# 1NC

## 1 – T

**Interpretation: Appropriation means the act of claiming something as one’s own**

**Oxford languages:**

“Appropriation.” Oxford Languages. [https://www.lexico.com/en/definition/appropriation //](https://www.lexico.com/en/definition/appropriation%20//) Park City NL

**1 The action of taking something for one's own use**, typically without the owner's permission. ***‘the appropriation of parish funds’*** 1.1The artistic practice or technique of reworking images from well-known paintings, photographs, etc., in one's own work.*‘the hallmark of postmodernism has turned out to be appropriation’* 2A sum of money or total of assets devoted to a special purpose. *‘success in obtaining appropriations for projects’*

#### In space, that means exclusive control and permanence

TIMOTHY JUSTIN TRAPP, JD Candidate @ UIUC Law, ’13 quoting Smith 92, TAKING UP SPACE BY ANY OTHER MEANS: COMING TO TERMS WITH THE NONAPPROPRIATION ARTICLE OF THE OUTER SPACE TREATY UNIVERSITY OF ILLINOIS LAW REVIEW [Vol. 2013 No. 4]

The issues presented in relation to the nonappropriation article of the Outer Space Treaty should be clear.214 The ITU has, quite blatantly, created something akin to “property interests in outer space.”215 It allows nations to exclude others from their orbital slots, even when the nation is not currently using that slot.216 This is directly in line with at least one definition of outer-space appropriation.217 [\*\*Start Footnote 217\*\*Id. at 236 (“Appropriation of outer space, therefore, is ‘the exercise of exclusive control or exclusive use’ with a sense of permanence, which limits other nations’ access to it.”) (quoting Milton L. Smith, The Role of the ITU in the Development of Space Law, 17 ANNALS AIR & SPACE L. 157, 165 (1992)). \*\*End Footnote 217\*\*]The ITU even allows nations with unused slots to devise them to other entities, creating a market for the property rights set up by this regulation.218 In some aspects, this seems to effect exactly what those signatory nations of the Bogotá Declaration were trying to accomplish, albeit through different means.219

**Violation: space tourism does not involve private entities “taking” space – they are visitors and don’t claim to own it. Space tourism only occurs in earth orbit – there are no celestial bodies to appropriate there.**

Henderson and Tsui 19

Isaac Levi Henderson, Wai Hong Kan Tsui. “Air Transport: A Tourism Perspective.” Science Direct. 2019. <https://www.sciencedirect.com/topics/social-sciences/space-tourism>

// Park City NL

**Space tourism is a**nother niche **segment of the aviation industry** that seeks to give tourists the ability to become astronauts and experience space travel for recreational, leisure, or business purposes. Since space tourism is extremely expensive, it is a case of a very small segment of consumers that are able and willing to purchase a space experience. There are several options for space tourists. For example, Crouch et al. (2009) investigate the choice behaviour between **four types of space tourism: high altitude jet fighter flights, atmospheric zero-gravity flights**, short-duration **suborbital flights**, **and** longer duration **orbital trips** into space. Reddy et al. (2012) find the following motivational factors behind space tourism (in order of importance): vision of earth from space, weightlessness, high speed experience, unusual experience, and scientific contribution. Currently, only high-altitude jet fighter flights and atmospheric zero-gravity flights are commercially available to tourists in the space tourism sector. Accordingly, this section provides an example of each, whilst the potential for suborbital and longer duration orbital trips into space are discussed later in this chapter.

**Standards:**

1. **Limits: This justifies them banning any activity by a private entity in space, including exploration, research, and militarization, because they all occupy space like tourism. That explodes neg prep burdens and makes it impossible to predict their case, leading to unfair rounds.**
2. **Ground: they take neg links from any k’s about claiming property, any DAs about ownership (like mining), and a bunch of other core topic negatives. This skews prep towards the aff because we can’t read as much to beat them.**

**Fairness is a voter because**

1. **The only way a judge can determine who’s better is if we enter the debate on an even playing field.**
2. **People quit if they lose to unfair arguments so fairness is a prereq to debate’s existence.**

**Topicality is drop the debater:**

1. **Only DTD enables theory to deter bad behavior and be a tool for norm setting.**
2. **Even if it’s DTA, you drop the entire 1AC**

**No RVI’s:**

1. **they’re illogical – it doesn’t make sense to reward someone for not doing anything bad.**
2. **RVI’s chill legitimate theory, justifying even more abuse.**

**Competing Interps: Reasonability lets them arbitrarily choose a brightline that favors their arguments – skews fairness.**

## 2 – DA

#### Private companies are set to mine in space – new tech and profit motives make space lucrative

Gilbert 21, (Alex Gilbert is a complex systems researcher and PhD student in Space Resources at the Colorado School of Mines, “Mining in Space is Coming”), 4-26-21, Milken Institute Review, https://www.milkenreview.org/articles/mining-in-space-is-coming // MNHS NL

Space exploration is back. after decades of disappointment, a combination of better technology, falling costs and a rush of competitive energy from the private sector has put space travel front and center. indeed, many analysts (even some with their feet on the ground) believe that commercial developments in the space industry may be on the cusp of starting the largest resource rush in history: mining on the Moon, Mars and asteroids. 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](https://payneinstitute.mines.edu/wp-content/uploads/sites/149/2020/09/Payne-Institute-Commentary-The-Era-of-Commercial-Space-Mining-Begins.pdf" \t "_blank). 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](https://www.fastcompany.com/90347364/jeff-bezos-wants-to-save-earth-by-moving-industry-to-space" \t "_blank) 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. Start with the fact that space belongs to no country, complicating traditional methods of resource allocation, property rights and trade. With limited demand for materials in space itself and the need for huge amounts of energy to return materials to Earth, creating a viable industry will turn on major advances in technology, finance and business models. That said, there’s no grass growing under potential pioneers’ feet. Potential economic, scientific and even security benefits underlie an emerging geopolitical competition to pursue space mining. The United States is rapidly emerging as a front-runner, in part due to its ambitious Artemis Program to lead a multinational consortium back to the Moon. But it is also a leader in creating a legal infrastructure for mineral exploitation. The United States has adopted the world’s first spaceresources law, recognizing the property rights of private companies and individuals to materials gathered in space. However, the United States is hardly alone. Luxembourg and the United Arab Emirates (you read those right) are racing to codify space-resources laws of their own, hoping to attract investment to their entrepot nations with business-friendly legal frameworks. China reportedly views space-resource development as a national priority, part of a strategy to challenge U.S. economic and security primacy in space. Meanwhile, Russia, Japan, India and the European Space Agency all harbor space-mining ambitions of their own. Governing these emerging interests is an outdated treaty framework from the Cold War. Sooner rather than later, we’ll need [new agreements](https://issues.org/new-policies-needed-to-advance-space-mining/" \t "_blank) to facilitate private investment and ensure international cooperation.

