as the first to fly as part of the new lunar program — possibly even by the end of the year — are what NASA terms "resource prospecting instruments." That pairs well with O'Neill's vision. These **colonies are meant to use resources gathered from space, whether asteroids, the Moon, or even Mars.** Doing so avoids the costly effort of heaving materials and goods out of Earth's deep gravity well. That means they would be built using materials available cheaply in space. The humans and their attendant plants and animals would

need to be carried from Earth. But raw materials like oxygen, nitrogen and aluminum are plentiful in the solar system, and mining for resources in space is a common theme across space settlement discussions.

Because of their size, the colonies should be able to act as fully independent ecosystems, with plants to cycle air and water and resource cycles not so dissimilar from Earth. Humans are a long way from being able to launch anything like an O'Neill colony in the near future. But it's somewhat telling that, after 50 years

Solvency

1. The status quo already prevents the worst-case scenario for private companies in space. Even though the Outer Space Treaty doesn't bind private entities, governments still restrict and regulate them to ensure just compliance.

Eijk 20 [Cristian van Eijk is finishing an accelerated BA in Law at the University of Cambridge. He holds a BA cum laude in International Justice and an LLM in Public International Law from Leiden University, and has previously worked at the T.M.C. Asser Institute and the International Commission on Missing Persons. "Sorry, Elon: Mars is not a legal vacuum – and it's not yours, either." Voelkerrechtsblog. May 11, 2020. <https://voelkerrechtsblog.org/sorry-elon-mars-is-not-a-legal-vacuum-and-its-not-yours-either/>] HW AL

Two provisions of the Outer Space Treaty (OST), both also customary, are particularly relevant here. OST article II: "Outer 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." OST article III: "States... shall carry on activities in the exploration and use of outer space, including (...) celestial bodies, in accordance with international law". SpaceX is a private entity, and is not bound by the Outer Space Treaty – but that does not mean it can opt out. Its actions in space could have consequences for the United States in three ways. First, the US, as SpaceX's launch state, bears fault-based liability for injury or damage SpaceX's space objects cause to other states' persons or property (OST article VII, Liability Convention articles I, III). Second, the US, as SpaceX's state of registry, is the sole state that retains jurisdiction and control over SpaceX objects (OST article VIII, Registration Convention article II). Both refer to objects in space and are irrelevant. According to article VI OST, States "bear international responsibility for national activities in outer space", including Mars, including those by "non-governmental entities". The US, as SpaceX's state of incorporation, must authorise and continuously supervise SpaceX's actions in space to ensure compliance with the OST (OST article VI) and international law (OST article III). In practice, this task is done by the US Federal Communications Commission, which licenses and regulates SpaceX Article VI OST sets a specific rule of attribution, supplementing the customary rules of state responsibility (Stubbe 2017, pp. 85-104). SpaceX acts with US authorisation, and its conduct in space within and beyond that authorisation is attributable to the US (ARSIWA articles 5, 7). In the absence of circumstances precluding wrongfulness, the result is straightforward. If SpaceX breaches a US obligation under international law, the US bears responsibility for an internationally wrongful act.

2. Private sector is key to make public space development successful.

Urrutia '18

(Doris Elin Urrutia, October 12, 2018, Urrutia is a journalist for Inverse that bridge archaeological and paleontological discoveries with modern life. She also writes about astronomy and spaceflight for Space.com and on marine life for Scientific American, "How Will Private Space Travel Transform NASA's Next 60 Years?", <https://www.space.com/42113-nasa-future-private-spaceflight.html> //NL)

First, people should understand that about 75 percent of the worldwide space enterprise is already commercial, said Scott Hubbard, an adjunct professor in the Department of Aeronautics and Astronautics at Stanford University. This includes the satellites belonging to DirecTV and Sirius XM radio. "What's new is the extension of that into the human realm," said Hubbard, who also previously directed NASA's Ames Research Center in Silicon Valley. He served as the agency's "Mars czar," restructuring NASA's robotic Red Planet-exploration program after it suffered several failures in the 1990s. And if private companies can get the price of a suborbital flight down to about \$50,000, "you get a lot of interest," Hubbard told Space.com. The highest-profile program currently in the works between NASA and the private sector is the agency's Commercial Crew Program, said Eric Stallmer, president of the nonprofit Commercial Spaceflight Federation. Commercial Crew is encouraging the development of U.S. spacecraft that will carry astronauts to and from the International Space Station (ISS). Toward this end, NASA has awarded multibillion-dollar contracts to both SpaceX and Boeing, which are building capsules called Crew Dragon and CST-100 Starliner, respectively. These craft are currently scheduled to start flying astronauts sometime next year. There's also the maturing commercial cargo program, which has given contracts to SpaceX and Northrop Grumman Corp. to fly robotic cargo missions to the ISS. Both of these companies have already completed numerous such flights. Both Hubbard and Stallmer said that NASA wins by relying on private industry to provide such services in low Earth orbit. Hubbard argued that this strategy allows the space agency to continue "exploring the fringe where there really is no business case." NASA has a budget about five times larger than the next biggest national space agency out there, but the U.S. agency's ambitious goals are still costly, said Stallmer. To get the most bang for the buck, you'd have to leverage the innovation and technology that is in the private sector and let NASA do the

