# PTD AFF

## AC

### Cooperation

#### Contention 1: Cooperation

#### Appropriation makes space conflicts inevitable- creates rivalrous competition and congestion

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III. PROPERTY IN OUTER SPACE

“Space law must take into account private needs and build on private opportunities; to do this, it must embrace the principle of private property.”215

In our legal system, there are three types of property ownership— private, public, and communal.216 Private property usually involves a single owner, either “a legal person like a corporation” or “a natural person.”217 Public property, on the other hand, is owned by the state or its agents, while “common property” usually involves at least two entities who “hold the property in question either as joint tenants or as tenants in common.”218 If neither of these situations is involved, the property may be “characterized as null property, open-to-entry property, or res nullius, and the resources covered by these arrangements are open to use by one and all without restrictions.”219

The debate over the property ownership provisions of the OST and the Moon Treaty is between private and common ownership with commercial interests favoring the first, and those concerned with assuring the sustainability of outer space resources and equitable access to them favoring ownership in common.220 This Part explores these two types of ownership in the context of outer space,221 identifying their benefits and flaws before concluding that considering outer space as common property owned by the citizens of the globe is more closely aligned with overarching international principles of how space should be managed.222

At its heart, the debate about property type is about rights in that property. Property rights, like any other right, are “social artifacts.”223 They are neither fixed nor assumed, and may “vary from one society to another and over time within the same society.”224 They consist of “bundles of rights that can be and often are separated or combined in complex ways.”225 Some forms of property management, like custodial or stewardship management, allow for disaggregating those bundles.226

At a minimum, these bundles include possessory rights or the entitlements of ownership per se, usufructuary rights or rights to make use of property in specified ways, exclusion rights or rights to prevent others from using property without permission, and disposition rights or rights to dispose of property according to the wishes of the owner.227

Some of these rights, such as exclusion rights, the right to prevent access to or use of the property, and disposition or alienation of the property, may be problematic in outer space under international law, as discussed in Part IV.228

Possessory rights, a stick in the property rights bundle, can be “subdivided.”229 Some of the ways this can be done are discussed in Part VI and are worth considering in the context of outer space.230 “[E]ven relatively full bundles of rights are not unlimited or unrestricted.”231 Imagining property regimes of less than full and unimpeded ownership in outer space is conceivable, as is altering the structure of property rights to eliminate or lessen perverse incentives, like competition, from the implementation of those rights.232

For private property rights to emerge out of a common property regime or from null property where there is no ownership, like outer space, “cost-effective technologies for measuring, monitoring, and enclosing private property must emerge” to enable the claiming and transferring of “identifiable units of the resource.”233 If there is no private rights technology or “the distributional cost hurdle is too high, private property rights cannot emerge because the transaction cost wedge is simply too large.”234 Instead, “political or regulatory property rights will emerge.”235 While property rights are continually created and abandoned, depending on economic conditions, the act of defining property “has a high fixed cost element,” such as the cost of establishing and defending boundaries, which can have an effect on the emergence of property rights.236

One of the problems facing the creation of private property rights in outer space is the emergence of technology to define those rights in an area that is **without static geographic and political boundaries**.237 Another problem is how to grant, let alone enforce, those rights without violating international space law that bans the appropriation of outer space and its resources. So, the presence of potential entrepreneurs eager for the development of that technology, like Bruce Yandle and Andrew Morriss’s cattlemen of yore and the development of barbed wire, may not stimulate its production because its application would conflict with international prohibitions.238

Robert Ellickson suggests that “bottom-up, somewhat ad hoc property systems can [emerge and] reproduce most or all of the benefits of formal property law with a minimum of economic investment, procedure, and social disruption.”239 “Informal governance, like formal regulation, can ‘privatize’ [CPRs]”; Zachery Arnold points to “the ‘lobster gangs’ chronicled by James Acheson” as a “classic example of informal privatization.”240 Elinor Ostrom writes about how communities under the right “sociopolitical conditions” can protect valuable CPRs from over-consumption or damage.241 But, none of these approaches appears appropriate for circumstances in outer space where small groups are unlikely to form around CPRs or where communication among entities will be intermittent at best, making any sharing of informal management approaches unlikely.242 With this as background, the Article describes what space might look like under the two basic property regimes—private ownership and ownership in common.

A. Space Under a Traditional Private Property Regime

Private property is the cornerstone of American ideals and “a foundation of the Constitution as well as its philosophical precepts.”243 Indeed, “private property—and individual ownership specifically—runs throughout the DNA of this Nation.”244 Private property is often considered a driver of our economy because it creates incentives for investments in new technology and resource development, both of which are in play in the development of outer space.245 Property ownership can also encourage people to care about their property, protect adjacent land owners from the external effects of activities undertaken on their property, and assure its sustainability for future generations.246 Selfinterest can motivate a property owner to preserve their property to attract future buyers.247 To Richard Posner, the value of possession lies in its “economic efficiency” because it “tends to allocate resources to those persons best able to use them productively, for they are the people most likely to be willing to incur the costs involved in possession.”248 Possession of property puts the rest of the world on notice of that possession.249 While possession is most commonly understood as physically holding onto an object, a more modern view sees it as a “form of control.”250

But, private property can also “enhance income **disparity**, exacerbate[] economic **tensions** among individuals, and **consolidate**[] **power** among the one percent.”251 M. Alexander Pearl calls property privatization “a black hole focused solely on centralization of power and economic wealth without regard to the sustainability of an essential resource or the communities that depend upon its continued existence.”252 Hanoch Dagan goes further, quoting Eric Posner and Glen Weyl, by saying,