Back up for a moment. For the record, space is already being heavily exploited, because space resources include non-material assets such as orbital locations and abundant sunlight that enable satellites to provide services to Earth. Indeed, satellite-based telecommunications and global positioning systems have become indispensable infrastructure underpinning the modern economy. Mining space for materials, of course, is another matter. In the past several decades, planetary science has confirmed what has long been suspected: celestial bodies are potential sources for dozens of natural materials that, in the right time and place, are incredibly valuabl**e**. Of these, water may be the most attractive in the near-term, because — with assistance from solar energy or nuclear fission — H2O can be split into hydrogen and oxygen to make rocket propellant, facilitating in-space refueling. So-called “rare earth” metals are also potential targets of asteroid miners intending to service Earth markets. Consisting of 17 elements, including lanthanum, neodymium, and yttrium, these critical materials (most of which are today mined in China at great environmental cost) are required for electronics. And they loom as bottlenecks in making the transition from fossil fuels to renewables backed up by battery storage. The Moon is a prime space mining target. Boosted by NASA’s mining solicitation, it is likely the first location for commercial mining. The Moon has several advantages. It is relatively close, requiring a journey of only several days by rocket and creating communication lags of only a couple seconds — a delay small enough to allow remote operation of robots from Earth. Its low gravity implies that relatively little energy expenditure will be needed to deliver mined resources to Earth orbit. The Moon may look parched — and by comparison to Earth, it is. But recent probes have confirmed substantial amounts of water ice lurking in [permanently shadowed craters](http://lroc.sese.asu.edu/posts/1105" \t "_blank) at the lunar poles. Further, it seems that solar winds have implanted significant deposits of helium-3 (a light stable isotope of helium) across the equatorial regions of the Moon. Helium-3 is a potential fuel source for second and third-generation fusion reactors that one hopes will be in service later in the century. The isotope is packed with energy (admittedly hard to unleash in a controlled manner) that might augment sunlight as a source of clean, safe energy on Earth or to power fast spaceships in this century. Between its water and helium-3 deposits, the Moon could be the resource stepping-stone for further solar system exploration. Asteroids are another near-term [mining target](https://foreignpolicy.com/2016/04/28/the-asteroid-miners-guide-to-the-galaxy-space-race-mining-asteroids-planetary-research-deep-space-industries/" \t "_blank). There are all sorts of space rocks hurtling through the solar system, with varying amounts of water, rare earth metals and other materials on board. The asteroid belt between the orbits of Mars and Jupiter contains most of them, many of which are greater than a kilometer in diameter. Although the potential water and mineral wealth of the asteroid belt is vast, the long distance from Earth and requisite travel times and energy consumption rule them out as targets in the near term. The prospects for space mining are being driven by technological advances across the space industry. The rise of reusable rocket components and the now-widespread use of off-the-shelf parts are lowering both launch and operations costs. Once limited to government contract missions and the delivery of telecom satellites to orbit, private firms are now emerging as leaders in developing “NewSpace” activities — a catch-all term for endeavors including orbital tourism, orbital manufacturing and mini-satellites providing specialized services. The space sector, with a market capitalization of $400 billion, could grow to as much as $1 trillion by 2040 as private investment soars.

#### Squo private companies are willing to invest, but the plan crosses a perception barrier which destroys investment

Shaw 13 - 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> // recut MNHS NL

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.'

#### Space mining is the only way to solve climate change

Duran 21, (Paloma Duran is a journalist and industry analyst at Mexico Business News, “Is Space Mining the Best Option to Face Climate Change?”), 11-03-21, Mexico Business News, https://mexicobusiness.news/mining/news/space-mining-best-option-face-climate-change // MNHS NL

Going to net zero means that more mining is needed. Experts have said that the current supply cannot support the necessary metals demand for the green transition. As a result, new mining alternatives have gained greater relevance, among them is space mining. Several countries, including Mexico, have shown their interest in this alternative, creating a new space race. “The solar system can support a billion times greater industry than we have on Earth. When you go to vastly larger scales of civilization, beyond the scale that a planet can support, then the types of things that civilization can do are incomprehensible to us … We would be able to promote healthy societies all over the world at the same time that we would be reducing the environmental burden on the Earth,” said Dr. Phil Metzger, Planetary Scientist at the University of Central Florida. Currently, there are several attempts to address global warming and transition to a net zero carbon economy. There has been an increasing interest in renewable energy and infrastructure, which has increased demand for various minerals, especially lithium, cobalt, nickel, copper and rare earth elements. However, according to experts, the world is close to entering a metals supercycle, where demand will exceed available supply, causing prices to skyrocket. Consequently, the mining industry has sought alternatives to achieve the required supply. Options include recycling and improved mine waste management, sea mining and space mining. The latter is considered one of the alternatives with the greatest potential. However, a regulatory framework is still lacking and there is almost no experience in this regard. Despite the lack of knowledge regarding space mining, it has become a very attractive option since the planet is running out of resources. While some people believe that land-based mining is cheaper than space mining, experts believe this may change in the long term. Furthermore, within the solar system there are countless bodies rich in minerals, ores and elements that will accelerate the fight against climate change. “There will come a point when there is nothing left to mine on the surface, prompting mines to reach even further below. But even those resources are destined to run out and so we will aim toward ocean mining, which already has specific technologies that are being developed. Nevertheless, even those mines are limited as well. The mine of the future, which today may seem unlikely, will no longer be on our planet. There will be a time when space mining will be as common as an open leach mine,” Eder Lugo, Minerals Head at Siemens, told MBN. More than 150 million asteroids measuring approximately 100m are believed to be in the inner solar system alone. In addition, astronomers have also identified abundant minerals near the Earth’s space and the Main Asteroid Belt. There are three main groups into which asteroids are divided: C- type, S- type, and M- type. The last two groups are the most abundant in minerals such as gold, platinum, cobalt, zinc, tin, lead, indium, silver, copper and rare earth metals. "Energy is limited here. Within just a few hundred years, you will have to cover all of the landmass of Earth in solar cells. So, what are you going to do? Well, what I think you are going to do is you are going to move out in space … all of our heavy industry will be moved off-planet and Earth will be zoned residential and light-industrial,” said Jeff Bezos, Founder of Amazon and the Space Launch Provider Blue Origin.