exquisite" projects. The "exquisite" projects, Stallmer explained, are the "push-the-envelope-type things on deeper space exploration." "I see it not only as a cooperation or a collaboration, but maybe even interdependence," Hubbard said. "Without a thriving spaceflight entrepreneurship sector, I don't think that deep-space exploration with [regular] people is sustainable," he added. "And I think using the way in which **the private sector** has **demonstrated they can reduce costs**, through more nearly assembly-line production techniques, is really **critical to sustainable space exploration in the future.**" Phil McAlister, director of commercial spaceflight at NASA, also advocated these public-private **partnerships**. Private companies **offer the advantages of "being quick**, being nimble, being fast, making a decision maybe without perfect knowledge — then moving forward and adjusting as required," McAlister told Space.com. **NASA officials**, he **said**, "have a lot of meetings ... a lot of discussions, and **things tend to take longer**" than in private industry. **"The private sector wanting to move fast and wanting to be cost-effective** and NASA having our 50 years of human spaceflight experience ... you bring those two things together, and they actually **complement each other very effectively**," McAlister said.

Case

The standard is maximizing expected well-being –

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

Bostrom 12 [Nick Bostrom. Faculty of Philosophy & Oxford Martin School University of Oxford.

“Existential Risk Prevention as Global Priority.” Global Policy (2012)]

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

2] Independently, extinction turns suffering impacts – mass death causes massive amounts of structural violence

3] Exclusion is inevitable and non-unique. Slow violence framing means we de-value extinction just as much as extinction-first framing de-values slow violence. Policy is about weighing those trade-offs, so they need to win that theirs are larger.

4] Governments must use util since they can't focus on every individual rights violation

Goodin 95 Robert, 1995, *Philosopher of Political Theory, Public Policy, and Applied Ethics. Utilitarianism as a Public Philosophy*, Cambridge University Press, pg. 26-27

The great advantage of **utilitarianism** as a guide to public conduct is that it avoids gratuitous sacrifices, it **ensures** as best we are able to ensure in the uncertain world of public policy-making **that policies are sensitive to** people's **interests** or desires or preferences. The great failing of more deontological theories, applied to those realms, is that they fixate upon duties done for the sake of duty rather than for the sake of any good that is done by doing one's duty. Perhaps it is permissible (perhaps it is even proper) for private individuals in the course of their personal affairs to fetishize duties done for their own sake. It would be a mistake for public officials to do likewise, not least because it is impossible. The fixation on motives makes absolutely no sense in the public realm, and might make precious little sense in the private one even, as Chapter 3 shows. **The reason public action is required** at all **arises from the inability of** uncoordinated **individual action to achieve** certain morally **desirable ends**. Individuals are rightly excused from pursuing those ends. The inability is real; the excuses, perfectly valid. But libertarians are right in their diagnosis, wrong in their prescription. That is the message of Chapter 2. The same thing that makes those excuses valid at the individual level – the same thing that relieves individuals of responsibility – **makes it morally incumbent upon individuals to organize** themselves **into collective units** that are **capable of acting where** they as isolated **individuals are not**. When they organize themselves into these collective units, those collective deliberations inevitably take place under very different circumstances and their conclusions inevitably take very different forms. **Individuals** are morally required to operate in that collective manner, in certain crucial respects. But they **are** practically **circumscribed in how they can operate, in their collective mode**. And those **special constraints characterizing the public sphere** of decision-making **give rise to** the special circumstances that make **utilitarianism** peculiarly apt for public policy-making, in ways set out more fully in Chapter 4. Government house utilitarianism thus understood is, I would argue, a uniquely defensible public philosophy.

5] Extinction justifies moral loopholes – therefore, ignoring it is unethical.