The key remedy for this predicament is to eradicate the institution of private ownership. Since “private ownership of any asset, except homogenous commodities, may hamper allocative efficiency,” we need to reconstruct markets so they are “competitive by design.” More precisely, we must discard private property and adopt in its stead a regime that partly transfers property’s “two most important ‘sticks’”— the right to use and the right to exclude—”from the possessor to the public at large.”253

When the value of a resource is increasing, it is more likely to be privatized so that the entity responsible for developing it can “fully capture the resulting benefits.”254 Indeed, a movement from common to private property occurs when the efficiency gains from private property are more than the costs of creating and maintaining it, such as “the basic costs of exclusion (fences, guards, and so on) and the extra vigilance needed to deter interlopers from absconding with rising-value resources.”255 This balancing of costs and benefits may be irrelevant in outer space, as the costs of establishing private property in the first place would be huge, and the complexity and cost of technological innovations called for in outer space would be magnitudes greater than what is required on Earth.256

1. The Positive and Negative Features of Private Property

Many believe that transporting the concept of private property to space should cause no concern; in fact, they view it positively.257 “By guaranteeing rights in extracted minerals taken from space, private industry could usher all of humanity into a new technological era.”258 Among the advantages of private property ownership in space is the “reduc[tion] of wasteful use” and the right to transfer alienability to others, which “would compensate for positive externalities, thereby creating added incentive to productively develop space.”259 Private property would also enable colonization of celestial bodies like the moon.260

In the absence of private ownership, there is the possibility that “each individual developer will seek to maximize his or her own gain by extracting as much value as quickly as possible without regard to the effect on the communal resource.”261 The President’s Commission on Implementation of U.S. Space Exploration Policy found that although the idea of private property in space is complicated because of national and international legal issues, it was imperative that they be addressed early in the process, “otherwise there will be little significant private sector activity associated with the development of space resources, one of our key goals.”262

For those who seek development of space resources, “a reliable property rights regime will remove impediments to business activities on these bodies and inspire the commercial confidence necessary to attract the enormous investments needed for tourism, settlement, construction, and business development, and for the extraction and utilization of resources.”263 The resources supporting private space mining companies are essentially worthless if the companies have no legal right to the resources they have mined.264 “Without the legal right to use water and hydrogen mined from celestial bodies, and to alienate platinum group elements, the potential profitability of private space expeditions collapses along with the goals of deeper space exploration and settlement.”265 The lack of a stable private property regime in outer space also means that space settlements will not be able “to claim sufficient land to yield enough of the only ‘product’ the settlement can sell profitably enough to guarantee its survival.”266 The strong belief is that unless private property rights in outer space and its resources are recognized, commercial enterprises will be unable to sustain any type of successful commercial activities in outer space.267

The absence of “‘security derived from ownership and sovereign control, [means that] entities that might be interested in the development of space resources will be reluctant to undertake [the] expensive and risky path’ implicit in all space travel”268 without some return on their investment.269 In all likelihood, such a return would be “in the form of the right to exploit limited areas of space and in proceeds from the sale of space resources.”270 This uncertainty arguably leaves a large “legal void, a wasteland of indeterminacy and instability.”271 According to Reinstein, “Unless people and nations are encouraged to exploit the riches of space, humanity will never know their benefit. And the more we are able to exploit, the more humanity stands to benefit. If commercialization is to be successful, space law must encourage investment in outer space development.”272

But, recognition of private property claims by the United States or by any other country could violate Article II of the OST’s prohibition against the national appropriation of space resources, including the surface of celestial objects.273 “[E]ven well-crafted domestic legislation that carefully addresses international law issues would create a significant risk of frustrating the explicit terms of the Outer Space Treaty, the intent and purpose of the treaty, or both.”274 No nation, including the United States, can independently alter the current international legal framework governing activities in outer space.275 And amending the OST to strike the language is unlikely, since the ban against appropriation of property in outer space is a “fundamental tenet of the treaty.”276

Coffey believes that

full ownership rights further [violate] the OST by disregarding the concerns of developing nations. If lunar real estate were put on the market, only the wealthy, developed nations and their citizens would be able to purchase it. If developing nations tried to purchase land later when they could afford it, they would be at a disadvantage because the prime locations are likely to be taken and the land’s current owners could demand whatever price they wanted. This could perpetuate current disparities of wealth and resources on Earth to the [m]oon and outer space.277

This would be in violation of the Treaty’s intent as expressed in Article I that outer space and its resources shall be the “province of all mankind.”278 Ownership of space real estate could also lead to **speculative purchases**, the goal being not to develop the property, but to hold it until market conditions are more favorable, and then sell it for a large profit— again, leading to the exclusion of poorer nations from the market.279 In all likelihood, the international community would react unfavorably to “a private property regime in outer space” because it would be perceived as benefiting large space-faring nations, like the United States and Russia, “at the expense of nations that do not have such capabilities.”280 But restricting ownership to anything less than fee simple absolute, like a lease or a license,281 means that the rights-holder could not alienate their property in any way, which decreases any significant incentive to acquire the right in the first place.282