#### Anthropogenic warming causes extinction per the evidence on their climate advantage.

## 3 – DA

#### Private appropriation key to space colonization – commercial exchanges promote development, but the plan makes businesses hesitant.

Shakouri, 13 has an LL.M. in international law and is based in Tehran (Babak Shakouri “Space settlements on the Moon and elsewhere will create new legal issues” 4/1/13 <http://www.thespacereview.com/article/2269/1>) //NG

Once human settlements on nearby celestial bodies are established, their commercial exchanges with Earth will become an issue. Space migrants who choose to leave Earth and settle in an uncomfortable concrete or metal base on the Moon or Mars must have very strong incentives to step forth for such breathtaking adventure. There seems to be no greater reward than the lucrative economic opportunities found in a settlement on an alien surface full of potential resources.¶ The positive economic exchange rate with the Earth may assure the continuation and even expansion of space settlements on celestial bodies. Otherwise, settlers either will depend on equipment and reinforcements from Earth or go bankrupt. This may shed light on the importance of adopting suitable legal regime for human space settlements that, on one hand, fuels the needed investments for establishment of space settlements and, on the other hand, helps the efforts of inhabitants those settlements flourish economically and leads ultimately to their self-sufficiency.¶ There is sufficient evidence to suggest that the legal framework of a free market economic system incredibly suits the requirements of human settlements in space, since freedom of business and market innovation, together with recognition of private property, are the key elements in making the humans the first known spacefaring intelligent species.¶ Finally, the matter of the administrative legal regime of space settlements is another noteworthy issue to be considered. This matter, which is mainly categorized within the realm of administrative law, has attracted less attention in comparison with other legal aspects of outer space activities, but in no way should its importance and impact on future space settlement be disregarded.

#### Solves all extinction scenarios, including the aff, because better space exploration means we can escape catastrophes.

Baum 09 – (2009, Seth, visiting scholar at Columbia University's Center for Research on Environmental Decisions, PhD candidate in Geography with a focus on risk analysis, “Cost–benefit analysis of space exploration: Some ethical considerations,” Space Policy Volume 25, Issue 2, May 2009, Pages 75-80, science direct Ajones)

Another non-market benefit of space exploration is reduction in the risk of the extinction of humanity and other Earth-originating life. Without space colonization, the survival of humanity and other Earth-originating life becomes extremely difficult- perhaps impossible- over the very long-term. This is because the Sun, like all stars, changes in its composition and radiative output over time. The Sun is gradually converting hydrogen into helium, thereby getting warmer. In approximately 500 million to one billion years, this warming is projected to render Earth uninhabitable to life as we know it [25–26]. Humanity, if it still exists on Earth then, could conceivably develop technology by then to survive on Earth despite these radical conditions. Such technology may descend from present proposals to “geoengineer” the planet in response to anthropogenic climate change [27–28].3 However, the Sun later- approximately seven billion years later- loses mass that spreads into Earth’s orbit, causing Earth to slow, be pulled into the Sun, and evaporate. The only way life could survive on Earth may be if Earth, by sheer coincidence (the odds are on the order of one in 105 to one in 106 [29]) happens to be pulled out of the solar system by a star system that passes by. This process might enable life to survive on Earth much longer, although the chance of this is quite remote. While space colonization would provide a hedge against these very long-term astrological threats, it would also provide a hedge against the more immediate threats that face humanity and other species. These threats include nuclear warfare, pandemics, anthropogenic climate change, and disruptive technology [30]. Because these threats would generally only affect life on Earth and not life elsewhere,4 self-sufficient space colonies would survive these catastrophes, enabling life to persist in the universe. For this reason, space colonization has been advocated as a means of ensuring long-term human survival [32–33]. Space exploration projects can help increase the probability of long-term human survival in other ways as well: technology developed for space exploration is central to proposals to avoid threats from large comet and asteroid impacts [34–35]. However, given the goal of increasing the probability of long-term human survival by a certain amount, there may be more cost-effective options than space colonization (with costs defined in terms of money, effort, or related measures). More cost-effective options may include isolated refuges on Earth to help humans survive a catastrophe [36] and materials to assist survivors, such as a how-to manual for civilization [37] or a seed bank [38]. Further analysis is necessary to determine the most cost-effective means of increasing the probability of long-term human survival.

## Case

### Colonization

#### Social, biological, and technological problems prevent space colonization in the near future. If we can’t colonize mars, further colonization must be impossible.

Creighton 18

Creighton, Jolene. “Neil DeGrasse Tyson Says Humans Will Never Colonize Mars.” *Futurism*, Futurism, 20 Feb. 2018, https://futurism.com/neil-degrasse-tyson-humans-colonize-mars.