Bok, 1988 (Sissela Bok, Professor of Philosophy, Brandeis, Applied Ethics and Ethical Theory, Ed. David Rosenthal and Fudloun Shehadi, 1988)

The same argument can be made for Kant's other formulations of the Categorical Imperative: "So act as to use humanity, both in your own person and in the person of every other, always at the same time as an end, never simply as a means"; and "So act as if you were always through actions a law-making member in a universal Kingdom of Ends." No one with a concern for humanity could consistently will to risk eliminating humanity in the person of himself and every other or to risk the death of all members in a universal Kingdom of Ends for the sake of justice. To risk their collective death for the sake of following one's conscience would be, as Rawls said, "irrational, crazy." And to say that one did not intend such a catastrophe, but that one merely failed to stop other persons from bringing it about would be beside the point when the end of the world was at stake. For although it is true that we cannot be held responsible for most of the wrongs that others commit, the Latin maxim presents a case where we would have to take such a responsibility seriously—perhaps to the point of deceiving, bribing, even killing an innocent person, in order that the world not perish.

Adv 1: Capitalism

Evaluate **ONLY** the parts of cap and inequality the aff can solve – I'll give you a hint: its next to nothing. Do not give them all of the generic cap or inequality impacts they read in the 1AC.

Vote neg on presumption – space privatization may be an example of neoliberal, but no chance that they solve it:

1. None of their ev is reverse causal – industrial agriculture, the defense industrial base, Amazon, Koch Industries are all examples of capitalism – plus capitalism predates space exploration, which proves they don't control the root cause
2. 1AC Holen is a critique of growth mindset writ large – if governments are fundamentally neoliberal, they have the same incentives to appropriate space as private companies – the aff has zero bearing on NASA – means they don't solve spatial fixes because NASA can appropriate space resources, then sell them to private companies – proven by existing contracts between NASA and NewSpace –
3. No brightline for when spatial fixes on Earth are exhausted – corporations will continue extracting resources from Earth even if it's less lucrative
4. No plan text or any solvency warrants/cards is damning – don't allow new 1AR spins or readings because it shortchanges the entire 1NC

5] Root cause claims are wrong- capitalism is key to reducing war and environmental destructions

Zitelman, PhD, 21

(Rainer, <https://nationalinterest.org/feature/terror-consumption-why-capitalism-gets-blamed-everything-194769>, 10-3)

Before the emergence of capitalism, a majority of the global population was living in extreme poverty. In 1820, that applied to 90 percent of the people on the planet; today, it is less than 10 percent. And most remarkably: In recent decades, since the end of communism in China and other countries, the decline in poverty has accelerated to a pace unmatched in any previous period of human history. In 1981, the poverty rate amounted to 42.7 percent; by 2000, it had fallen to 27.8 percent, and in 2021 it was only 9.3 percent. There is more good news: the number of child laborers worldwide has dropped significantly, falling from 246 million children in 2000 to 160 million twenty years later in 2020. This is despite the fact that the world population increased from 6.1 to 7.8 billion people over the same two decades. Despite these facts, most people do not like capitalism. The Edelman Trust Barometer 2020, a survey that is conducted in twenty-eight countries, concludes that, on average, 56 percent of respondents believe that “Capitalism as it exists today does more harm than good in the world.” In Europe, people in France were most likely to agree with this statement (69 percent), followed by respondents in Italy (61 percent), Spain (60 percent), Germany (55 percent) and the United Kingdom (53 percent). In both the United States and Canada, 47 percent agreed with this critical assessment of capitalism. Anti-capitalism is a political religion. In classical religions, the devil is the prototypical expression of evil in the world. In the political religion of anti-capitalism, capitalism assumes the role of evil incarnate. Accordingly, capitalism is not only responsible for all of the evils in society, but also for everyone’s personal problems. People blame capitalism for hunger, poverty, inequality, climate change, pollution, war, alienation, fascism, racism, gender inequality, slavery, colonialism, corruption, crime, mental illness and cultural decay. Wars were more frequent in pre-capitalist times than in the period since capitalism came into being. And numerous scientific studies on “capitalist peace” have shown that free trade and capitalism reduce the likelihood of military conflicts. Also, there are various studies showing that environmental standards are much better in capitalist than in non-capitalist countries—and there are the facts cited above about the extent to which capitalism has reduced hunger and poverty. So why don’t most people want to hear these facts? Well, one reason is that when it comes to topics such as hunger, poverty, climate change and war, it is very difficult to engage in a discussion based on facts. The more emotionally charged a topic is, the less willing people are to acknowledge the facts, especially when they contradict their own personal opinions. Scientists have encountered this phenomenon in many experiments and surveys. In numerous almost identical representative surveys that scientists have conducted over the past decades, respondents were presented with a sheet of paper with a picture and a speech bubble and asked the following question: “I would now like to tell you about an incident that happened the other day at a panel discussion about [then followed various topics such as genetic engineering, climate change, nuclear energy, air pollution, etc., all of which are emotionally polarizing]. Experts were talking about the risks and the state of research. Suddenly, an audience member jumps up and shouts something to the panelists and the audience.” The researchers then asked respondents to look at the person and the speech bubble on the paper that contained the words, “What do I care about numbers and statistics in this context? How can you even talk so coldly when the survival of mankind and our planet is at stake?” Below the speech bubble was a question: Would you say this person is right or wrong? That question was repeatedly asked over a period of twenty-seven years in fifteen different representative surveys on a variety of highly emotive and controversial topics. Invariably, the majority of respondents agreed with the heckler who was not interested in the facts. On average, 54.8 percent said the fact-resistant heckler was right, only 23.4 percent disagreed. Anti-capitalists cannot be convinced by facts. If there are too few goods, then capitalism is to blame. The same is true if there are too many goods (“the terror of consumption”). And even when a person goes shopping and can’t find the goods they are looking for, capitalism is to blame. Author Eula Biss is widely celebrated for her novels and begins her book on possession, capitalism, and the value of things, *Having and Being Had* (2020), with this anecdote: We’re on our way home from a furniture store, again. What does it say about capitalism, John asks, that we have money and want to spend it but we can’t find anything worth buying? We almost bought something called a credenza, but then John opened the drawers and discovered it wasn’t made to last. I think there are limits, I say, to what mass production can produce. Later in the book, the author recounts a conversation with her mother, who asks her if she thinks capitalism is good or bad. She responds with, “I say I’m tempted to think it’s a bad thing but I don’t really know what it is.” For many people, anti-capitalism is an emotional issue. It is a diffuse feeling of protest against the existing order. There is no evil, neither in society nor in my personal life, anti-capitalists say to themselves, that cannot be blamed on the capitalist “system,” even if it is only the fact that I can’t find any furniture to buy.