2. The Rule of First Possession

The “most extreme proposal” with respect to implementing a property regime in outer space is to apply “first possession rules.”283 Under these rules, a country could claim territory it discovered, and then decide whether “to open up settlement in its new territory to its own citizens or to the international community as a whole.”284 Within its own territory, the discovering nation’s sovereignty “would extend to its outer space territory, where it could govern as it pleased.”285 Such an approach would directly conflict with international space law forbidding countries from appropriating outer space or its resources.286 MacWhorter also worries that a first possession rule in space could devolve into “a **space race** and colonialism in a situation that requires limitation and prudence,” and would be difficult to sell to other nations, especially non-space faring ones.287 If the rules were applied to commercial enterprises, without a “centralized mechanism for demarcating the property”288—such as a sovereign289—the **inevitable result** would be **disputes among putative property owners**, like what happened in the West during the **homesteading era**.290 Reinstein agrees: “If the rule of ownership was no more than ‘first come, first served,’ with ownership going to the first person to grab a celestial body, an unmitigated land-rush would ensue.”291 But MacWhorter also believes that limited property rights under a first possession rule might be an “appropriate first step,” if, for example, the property claim extended no further than to the claimed materials brought back to Earth.292

Those who are concerned that less technically adept nations would be severely disadvantaged by a property rights regime that is premised “on the ‘right of [first] grab,’ the first-come, first-served theory of property acquisition,” oppose such an approach.293 “By the time space capable nations develop the technological prowess and capital reserves to fund meaningful development of outer space, the earlier space-faring nations [and their citizens], left unchecked, might already have locked up the most accessible and valuable resources.”294 This would carry forward current disparities in global wealth distribution into the “Space Age.”295

The argument against a right of first possession gains salience from the fact that prior wrongs inflicted on less developed countries may be the reason they are not “space-capable.”296 This inequitable situation would persist, as those who profit from private property rules like the right of first possession will have the political ties, money, and understanding of the “rules of the game” to prevent their reform.297 An additional problem with the proposal is its enforceability. The fact that outer space is **infinite** makes it more **difficult to “police**” and to enforce the various treaties that apply to it.298 In outer space, “a breaching private party could **pursue its interests** outside the scope of such an agreement with **relative impunity** before it was discovered by the relevant international authority.”299

3. Less than Fee Ownership

There are less than fee ownership property regimes that can give the holder of a defeasible fee all the rights of an owner with complete title to the property, except the right to alienate it.300 Thus, “leaseholds, licenses, reversionary interest, easements, and covenants” might work well in outer space without violating international laws.301 There are also three types of defeasible fees that might be useful in outer space.302 “Defeasible fees, unlike fee simple absolute,” might convey property to a company, but are encumbered by an “automatic reversion or right of entry interest.”303 The first of these is a “fee simple subject to condition subsequent.”304 These conditions, “if triggered, would revert the realty back into the control of the multinational community.”305 So to the extent space resources have been appropriated, the withdrawal is not permanent.306

Then there is a “fee simple determinable,” which is like a fee simple subject to condition subsequent, “except that a fee simple determinable creates an automatic reversion to the grantor upon the occurrence of the condition—the grantor need not assert the right of reverter in order to reestablish possession of the property.”307 A third type of defeasible fee is a “fee simple subject to executory limitation[, which] reverts ownership upon the occurrence of a specified event or condition not back to the grantor, but to an heir or third party.”308 In each of these situations, a fee simple is less than absolute because it can revert back to the grantor or a third party if some later condition occurs.309 In the case of development of outer space resources, examples of later changes in circumstances that could revert title to the grantor might be those that damage the resource or make its continued development non-sustainable, or the developer’s violation of international law or any terms regulating or otherwise limiting their actions.

Leases and licenses are additional examples of impermanent types of property transfers.310 While a lease transfers exclusive possession of property from a grantor to a grantee, the transfer is only for a limited period of time; a license does not transfer any property and merely allows one party to use property that is managed and controlled by another party.311 Then there are easements, which “are rights, conveyed with the property.”312 Easements generally allow the property owner who owns the transferred property to continue to make some specified use of it.313 A negative easement, on the other hand, allows the entity that transferred property to prohibit the person who received it from using it in a specified way.314 Covenants are found in property conveyances and may prevent the grantee from using the property in some specific way.315

In each situation, not only is less than a full fee interest in property conveyed, but that interest can be restricted in a multitude of ways.316 In some situations, when the restrictive conditions are not complied with, the property can revert back to its original holder; in other cases, the reversion is automatic if conditions contained in the grant occur.317 But, each situation is predicated on some entity owning or holding the property in question, which would violate the terms of international space law unless the entity was some international authority.318 An international organization could establish specific rules governing activities in outer space, oversee their implementation, and enforce them.319 The International Seabed Authority (ISA), established by UNCLOS, could serve as a model for such an authority.320 The ISA was established in 1994 and since then it has issued new regulations governing exploring and prospecting for marine mineral resources and has contracted with seven nations granting them exclusive fifteen-year prospecting rights.321

However, “[t]here are drawbacks to forming a new international body to oversee the exploitation of space resources.”322 They can be expensive to establish and support.323 Non-spacefaring nations might not want to invest money in a venture which might “freeze them out of the decision-making process and put them at a disadvantage if they someday are able to participate in lunar missions.”324 There are the inevitable questions that arise whenever a new international governing organization is created, such as whether it should be under the authority of the United Nations or be completely independent, and how power should be allocated between spacefaring nations and developing countries without the expertise of money to venture into space.325 Further, there is an underlying equity question about spending money to create a new administrative authority.326 That authority will spend money that might otherwise have helped poorer countries develop the capacity to participate in outer space directly.327