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SpaceX. Mars One. NASA. These three organizations have bold plans to be the first to colonize Mars in the next few decades. To astrophysicist Neil deGrasse Tyson, those plans aren’t just bold. They’re foolhardy and ill-advised. They may even be impossible. When I met with Tyson last month at the World Government Summit in Dubai, he made it clear that the **plan to create a civilization on Mars is entirely absurd**. His reasoning is simple: **Mars is** entirely **inhospitable to life as we know it.** First of all, that means **no one will want to live there**. Humans generally like to live in places that aren’t quite so, well, deadly. “We’d rather stay where it is warm and comfortable,” he said. This simple reasoning explains why **we don’t find populated cities** dotting the landscapes **at Earth’s poles**. **Antarctica is both warmer and wetter than any place on Mars**, and we don’t exactly see people lined up to live in the Arctic tundra. We won’t see cities flourishing on Mars for the same reason, Tyson says. Like the icy recesses of our own planet, Tyson says that some humans will venture to Mars for short visits, but they won’t remain for long. “Definitely, we’ll visit as a vacation spot. [But] I’m skeptical that you’ll find legions of people that will go there and want to stay,” he said. But it’s not just that humans would find Mars an unappealing home. According to Tyson, humans can’t colonize Mars. The Red Planet has a **notoriously thin atmosphere and no global magnetic field**. As a result, deadly **cosmic rays and UV radiation shower the Martian surface, transforming the soil into a “toxic cocktail**” of chemicals and causing **temperatures to plunge to** minus 62 degrees Celsius (**minus 80** degrees **Fahrenheit**). To survive under these deadly conditions, **humans would require “an entire infrastructure** in which you live **that mimics Earth**,” Tyson says—and that’s pretty much impossible to create **on a global scale**. Instead of setting our sights on generations of humans living on Mars, Tyson says we should hope for “just an Earth outpost” at best. So, will anyone actually colonize Mars? Tyson isn’t optimistic. “My read of history tells me, no. Not because I don’t want it to be so. I’m just a realist about this.” In a speech later that day, Tyson called for “a rational assessment” of our ability to settle space and railed against those who make predictions based on “deeply delusional premises.” To those at the helms of SpaceX, Mars One, and NASA, going to Mars probably doesn’t seem delusional. It just requires more preparation. But if **colonizing Mars isn’t possible because of humans’ biology**, well, maybe they will have to reassess after all.

**No ‘space war’ – Insurmountable barriers and everyone has an interest in keeping space peaceful**

**Dobos 19** [(Bohumil Doboš, scholar at the Institute of Political Studies, Faculty of Social Sciences, Charles University in Prague, Czech Republic, and a coordinator of the Geopolitical Studies Research Centre) “Geopolitics of the Outer Space, Chapter 3: Outer Space as a Military-Diplomatic Field,” Pgs. 48-49] TDI

Despite the theorized potential for the achievement of the terrestrial dominance throughout the utilization of the ultimate high ground and the ease of destruction of space-based assets by the potential space weaponry, the utilization of space weapons is with current technology and no effective means to protect them far from fulfilling this potential (Steinberg 2012, p. 255). In current global international political and technological setting, the utility of space weapons is very limited, even if we accept that the ultimate high ground presents the potential to get a decisive tangible military advantage (which is unclear). This stands among the reasons for the lack of their utilization so far. Last but not the least, it must be pointed out that the states also develop passive defense systems designed to protect the satellites on orbit or critical capabilities they provide. These further decrease the utility of space weapons. These systems include larger maneuvering capacities, launching of decoys, preparation of spare satellites that are ready for launch in case of ASAT attack on its twin on orbit, or attempts to decrease the visibility of satellites using paint or materials less visible from radars (Moltz 2014, p. 31). Finally, we must look at the main obstacles of connection of the outer space and warfare. The first set of barriers is comprised of physical obstructions. As has been presented in the previous chapter, the outer space is very challenging domain to operate in. Environmental factors still present the largest threat to any space military capabilities if compared to any man-made threats (Rendleman 2013, p. 79). A following issue that hinders military operations in the outer space is the predictability of orbital movement. If the reconnaissance satellite's orbit is known, the terrestrial actor might attempt to hide some critical capabilities-an option that is countered by new surveillance techniques (spectrometers, etc.) (Norris 2010, p. 196)-but the hide-and-seek game is on. This same principle is, however, in place for any other space asset-any nation with basic tracking capabilities may quickly detect whether the military asset or weapon is located above its territory or on the other side of the planet and thus mitigate the possible strategic impact of space weapons not aiming at mass destruction. Another possibility is to attempt to destroy the weapon in orbit. Given the level of development for the ASAT technology, it seems that they will prevail over any possible weapon system for the time to come. Next issue, directly connected to the first one, is the utilization of weak physical protection of space objects that need to be as light as possible to reach the orbit and to be able to withstand harsh conditions of the domain. This means that their protection against ASAT weapons is very limited, and, whereas some avoidance techniques are being discussed, they are of limited use in case of ASAT attack. We can thus add to the issue of predictability also the issue of easy destructibility of space weapons and other military hardware (Dolman 2005, p. 40; Anantatmula 2013, p. 137; Steinberg 2012, p. 255). Even if the high ground was effectively achieved and other nations could not attack the space assets directly, there is still a need for communication with those assets from Earth. There are also ground facilities that support and control such weapons located on the surface. Electromagnetic communication with satellites might be jammed or hacked and the ground facilities infiltrated or destroyed thus rendering the possible space weapons useless (Klein 2006, p. 105; Rendleman 2013, p. 81). This issue might be overcome by the establishment of a base controlling these assets outside the Earth-on Moon or lunar orbit, at lunar L-points, etc.-but this perspective remains, for now, unrealistic. Furthermore, no contemporary actor will risk full space weaponization in the face of possible competition and the possibility of rendering the outer space useless. No actor is dominant enough to prevent others to challenge any possible attempts to dominate the domain by military means. To quote 2016 Stratfor analysis, "(a) war in space would be devastating to all, and preventing it, rather than finding ways to fight it, will likely remain the goal" (Larnrani 20 16). This stands true unless some space actor finds a utility in disrupting the arena for others.

#### No war over satellites

Bowen 18 [Bleddyn Bowen, Lecturer in International Relations at the University of Leicester. The Art of Space Deterrence. February 20, 2018. https://www.europeanleadershipnetwork.org/commentary/the-art-of-space-deterrence/]

Space is often an afterthought or a miscellaneous ancillary in the grand strategic views of top-level decision-makers. A president may not care that one satellite may be lost or go dark; it may cause panic and Twitter-based hysteria for the space community, of course. But the terrestrial context and consequences, as well as the political stakes and symbolism of any exchange of hostilities in space matters more. The political and media dimension can magnify or minimise the perceived consequences of losing specific satellites out of all proportion to their actual strategic effect.

### Environment

#### Evidence isn’t reverse causal – even if tourism is bad for the climate, there’s no reason a ban solves warming. There are a ton of alt causes for warming, and no warrant for why space tourism is the brink.