Adv 2: Spatial Gap

1] Public and private companies must work together to overcome blockages that each industry face, only together can the process be expedited

Houser 17 (Kristin Houser is a writer for Futurism , where she covers science and tech. Her written work has appeared in Business Insider, NBC News, and the World Economic Forum's Agenda, among other publications

<https://futurism.com/private-companies-not-governments-are-shaping-the-future-of-space-exploration>
//HWLND

Private companies may be in the lead, but the finish line for this Space Race isn't exactly clear. The first iteration was arguably "won" when Neil Armstrong took his first steps on the Moon, so does this sequel end when we establish the first Moon base? When a human walks on Mars?

When we leave the solar system? Truthfully, the likelihood of humanity ever calling it a day on space exploration is slim to none. **The universe is huge, with galaxy estimates in the trillions, so the goalpost will continue moving back (to bring another sport into the analogy). Rather than focusing on competing in what is ultimately an unwinnable race, private and government-backed space agencies can actually benefit from collaboration thanks to their inherent differences.** "The way that SpaceX, Planetary Resources, or Virgin Galactic approaches space exploration is going to be very different from NASA or the Air Force," explains Lewicki. **Private companies aren't beholden to the same slow processes that often stall government projects, and they can secure or reallocate funding much more swiftly if need be. However, unlike agencies like NASA, they do have shareholders to keep happy and a need to constantly pursue profitability. The two sectors, therefore, have a tremendous opportunity to help one another. Private companies can generate revenue through government contracts —for example, NASA has contracted Boeing to transport astronauts to the International Space Station (ISS), and SpaceX just closed a deal with the U.S. Air Force to launch its secretive space drone.** This leaves the **government agencies** free to **pursue** the kind of **forward-thinking, longer-term research** that might not immediately generate revenue, but that can be **later streamlined** and improved upon **in the private sector.**

2] Tons of alt causes to inequality – vaccines, economies, geopolitics, populations, environments, etc

3] Dallas and Chouhan concedes space gap is Non-unique. They have tagged it as "private appropriation" but neither of those words are in the highlighting. What this card actually says is just about how some countries have space programs while others don't, the aff doesn't solve that + major alt cause.

4] Worst case, space tech benefits rich nations. That's better than the squo because its not harming lower-income nations. History proves resources are shared the more abundant they are because of things like international treaties and trade, which means private space exploration helps low-income countries