An alternative to creating a new entity and new laws to administer a private property system in outer space is to extend terrestrial property law to outer space.328 Coffey proposes dividing the ISS between participating nations and then allowing each participant nation to apply its law to its assigned portion.329 But, this alternative suffers from some of the same flaws that establishing a centralized authority suffers—namely, it allows the **powerful countries** to **control** activities in outer space, specifically **access**.330 It allows those countries to collectively “set precedent for property rights in space instead of establishing formal international laws that the international community agrees upon.”331 The proposal “disregards the ‘common heritage’ provision of the OST,” because it completely excludes developing nations, who likely are not participants in the ISS, and provides them with no benefits from resources derived from space unless they eventually become technically proficient.332 Allowing countries to dictate any agreement that governs behavior in outer space also presents a risk that a country may be excluded from participation for unrelated reasons, like “diplomatic problems between the nations, unwillingness to share equipment and resources, or pressure from other members.”333

Thus, while establishing a private property regime in outer space might encourage development of celestial resources, it is hard to design a way around the ban against appropriating property and to establish a system that is both workable and protects the interests of less developed countries.

B. Space Under a Commons Property Regime

This Section discusses what about space makes it more like a commons than private property. Indeed, early space treaties treated space as though it was a commons.334 But, like private property, commons also have negative features that may be problematic in space, and simply declaring something a commons does not dictate the rules under which it should be managed. When various commons management approaches are tried, like the law of first possession under a private property regime, they are also found wanting.335

1. Early Treaties and Analogous Areas of the Globe

Early treaties, such as the 1968 Agreement on the Rescue of Astronauts, the Return of Astronauts, and the Return of Objects Launched into Outer Space, which “requires space-faring nations to rescue stranded astronauts and wayward objects and return them to the appropriate country,” “envisions space as a commons beyond the possession and control of any one nation or people.”336 So too, the 1972 Convention on International Liability for Damage Caused by Space Objects, which “was established to resolve concerns over financial liability in the event that a spacecraft or other space machine causes damage to other space-based or [e]arth-bound assets,” and the 1975 Convention on Registration of Objects Launched into Outer Space, which “imposes a requirement that states maintain and submit to the [United Nations] thorough records of all objects launched into outer space.”337

Indeed, the 1967 OST “allocates the use of orbital space as if it were a common property resource”338 by declaring outer space an open access resource and banning appropriation by any country.339 Jared Taylor notes that “during the Treaty’s preliminary negotiations, one drafter analogized the absence of property rights in space to the absence of property rights in the ocean.”340 According to Taylor, later treaties, as well as the practices engaged in by spacefaring nations and private companies, “have confirmed the spirit of the Outer Space Treaty: space is a resource from which no nation or private entity can be excluded”341—a true open access commons.342

The 1959 Antarctic Treaty343 established “the foundation for international space law.”344 Like outer space, Antarctica and the oceans “presented a dilemma regarding habitation and defense. No nation occupied these territories and no nation desired a ‘race to own’ without a guarantee of who would emerge victorious.”345 Both the Antarctic Treaty and the Deep Seabed Hard Mineral Resources Act (the “Deep Seabed Act”)346 eschewed the concept of private property as well as the rights of first possession, in part, because the riches of those areas might allow developing nations to share in those riches as opposed to remaining economically marginalized.347 The Deep Seabed Act provides a model for how to regulate activities in a commons, like outer space, which it manages to do without privatizing the marine resource.348 As a result, it is “customary and accepted legal reasoning” to analogize between private ownership rights outside of national sovereignty, like those the Deep Seabed Act granted, and a “land claims recognition law for celestial bodies.”349

“The oceans and Antarctica . . . have much in common with the moon. They can be harsh environments that are difficult to reach to extract minerals [and are resource rich]. They are also designated international areas in which no nation has a sovereign claim.”350 The history of the earth’s oceans is a progression from “the domain of conquering armadas and privateers, when good legal title required as little as arbitrary lines drawn on a map,” to the concept of a “free sea” open to all countries, where no single country could “obstruct the use of that privilege.”351 International space law built on that history of open passage and “free sea.”352 The roots of the idea of granting non-space faring nations right of access can also be found in the 1958 Geneva Convention on the High Seas, which granted “landlocked states the right to sail the oceans by requiring their coastal neighbors to grant free passage over land and through territorial waters.”353 The legal framework of UNCLOS united “a broad spectrum of national and private interests into a shared agreement on the possession and usage of a seemingly borderless area of the global commons,” setting another useful precedent for outer space.354 However, UNCLOS, as a model, is impractical in “the vast reaches of outer space”—space is simply too vast and unlimited.355’

2. Common Property

Common property is property, the rights to which belong to more than one entity.356 Like private property, common property is endemic to life in the United States and always has been, even though many Americans view it ambivalently.357 There is considerable overlap between property held in common and that which is privately owned. Carol Rose suggests that collective, but privately owned property, like a tenancy in common, “has all the hallmarks of individual private property,” and, therefore, should not be seen as “fundamentally problematic or prone to inefficient use.”358 Additionally, the plasticity of the commons, demonstrated by the appearance of new commons, like the “knowledge commons, cultural commons, infrastructure commons, and neighborhood commons,” indicates that the concept might fit in outer space.359

A commons, or CPR, is frequently asserted to resist “privatization and/or commodification of those resources,” making it oppositional to a claim that something is private property.360 Sheila Foster and Christian Iaione’s suggestion that the “language of the ‘commons’” is often used to prevent the enclosure of public urban space “by economic elites,” resonates with the situation in outer space where wealthy countries or private companies want to claim or enclose space that the public owns.361 A claim that something is a commons acknowledges that “it is a shared resource that belongs to all of its inhabitants,”362 like outer space, which is the “province of all mankind.”363