#### Turn – space tourism gives influential tourists a cosmic perspectives and rallies them to the environmentalist cause. It’s the only way to solve climate change because we need policy and money on our side. Even if space tourism causes short-term emissions, it leads to long-term sustainability which outweighs.

Wilks 12/7

Wilks, Jeremy. “Virgin Galactic space launch: Will the dawn of space tourism be an environmental wake-up call?.” Euronews. 12/7/21. <https://www.euronews.com/green/2021/07/10/virgin-galactic-branson-will-the-dawn-of-space-tourism-be-an-environmental-wake-up-call>

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The blackness of space, the thinness of the atmosphere, and the lack of borders below. These are the three things that astronauts normally mention when you ask them about their first impressions from orbit. For those of us who are lucky enough to have met professional spacefarers, these answers have become something of a cliché. However, if we unpack them, turn them around and reflect on them in the light of the dawning age of space tourism, then perhaps those three observations will herald a change in mindset on the environment. Is there a chance that this decade's generation of privateer **space tourists will emerge** from their shiny new capsules **with a newfound appreciation of our planet**? If you watch the latest video from Branson's team at about one minute thirty seconds into the clip, you might be able to see one of the first examples of that process in action. Richard Branson flew up to an altitude of 85 kilometres in Virgin Galactic's VSS Unity on Sunday, and Amazon founder Jeff Bezos will blast above the 100-kilometre altitude Kármán Line on 20 July in Blue Origin's New Shepard 4. Both of them will be able to say that they have been to the edge of space, albeit just for a few minutes. They won't orbit around the Earth, as Yuri Gagarin did in 1961, and they won't cruise along 400 kilometres above our heads like Thomas Pesquet and his crewmates today. However, both Branson and Bezos will have the most outstanding view across the countries below, they will see the curvature of the Earth, and they will be confronted by the chilling blackness of outer space. British ESA astronaut Tim Peake once recounted to me the first moment he saw the vast universe before his eyes as he took a pause during an ISS spacewalk. People like Tim are incredibly brave, but I didn't get the impression that looking into the void made him feel at all reassured or comforted. The first man to spacewalk, Russian space legend Alexei Leonov once recounted to Euronews his brief venture into the nothingness around our planet, his eyes full of wonder as he described "the very black sky, black as coal, bright, un-flickering stars, and so many of them”. Even in his twilight years, you could see that it was a vision that continued to blow his mind. Those who have witnessed the universe first-hand often recount how our blue planet is a unique oasis amongst an all-enveloping blackness. So, let's hope that Branson, Bezos, and the other rich and influential people who pioneer these fleeting forays into space will return humbled by the absolutely epic emptiness of our universe. Let's hope that they briefly turn their heads away from the brilliance of the Earth below and contemplate the infinite expanse beyond. It's a place where even the wealthiest people in our world are tiny specks of insignificance. The first time I met French astronaut Jean-Francois Clervoy he recounted his Shuttle ride and the moment when he saw our atmosphere hugging the curve of the planet. He described what he saw in French - "l'atmosphère, cette fine couche qui nous maintient en vie" - 'the atmosphere, this fine layer that keeps us alive'. Many other astronauts I have met have talked passionately about their **first impressions of the fragility of our atmosphere**, a thin wrapping of gases protecting us from the cosmos. From ESA's Samantha Cristoforetti to NASA's Chris Ferguson, their memories are the same. They don't describe it in a heavy-handed or overly eco-conscious way, just in that matter-of-fact 'yes, I just flew to space' way that astronauts have. And each time they **conclude** with a similar point - **our atmosphere needs to be protected**. Once the new space tourism generation of **wealthy voyagers** and Instagram 'like'-hunters have flown into orbit there seems a strong chance that **their view of our atmosphere will have changed**, just as their view of Earth and humanity will have changed. Perhaps it will i**nspire them to insist on rapid advances in our actions towards polluting this fine layer** that allows us to breathe. There are many counter arguments to this of course - privately owned rockets using precious resources and leaving vast plumes of greenhouse gas emissions in their wake are about as un-green as it gets - but there is still a chance that both hearts and minds will be moved in a more ecological direction by the spaceflight experience. Heading to the final frontier gives the space tourist the chance to see that there are no borders visible from space. There is no line on the map between Texas and Mexico, or Russia and China. Ask astronauts about Europe from orbit and they always describe the snowy Alps and glinting Mediterranean. Tim Peake, Thomas Pesquet and Alexander Gerst all told me that **they were in awe of** the tiny Caribbean **islands and reefs they saw from orbit**, **and** again and again they **stressed how these places need to be** cared for and **protected**. When the space tourists of the 2020s look down they won't see the countries themselves, but the ensemble of green farmland, white-peaked mountains and grey-brown cities that make up our world. It's the view you get from an airliner times ten, quite literally, and that's a broad enough perspective to give anyone pause to reflect on how we are changing our planet. Space tourism offers the chance for many hundreds of people to see our planet and our universe from the same perspective as the world's astronauts. **Among the first** few hundred **to fly will** likely **be some of the world's** richest and **most influential people**: the kinds of people who build planet-straddling corporations or run continent-wide countries. The kinds of people who can actually change societies, in some cases. The kinds of people **who could really do something about climate change - if they felt they needed to.**

#### Robust psychology proves

Mammarella 21

Mammarella, Nicola. “Can Space Tourism Boost Sustainable Behavior?” Frontiers in Psychology. November 2021. <https://www.frontiersin.org/articles/10.3389/fpsyg.2021.771936/full>

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As the golden age of space tourism is becoming a reality, many are wondering about the usefulness of sending people to space for a few minutes. Given the high cost of a spaceflight, pollution-related problems, and the rigid training that private astronauts undergo, it is fundamental to understand and predict whether people can derive benefits from this type of tourism also from a psychological and behavioral point of view. Here we ask whether participating in a spaceflight may shape human behavior in terms of sustainable behavior (e.g., prosocial skills). The question may be perceived as a non-sense. In fact, spatial industries and rockets are far from being an example of sustainability. However, the definition of sustainable behavior appears to offer a different perspective that may add to the psychological value of space tourism per sé at least from a theoretical point of view. Sustainable behavior can be defined as a series of voluntary actions that result in benefits for the natural environment and for the whole humanity. Prosocial behaviors are an instance of sustainable actions when referring to helping people and doing something for the conservation of their natural environment (e.g., [Eisenberg, 1982](https://www.frontiersin.org/articles/10.3389/fpsyg.2021.771936/full#B3)). Sustainable behaviors are based on the assumption that it is important to understand the complexity of the natural environment and to become aware of the consequences resulting from our behaviors as they impact over Earth's integrity. One of the main characteristics of sustainable behavior is that **sustainability and positive emotions are linked** conceptually and **empirically**. In fact, positive emotions are thought to foster subsequent helping behavior and vice versa. For example, there are studies showing that inducing the idea of love by asking to retrieve memory of a love episode, had a significant positive effect on compliance to a request by a passerby who was asked for help (e.g., [Lamy et al., 2008](https://www.frontiersin.org/articles/10.3389/fpsyg.2021.771936/full#B7)). When measured via self-reports of intent to help or experimental records of helping behaviors, individuals that engage in sustainable actions frequently report greater level of satisfaction, self-efficacy and, generally speaking, psychological well-being (e.g., [Fredrickson and Joiner, 2018](https://www.frontiersin.org/articles/10.3389/fpsyg.2021.771936/full#B5)). As theorized by Barbara Fredrickson and her colleagues (e.g., [Fredrickson and Joiner, 2018](https://www.frontiersin.org/articles/10.3389/fpsyg.2021.771936/full#B5)), the main idea is that positive emotions are associated with greater feelings of self–other overlap. That is, by broadening cognition, positive emotions produce more inclusive social categorization and subsequently produce feelings of oneness, helping behavior toward people and their natural environment. In this regard, one can wonder whether space tourism may offer a contribution. For instance, Jeff **Bezos' first words after returning to Earth “*I felt unbelievably good*** *…this is* ***the only good planet*** *in the solar system, and we have to take care of it. When you go to space and see how fragile it is* ***you want to take care of it*** *even mor*e” seem to testify how positive emotions fuel people's desire to experience conditions of helping behavior and engaging in conservation practices. However, one can argue that the association between positive emotions and sustainable behavior is not always straightforward and this may be particularly true when referring to an extreme environment such as space. In fact, a space mission is characterized by many physical and psychological stressors such as microgravity, isolation, confinement, sensory and sleep deprivation (e.g., [Messerotti Benvenuti et al., 2011](https://www.frontiersin.org/articles/10.3389/fpsyg.2021.771936/full#B8), [2013](https://www.frontiersin.org/articles/10.3389/fpsyg.2021.771936/full#B9); [Spironelli and Angrilli, 2011](https://www.frontiersin.org/articles/10.3389/fpsyg.2021.771936/full#B10)) that may differentially impact on affective responses and on the subsequent engagement in sustainable actions. Moreover, a study by [Ballantyne et al. (2008)](https://www.frontiersin.org/articles/10.3389/fpsyg.2021.771936/full#B2) found that a visit to a botanic garden, thought to foster positive emotions (e.g., enjoying being in a nature scene, admiring a garden's scenery with family, etc.) coupled with the importance of preserving plants, did not generate a higher level of interest in and commitment to conservation practices compared with other types of visits (e.g., museum, zoo, etc.). This finding indicates that perceiving vulnerability does not necessarily lead to the subsequent adoption of sustainable behaviors. The rationale being that sustainable actions do not simply rely on the sole exposure to a certain environment, rather it requires the interaction of multiple processes, such as decision making, emotion, motivation, attention, etc. (to cite only few) that can lead individuals to act in different ways. The same scenario, thus, may occur during a space mission: positive emotions may be associated to space tourism but not necessarily in a way that fosters behavioral changes. One aspect that may strengthen the link between space tourism and sustainable behavior is the focus on Earth's perception as thought to be strictly connected with the occurrence of positive emotions and with subsequent sustainable behaviors (e.g., [Suedfeld et al., 2010](https://www.frontiersin.org/articles/10.3389/fpsyg.2021.771936/full#B11)). Basically, **the global vision of the Earth prompts** the occurrence of **positive emotions**. This phenomenon looks like a mood induction procedure where participants are exposed to a series of positively laden pictures or to a funny movie with the aim of increasing their mood on the positive side. The rationale being that when measuring the degree to which people see the “big picture” or focus on smaller details and its relationship with positive emotions, it was found that compared with those in negative or neutral states, people who experience positive emotions tend to focus on global processing (e.g., [Fredrickson and Branigan, 2005](https://www.frontiersin.org/articles/10.3389/fpsyg.2021.771936/full#B4)). This finding may indirectly indicate that perceiving the Earth may alone trigger positive emotions or, to say it better, that global visual processing and the generation of positive emotions are somehow linked. For example, in his diary, cosmonaut Lebedev wrote that the vision of Earth was restful and positive to him and helped him to cope with his 211-day *Salyut 7* mission (e.g., [Kanas and Manzey, 2008](https://www.frontiersin.org/articles/10.3389/fpsyg.2021.771936/full#B6)). In addition, the type and the number of Earth pictures taken daily by astronauts during their mission on the International Space Station communicate the need of acting for conservation of Earth's beauty. By studying reports of retired astronauts, researchers concluded that being in space is indeed reported as a massive experience with a long-lasting impact on their psychological well-being (e.g., [Kanas and Manzey, 2008](https://www.frontiersin.org/articles/10.3389/fpsyg.2021.771936/full#B6)). In particular, their experience has been described with the following categories: perception of the Earth, perception of Space, new possibilities, appreciating life, personal strength, changes in daily life, relating to others, spiritual change (these categories were also adopted by the so-called Positive Effects of Being in Space or PEBS which assesses the positive attitude toward space). In another study positive changes were measured and compared between a sample of 20 retired male Mir and International Space Station cosmonauts and two groups on Earth who had experienced stressful events (e.g., [Suedfeld et al., 2010](https://www.frontiersin.org/articles/10.3389/fpsyg.2021.771936/full#B11)). Cosmonauts' scores resulted particularly high in the field of realization of new possibilities and personal strength. Moreover, **those** who had spent more than a year **in space** and those who had flown to both Mir and the ISS **were more likely to report** a positive change in their appreciation of the others and in **their willingness to act to preserve our planet**. Critical here are gender differences. In fact, the “tend-and-befriend” strategy (e.g., [Taylor et al., 2000](https://www.frontiersin.org/articles/10.3389/fpsyg.2021.771936/full#B12)) mostly used by female compared with male astronauts during space mission has been shown to be oriented toward promoting prosocial behavior to a greater extent (e.g., team cohesion and team care). Indeed, while high competitiveness and poor sharing of personal concerns usually characterize all-male expedition teams, women tend to worry about the crewmates well-being and the decrease in crew cohesion more (e.g., [Kanas and Manzey, 2008](https://www.frontiersin.org/articles/10.3389/fpsyg.2021.771936/full#B6)). It is important to notice that the above-mentioned data come from studies where professional astronauts were involved. Indeed, there are differences among professional astronauts and private astronauts, for instance, in terms of long duration training, motivation, skills, education etc. Consequently, the relationship between Earth perception, positive emotions and sustainable behavior should be taken with caution when referring to private space tourism. Due to the lack of data, we can only assume that the association between Earth perception and positive emotions may be similar to the one reported by professional astronauts (e.g., [Kanas and Manzey, 2008](https://www.frontiersin.org/articles/10.3389/fpsyg.2021.771936/full#B6); [Alfano et al., 2018](https://www.frontiersin.org/articles/10.3389/fpsyg.2021.771936/full#B1)), for example, in terms of a more positive view of themselves and the others and of a better sense of the unity of humankind (e.g., [Kanas and Manzey, 2008](https://www.frontiersin.org/articles/10.3389/fpsyg.2021.771936/full#B6)). Reports from private astronauts seem to support our assumption, but we need future studies to help unraveling this interaction better. In closing, we emphasize that the findings reported here coming from behavioral studies on Earth and during space missions with professional astronauts seems to support the idea that **space tourism** too **can** generate positive emotions and, in turns, **facilitate sustainable** and approach **behaviors**. Of course, motivating people to engage in helping behaviors (e.g., interpersonal trust, providing social support, conservation practices) cannot rely on the sole perception of Earth's fragility. However, space tourism may represent a challenging and interesting new avenue for future research in this domain. Nevertheless, we hope that space tourism can offer the benefits of leading to more sustainable actions, capable of responding to the needs of most rather than those of few. In this way, space tourism may offer unexpected opportunities in terms of action for conservation strategies and aid programs also from a psychological point of view.