But there are problems with the idea of declaring anything a commons, just like there are problems with declaring something private property. One problem with the commons approach is the inability to exclude members of the commons from using the resource.364 Lacking the right to exclude, a user of CPRs has no incentive to do anything other than fully exploit the commons because if she refrains, her co-users will.365 The result is an “open access resource vulnerable to the tragic conditions of rivalry, overexploitation, and degradation.”366 Another problem is that since under a commons property regime the rights and interests of the present generation dominate those of future generations, there is no assurance that the claims of an unidentified future generation will have any effect on how the commons is managed.367 There are also management difficulties.368 “Under a communal system, one member wishing to preserve the CPR for future generations’ use faces significant—and perhaps insurmountable—transaction costs of negotiating with all members of the community and paying them to use the resource suboptimally.”369 And, exiting a commons when group action causes individual harm, without destroying “social gains from cooperation,” can be difficult.370

There is no one-size-fits-all solution to these problems, and there may be multiple approaches to the development of solutions.371 In the search for solutions, various legal scholars have promoted variations on the concept of a commons, highlighting different features.372 Pearl proposes something he labels the “vital commons,” which includes CPRs that are “essential to human existence,” like air or water, and which may require a different approach to their management.373 Pearl’s vital commons has five key traits:

(1) the benefits of the CPR are internalized by nearly all members of a given massive population; (2) the costs of the CPR’s depletion are externalized among nearly all members of that same massive population; (3) augmentation or depletion of the CPR by one party affects the ability to use the CPR by another party within the same massive population; (4) the CPR itself is necessary for sustenance; and 5) damage or depletion of the CPR is non-remediable or extremely difficult to correct.374

Outer space has most of these traits—the potentially affected population is the entire globe; its resources, as far as is known, are **not renewable**; and the benefits and costs of development of outer space resources could be widely internalized or externalized.375 Additionally, restoration of any depleted resources in outer space may be difficult, and the impact on any of those resources may be so dire that its overuse and depletion could be “the **epitome of apocalypse**.”376 Finally, the vastness of outer space makes it difficult to subject it to “local” regulation—i.e., regulation by individual nations, which might opt not to regulate certain activities or to regulate lightly.377

Similar to Garrett Hardin’s open pasture, a major problem with a commons is that, “absent a system that allocates use rights, it is difficult, if not impossible, to restrain the impulse of users to pursue their individual self-interests, even when pursuit of those interests result in the degradation or exhaustion of the resource.”378 This is why, he argued, “‘freedom in the commons’—i.e., the lack of controls on individual behavior and self-interest—ultimately leads to its ruin and hence to the ‘tragedy.’”379 If the amount of use of a CPR or the intensity of that use is too much, then the result can be “congestion” that decreases the values of those resources.380 “Similarly, certain types of uses can create incompatibilities with many ordinary uses and conservation of such spaces, creating the conditions for rivalry or subtractability.”381

The unbounded nature of space and the variety and wealth of its resources is already attracting potential users with competing or conflicting ideas about how space should be used.382 Even if space was regulated, this “magnetic pull” to occupy and develop space may create **rivalry** among different users, especially if those users are drawn to the same areas of outer space.383 Unless the development of outer space resources is regulated, too many entities vying for the same resource could lead not only to **congestion** and **rivalous behavior**,384 but also to **accidents** and serious **conflict**—the conditions the space treaties are intended to avoid.385

The way to prevent a tragedy on land held in common is not necessarily its transformation to private property, which is one solution Hardin called for.386 Oran Young says “[i]nstitutional innovation,” like individual transferable quotas, “can create a form of private property and, in the process, alleviate the perverse incentives arising from the condition of non-excludability.”387 Creating public property or, in the alternative, using regulatory controls can also avoid the tragedy to the commons.388 The owners of a commons can also self-regulate to control the adverse effects of non-excludability.389

But as Young notes, while each approach has its plus side, each approach, like privatization, can also have negative effects.390 “Privatization can lead to outcomes that are grossly unfair[, and] [g]overnments [may] lack both the capacity and the will to manage public property well.”391 And common property approaches can lead to nonsustainable use of the property, and “work best in situations where the sense of community is strong and social pressure is capable of controlling behavior effectively”—characteristics uncommon in outer space.392

So, we have learned thus far that (1) the race is on to extract valuable resources from outer space and celestial bodies;393 (2) the international legal framework governing those activities is far from complete, inviting behavior that may be in the economic best interests of the actor, but not necessarily of the globe;394 (3) the international legal principles governing this behavior may be counter-productive when it comes to incentivizing economic behavior, but beneficial non-spacefaring countries;395 and (4) the push to privatize space, which is clearly a **global commons**, may lead to rivalrous behavior, which could **dissolve into military activity** and squeeze out poorer countries from the benefits of space, in direct contradiction of the goals of international space law.396

We have also learned that while privatizing open access areas, like outer space, is not necessarily good or necessary to avoid the tragedy of the commons (the over-utilization of common or shared pool resources), the features of a commons make it difficult to avoid that tragedy and to provide for future generations.397 So the solution may lie in crafting new property regimes, perhaps combining the best features of both approaches. It is to that task this Article now turns—the circumstances in which new forms of property might emerge and what they might be.