#### Precision farming via satellites *locks in* unsustainable agriculture practices by securing agri-business’ hold over small farmers globally

Ruiz-Marrero 02 (Carmelo Ruiz-Marrero, Fellow at the Society of Environmental Journalists and a Research Associate at the Institute for Social Ecology, “Precision Farming: Agribusiness Meets Spy Technology”, 10/2/02, http://www.councilforresponsiblegenetics.org/ViewPage.aspx?pageId=131)

Which corporations are involved? Joining forces to promote precision farming are farm equipment manufacturers like John Deere, agrochemical companies like Monsanto and DowElanco, pharmaceutical/biotech companies like Rhone-Poulenc, Novartis and AstraZeneca, as well as information brokering and data management firms. Not surprisingly, corporations with a long history of service to the military-industrial complex and intelligence agencies, like Rockwell and Lockheed Martin, are also jumping onto the precision farming bandwagon. For example, in a 1,000-acre potato farm, aerospace behemoth Lockheed Martin can place meteorological stations that measure 13 different weather parameters every 15 minutes and telemeter the data to a computer base station. "More than 430 gauges measure irrigation. Yield measurements are taken every three seconds during harvest. Crop quality samples are analyzed," boasts Lockheed's promotional material. What's more, "Soil is tested for 18 nutrient parameters. Microbialcommunities in the topsoil are studied." The Downside An interesting historical parallel comes to mind. Just as World War Two military contractors developed the chemicals and machinery that fueled the Green Revolution of the 1970's, precision farming is, to a large extent, an outgrowth of the space-age surveillance technologies used in the Cold War. The tight relationship between the military industries and industrial agriculture continues well into the twenty-first century. Some observers fear that these new technologies bode ill for sustainable agriculture and democratic governance, and could impose new forms of dependence on farmers. "Precision farming has less to do with mitigating agricultural pollution than with advancing industrial modes of production", according to social scientists Steven Wolf of the University of California, Berkeley and Fred Buttel of the University of Wisconsin. Action Group on Erosion, Technology and Concentration (ETC Group) Research Director Hope Shand agrees. "Precision farming is about commodification and control of information and it is among the high-tech tools that are driving the industrialization of agriculture, the loss of local farm knowledge and the erosion of farmers rights", she told CorpWatch. "With precision farming, farmers increasingly depend on off-farm decision making to determine precise levels of inputs. For example, dictating what seed, fertilizer, chemicals, row spacing, irrigation and harvesting techniques are used, and other management requirements," Shand explained. Precision farming seeks to legitimate and reinforce the uniformity and chemical-intensive requirements of industrial agriculture under the guise of protecting the environment and improving efficiency, according to Shand. How it Works: Remote Sensing Remote sensing is an important component of precision agriculture. For example, NASA is a partner in Ag 20/20, a long-range research project that involves remote sensing. A satellite-mounted sensor looks down on farm fields, distinguishing as many as 256 light wavelengths. Similar systems that work with land-based and plane-mounted sensors are also in the works. With the right hardware, software and know-how, the precision farmer can use this spectral information to find out a crop's health status. Does it need irrigation? Is it under attack by pests? Are weeds gaining ground? Are soil nitrogen levels OK? A great number of quantifiable variables can be measured. The use of satellites in agriculture is already a reality. The government of the southern Pacific island of Tasmania is using GPS technology on some 600 farms as part of an identity protection pilot program, which it plans to extend to all of Tasmania's farms by 2005. In Argentina, satellite surveillance is being used to catch farmers who cheat on their taxes by underreporting the size of their fields, and to prevent them from saving seed, which is illegal there. Who Will Benefit? Will farmers want, or be able, to understand the advanced gadgetry of precision farming? In Puerto Rico, for example, only 14% of farmers have college degrees, and a higher percentage might be illiterate altogether. The average Puerto Rican farmer is 55 years old, according to the US Farm Census. Many are probably too traditional to embrace advanced software, satellite imaging and other new technologies. To get around this obstacle, precision farming contractors plan to offer farmers a plethora of consulting services. Critics fear that these services will exacerbate farmers' dependence on the purveyors of agribusiness even further. Of course, the more fundamental question is what farmer will be able to afford precision farming technology, whose basic packages start at $15,000 to $20,000? How can family farms in the United States, facing extinction by economic strangulation, afford these dazzling technological advances? What will happen to rural U.S. and worldwide farming communities if food processors, retailers and other major purchasers of agricultural produce start requiring suppliers to use precision farming and identity protection technology? Large U.S. industrial farms, heavily capitalized and subsidized by the government with tens of billions of dollars every year, will easily afford the technology. But struggling family farms could be put out of business. Suing the Victim These remote sensing technologies can also be used to distinguish GM from non-GM crops and trace genetic pollution. Runaway pollen and seeds from GM crops like soy, corn and canola have been a great concern since the commercial cultivation of GM plants began in 1996. Last year, GM corn was found to be aggressively proliferating in Mexico, causing farmers, scientists and environmentalists to worry about potential consequences for the environment, biodiversity and world agriculture. Agribusiness corporations can use satellite imaging to find out what farmers have had their crops contaminated with GM pollen and sue them. This actually happened to Canadian farmer Percy Schmeiser of Bruno, Saskatchewan. When he complained that his organic canola crop had been genetically contaminated by a GM canola field somewhere upwind, Monsanto's lawyers sued him for illegally planting the corporation's patented seed. Kafka could have hardly thought of a more bizarre scenario. Monsanto didn't accept Schmeiser's argument that the corporation's GM canola had blown downwind to his farm, and neither did the judge, who ruled that how the GM seed got there is irrelevant. In September 2002 Schmeiser lost his appeal and now intends to take his case to Canada's Supreme Court. [For more information about Schmeiser’s plight, visit www.percyschmeiser.com]. Unfortunately, Schmeiser's ordeal is not an isolated case. Monsanto is suing farmers all over Canada and the United States for allegedly planting its patented GM seeds without authorization. Many of them claim they never knowingly planted Monsanto's seeds, and that their fields were contaminated by upwind GM plantations. Once again, the tortilla gets flipped. The same corporations that vehemently denied that GM pollution by pollination would ever take place, may soon be eager — too eager — to believe every report of such contamination, especially if the information can be used to sue the victims. Precision Agriculture and Global Trade This type of persecution could reach global proportions through the Trade-Related Intellectual Property Rights agreement (TRIPS) enforced by the World Trade Organization (WTO). Under TRIPS, the WTO can impose economic sanctions against countries deemed guilty of illegally using patented products, like seeds. The intellectual property rights provisions of NAFTA are even more draconian, since the agreement allows private entities to sue governments. Given this possibility, one can visualize a scenario in which Monsanto sues Mexico under NAFTA for illegally planting its GM corn. The corporation could conceivably demand a compensation ranging in the hundreds of millions of dollars. What are advocates of socially responsible and environmentally sustainable agriculture doing about precision farming? Many in the movement against corporate globalization hold that this and other new agro-technologies must be addressed within the context of a broader critique of industrial agriculture. "The reality is that farmers do not control precision farming," notes Hope Shand of ETC Group. "Rather, precision agriculture is more likely to dictate decision making, control and management of the farmer." Shand compares precision agriculture to a kind of high tech feudalism: "Precision farming reinforces bioserfdom and the role of the farmer as a ‘renter of germplasm.’"

#### Unsustainable ag production is *independently* responsible for the biodiversity crisis

Lanz 18 (Bruno Lanz, University of Neuchâtel, Department of Economics and Business, ETH Zurich, Chair for Integrative Risk Management and Economics, Massachusetts Institute of Technology, Joint Program on the Science and Policy of Global Change; Simon Dietz, London School of Economics and Political Science, Grantham Research Institute on Climate Change and the Environment, and Department of Geography and Environment; Tim Swanson, Graduate Institute of International and Development Studies, Department of Economics and Centre for International Environmental Studies; “The Expansion of Modern Agriculture and Global Biodiversity Decline: An Integrated Assessment”, Ecological Economics, 144, 260–277, 2018, doi:10.1016/j.ecolecon.2017.07.018)

An increase in agricultural output can be achieved in various ways and the great increases seen in the second half of the twentieth century came mainly from intensification and corresponding increases in yields (FAOSTAT; Klein Goldewijk et al., 2011). Nonetheless the clear consensus from global land-use models is that some of the additional future production will come from expanding the agricultural land area. According to the Agricultural Model Intercomparison and Improvement Project or AgMIP, the area of world cropland in 2050 will be between 10 and 25% larger than today, under a reference scenario in which world food production rises by 43 to 99% (von Lampe et al., 2014; Schmitz et al., 2014). The expansion of modern agriculture through a combination of intensification and extensification has managed to sustain the world population explosion that began with the industrial revolution and accelerated in the early to mid twentieth century (United Nations, 2015). For example, the prevalence of undernourishment has declined globally (Fogel, 1997; World Bank, 2016), while the real prices of agricultural commodities fell quite significantly between 1950 and 2000 (Alston and Pardey, 2014).2 However, the expansion of modern agriculture has had other, less desirable consequences. Both agricultural intensification – of the prevailing, nonecological or unsustainable variety (cf. Bommarco et al., 2013; Godfray and Garnett, 2014) – and extensification have been primary causes of a historically unprecedented loss of global biodiversity.

According to the Millennium Ecosystem Assessment (2005), the current global rate of species extinction is up to 1000 times higher than the background rate that has been estimated from the fossil record. A broader index of global biodiversity has been in decline since 1970 (the first year for which data are available) and there is no statistical indication that the rate of decline is slowing (Butchart et al., 2010). Local species richness is estimated to have declined by over 10% in the last 200 years, globally on average (Newbold et al., 2015).

**Turns and outweighs – their ev says satellites mitigate biodiversity loss but we say unsustainable agriculture and satellites are the REASON for biod loss so we’re a root cause**