#### Competition and congestion make space war inevitable- only cooperative space governance solves

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[Kuan-Wei Chen; Ram S. Jakhu Acting Director, Institute of Air and Space Law, McGill University; Steven Freeland Emeritus Professor of International Law, Western Sydney University, "Space exploration should aim for peace, collaboration and co-operation, not war and competition," Conversation, 10-11-21, https://theconversation.com/space-exploration-should-aim-for-peace-collaboration-and-co-operation-not-war-and-competition-169317, accessed 1-14-22]

When the Soviet Union launched Sputnik 1 in 1957, it represented humanity’s first significant foray into the cosmos. Our imagination was opened to the wonder and lure of space for human endeavour as science fiction suddenly became science fact. A space arms race? At the time, the prevailing Cold War mentality contributed to suspicion and fear about what it meant to be in space, and resulted in the military roots of space technology and applications. John F. Kennedy famously stated that “if the Soviets control space they can control the earth, as in past centuries the nation that controlled the seas dominated the continents.” The Space Race, as it would become known, was characterized by fierce competition between the Soviet Union and the United States to achieve space superiority. Space technology and applications have evolved rapidly since Sputnik 1. Seven decades of space exploration and use have **revolutionized** the way the world communicates and greatly enhanced navigation on air, ground and sea. Space science has enabled us to monitor weather patterns, enhance land use and greatly advance our understanding of our own planet and our place in the universe. The desire to counter the space ambitions of others and to achieve superiority in space seems to have re-emerged. Despite the proliferation and **commercialization** of space activities, and the recognition of space as an essential part of every country’s economic, social and scientific progress, there is an **alarming build-up** of **counter-space capabilities** worldwide. Crowded space Even as private citizens can now crew space missions, military strategists are warning the **competitive** and **congested nature** of space will lead to an **outbreak of conflict in outer space**. Simmering **tensions** on Earth increase the risk that humanity may somehow **lurch into an unimaginable space war**, **destroying economies** and critical civilian and military **infrastructure** that have become so heavily space-dependent. In April, the International Committee of the Red Cross warned the international community that “the human cost of using weapons in outer space that could disrupt, damage, destroy or disable civilian or dual-use space objects is likely to be significant.” If a war in space takes place, the devastation might have long-lasting effects. Preventing colonialism However, despite assertions to the contrary, a space war is **not inevitable**. A notion that space is the new “warfighting domain” contradicts the six-decade-long understanding that space is a **shared** area governed by international law, where global interests converge to ensure its exploration and use for the benefit of all countries, irrespective of the degree of their economic or scientific development. The first space-focused UN General Assembly resolution recognized the desire “to avoid the extension of present national rivalries into this new field.” In 1967, a decade after Sputnik 1, diplomats came together during the height of Cold War brinksmanship to conclude the Outer Space Treaty. Today, 111 countries are parties to this phenomenal feat of international diplomacy, which underlines the **common interest** of all humanity to explore and use outer space “for peaceful purposes.” The treaty also affirms that space, including the moon and celestial bodies, are free to be explored and used by all states “on a basis of equality and in accordance with international law.” Departing from the traditionally reactive nature of international law, the Outer Space Treaty initiated the most significant principle of law for enhancing the common interest of all in space in order to thwart potential colonization ambitions in space. By declaring that outer space “is not subject to national appropriation” by any means, the Treaty established a foundational governance system based on mutual understanding and friendly relations. The race towards peace Since the 1980s, the UN General Assembly has every year passed a resolution on the prevention of an arms race in outer space (PAROS), the latest of which reminds the international community of “the importance and urgency of preventing an arms race” and calling on states to “refrain from actions contrary to that objective.” The prevention of an arms race in outer space is vital yet contemplates and may even legitimize increased military uses of space. A proper emphasis of the humanity of space and the preservation of its safety, stability and sustainability drives the need for peace in outer space. The Outer Space Treaty, and multilateral dialogue at the UN, have for decades provided the anchor to keep space free from conflict. There is no reason why this overarching legal and institutional framework for peace cannot continue to shelter us from irresponsible behaviour in space. The diplomatic language is shifting in this direction, as are initiatives to clarify international law as it applies to the military uses of outer space. Governments, industry stakeholders, civil society and the younger generations all have a role to play in promoting the benefits and common interests of humanity in space, drawing inspiration from the words of the first human in space, Soviet cosmonaut Yuri Gagarin: “There is room in space for everybody.” In an era when humanity is faced with climate change, a global pandemic and the rapid exhaustion of resources, there is **no room** for assertions of dominance and superiority. Rather, the common interests in peace that we all share are even more important, both on Earth and in outer space.

#### Congestion causes debris

**Fabian 19** (Christopher; January 2019; B.S. from the United States Air Force Academy, thesis submitted in partial fulfillment of the requirements for a M.S. from the University of North Dakota, approved by the Faculty Advisory Committee and in coordination with Dr. Michael Dodge, David Kugler, and Brian Urlacher; University of North Dakota Scholarly Commons, “A Neoclassical Realist’s Analysis Of Sino-U.S. Space Policy,” <https://commons.und.edu/theses/2455/>)

b. Defect/Defect The **ubiquity** of space technology has also yielded the **negative externality** of **overcrowding** the space domain. Despite its seemingly unlimited size, there are a **limited number** of useful **earth-centric orbits** to optimize terrestrial coverage. It is projected that there are over **300,000** medium sized objects capable of causing **catastrophic failure** of a satellite upon collision currently in earth’s orbit.159 Of these objects, 20,000 are actively tracked by the **comparatively robust** space **surveillance network** (SSN) of the United States Air Force, only 1,000 are active payloads, and even fewer have maneuver capability.160 **Recent trends** indicate that the problem of orbital **congestion** will only worsen in the coming decades as the barriers to entry are reduced. Launch service cost is rapidly decreasing due to an increased number of service providers and technology revolutions such as reusable rockets. Also, the miniaturization and simplification of satellite payloads further reduces the cost and infrastructure needed to be a spacefairing nation.161 This is evidenced by the **near doubling** of state operated satellites from 27 in 2000 to over 50 in 2012, coupled with a near doubling in **total space objects** from 1997 to 2007.162 The accumulation of space **debris** is a **vital concern** to the sustainable development of the space environment due to the **increased probability** of conjunction between active payloads and all other objects that results from crowded orbits. This increase in **collision** probability occurs **proportionally** to the number of objects in a given orbital domain. The **tripling** of orbital **debris** projected to occur in the next century, due to routine use and **accumulation alone**, would cause a **tenfold increase** in the probability of collision. In the event of a catastrophic collision between two objects, the resulting **debris cloud** could cause a **cascading effect**. Each **successive collision** increases the probability of another occurrence in a given orbit until an **instability threshold** is reached. At this threshold, debris removal due to decay would be **negligible** compared to debris created by subsequent collisions. As the propagation of debris continues, the cost of launching a satellite would eventually **outweigh the benefits** received due to the probability of that asset being **destroyed** by **errant debris**, effectively rendering the given orbit **unusable**. This debris propagation model and the dangers associated with it are colloquially referred to as the Kessler Syndrome. Kessler asserts **unstable regions** of low earth orbit (LEO) currently exist and that, barring the addition of more debris, a major collision would occur once every 10-20 years. If debris doubles, as it has in the last decade, the collision rate would increase to 2.5 years. Although most models’ time scales are on the order of centuries, it is **widely accepted** that the current rate of debris accumulation will render critical orbits **unusable** unless **immediate measures** are taken to return stability.163 There is near **universal acceptance** of the danger space debris presents, yet little substantive action has been taken to solve the problem. Current debris accumulation and propagation models show that earth orbiting domains are **finite** resources. Continued unsustainable development moving forward may preclude future usage, making earth orbits **rivalrous goods**.164 Furthermore, orbital domains are made a non-excludable good by the OST which states, “Outer space… shall be free for exploration and use by all States without discrimination of any kind.”165 As a non-excludable public good, space succumbs to the **tragedy of the commons** where the privately beneficial strategy of space utilization differs significantly from the socially optimal strategy promoting orbital stability.166 Understandably, most analysis has focused on solving the problem of orbital instability by addressing the **market failure** responsible for debris creation. The current reasoning suggests that if actors creating space debris **internalize the cost** of their actions, a solution can arise. Proposed solutions run the gamut of ideologies from free market tax incentives, to command and control legislation, to restructuring orbital property rights. Scientific solutions have also been proposed, but technological feasibility and cost remain major problems. Furthermore, analogous environments susceptible to the tragedy of the commons have been examined in hopes that they may prove applicable to the problem of orbit instability.167 This analysis is ultimately useful if the problem is to be solved under nominal conditions, but there is an **underlying problem** that needs to be addressed **before** any of these proposed solutions can realistically be enacted.

#### That cascades into global nuke war

Les **Johnson 13**, Deputy Manager for NASA's Advanced Concepts Office at the Marshall Space Flight Center, Co-Investigator for the JAXA T-Rex Space Tether Experiment and PI of NASA's ProSEDS Experiment, Master's Degree in Physics from Vanderbilt University, Popular Science Writer, and NASA Technologist, Frequent Contributor to the Journal of the British Interplanetary Sodety and Member of the American Institute of Aeronautics and Astronautics, National Space Society, the World Future Society, and MENSA, Sky Alert!: When Satellites Fail, p. 9-12 [language modified]

Whatever the initial cause, the result may be the same. A **sat**ellite destroyed in orbit will break apart into thousands of pieces, each traveling at over 8 km/sec. This virtual shotgun blast, with pellets traveling 20 times faster than a bullet, will quickly spread out, with each pellet now following its own orbit around the Earth. With over 300,000 other pieces of junk already there, the tipping point is crossed and a runaway series of collisions **begin**s. A few orbits later, two of the new debris pieces strike other satellites, causing them to explode into thousands more pieces of debris. The rate of collisions increases, now with more spacecraft being destroyed. Called the "Kessler Effect", after the NASA scientist who first warned of its dangers, these debris objects, now numbering in the millions, cascade around the Earth, **destroy**ing every **sat**ellite in **l**ow **E**arth **o**rbit. Without an atmosphere to slow them down, thus allowing debris pieces to bum up, most debris (perhaps numbering in the millions) will remain in space for hundreds or thousands of years. Any new satellite will be threatened by destruction as soon as it enters space, effectively rendering many Earth orbits **unusable**. But what about us on the ground? How will this affect us? Imagine a world that **suddenly loses all of its space technology**. If you are like most people, then you would probably have a few fleeting thoughts about the Apollo-era missions to the Moon, perhaps a vision of the Space Shuttle launching astronauts into space for a visit to the International Space Station (ISS), or you might fondly recall the "wow" images taken by the orbiting Hubble Space Telescope. In short, you would know that things important to science would be lost, but you would likely not assume that their loss would have any impact on your daily life. Now imagine a world that suddenly loses network and cable television, accurate weather forecasts, Global Positioning System (GPS) navigation, some cellular phone networks, on-time delivery of food and medical supplies via truck and train to stores and hospitals in virtually every community in America, as well as science useful in monitoring such things as climate change and agricultural sustainability. Add to this the [weakening] ~~crippling~~ of the US military who now depend up**on** spy satellites, space-based communications systems, and GPS to know where their troops and supplies are located at all times and anywhere in the world. The result is a **nightmarish world**, one step away from **nuclear war**, **economic disaster**, and potential **mass starvation**. This is the world in which we are now perilously close to living. Space satellites now touch our lives in many ways. And, unfortunately, these **satellites are extremely vulnerable** to risks arising from a half-century of carelessness regarding protecting the space environment around the Earth as well as from potential adversaries such as China, North Korea, and Iran. No government policy has put us at risk. It has not been the result of a conspiracy. No, we are dependent upon them simply because they offer capabilities that are simply **unavailable any other way**. Individuals, corporations, and governments found ways to use the unique environment of space to provide services, make money, and better defend the country. In fact, only a few space visionaries and futurists could have foreseen where the advent of rocketry and space technology would take us a mere 50 years since those first satellites orbited the Earth. It was the slow progression of capability followed by dependence that puts us at risk. The exploration and use of space began in 1957 with the launch of Sputnik 1 by the Soviet Union. The United States soon followed with Explorer 1. Since then, the nations of the world have launched over 8,000 spacecraft. Of these, several hundred are still providing information and services to the global economy and the world's governments. Over time, nations, corporations, and individuals have grown accustomed to the services these spacecraft provide and many are dependent upon them. Commercial **aviation**, **shipping**, **emergency** services, vehicle fleet tracking, financial transactions, and **ag**riculture are areas of the economy that are increasingly **reliant** on space. Telestar 1, launched into space in the year of my birth, 1962, relayed the world's first live transatlantic news feed and showed that space satellites can be used to relay television signals, telephone calls, and data. The modern telecommunications age was born. We've come a long way since Telstar; most television networks now distribute most, if not ali, of their programming via satellite. Cable television signals are received by local providers from satellite relays before being sent to our homes and businesses using cables. With 65% of US households relying on cable television and a growing percentage using satellite dishes to receive signals from direct-to-home satellite television providers, a large number of people would be cut off from vital information in an emergency should these satellites be destroyed. And communications satellites relay more than television signals. They serve as hosts to corporate video conferences and convey business, banking, and other commercial information to and from all areas of the planet. The first successful weather satellite was TIROS. Launched in 1960, TIROS operated for only 78 days but it served as the precursor for today's much more long-lived weather satellites, which provide continuous monitoring of weather conditions around the world. Without them, providing accurate weather forecasts for virtually any place on the globe more than a day in advance would be nearly impossible. Figure !.1 shows a satellite image of Hurricane Ivan approaching the Alabama Gulf coast in 2004. Without this type of information, evacuation warnings would have to be given more generally, resulting in needless evacuations and lost economic activity (from areas that avoid landfall) and potentially increasing loss of life in areas that may be unexpectedly hit. The formerly top-secret Corona spy satellites began operation in 1959 and provided critical information about the Soviet Union's military and industrial capabilities to a nervous West in a time of unprecedented paranoia and nuclear risk. With these satellites, US military planners were able to understand and assess the real military threat posed by the Soviet Union. They used information provided by spy satellites to help avert potential military confrontations on numerous occasions. Conversely, the Soviet Union's spy satellites were able to observe the United States and its allies, with similar results. It is nearly impossible to move an army and hide it from multiple eyes in the sky. Satellite information is critical to **all aspects** of US intelligence and military planning. Spy **sat**ellite**s** are used to monitor compliance with international arms treaties and to assess the military activities of countries such as **China**, **Russia**, **Iran**, and **North Korea**. Figure 1.2 shows the capability of modem unclassified space-based imaging. The capability of the classified systems is presumed to be significantly better, providing much more detail. Losing these satellites would place global militaries on **high alert** and have them operating, literally, in the blind. Our military would suddenly become vulnerable in other areas as well. GPS, a network of 24-32 satellites in medium-Earth orbit, was developed to provide precise position **info**rmation to the military, and it is now in common use by individuals and industry. The network, which became fully operational in 1993, allows our armed forces to know their exact locations anywhere in the world. It is used to guide bombs to their targets with unprecedented accuracy, requiring that only one bomb be used to destroy a target that would have previously required perhaps hundreds of bombs to destroy in the pre-GPS world (which, incidentally, has resulted in us reducing our stockpile of non-GPS-guided munitions dramatically). It allows soldiers to navigate in the dark or in adverse weather or sandstorms. Without GPS, our **military advantage** over potential adversaries would be dramatically reduced or **eliminated**.

#### Space conflicts go nuclear- both fast and probable

**Grego, 15** -- a physicist in the Global Security program at UCS

[Laura Grego, an expert in space weapons and security; ballistic missile proliferation, and ballistic missile defense, "Preventing Space War", Union of Concerned Scientists, 07-05-2015 <https://allthingsnuclear.org/lgrego/preventing-space-war>]

So says a very good New York Times editorial “Preventing a Space War” this week. Sounds right, if X-Wing fighters come to mind when you think space conflict. But in reality **conflict in space** is both **more likely than one would think** and **less likely** to be so **photogenic**. Space as a locus of conflict The Pentagon has known that space could be a flash point at least since the late 1990s when it began including satellites and space weapons in earnest as part of its wargames. The early games revealed some surprises. For example, attacking an adversary’s ground-based anti-satellite weapons before they were used could be the “trip wire” that starts a war: in the one of the first war games, an attack on an enemy’s ground-based lasers was meant to defuse a potential conflict and protect space assets, but instead was interpreted as an act of war and initiated hostilities. The games also revealed that **disrupting** space-based **communication** and information flow or “~~blinding~~” could **rapidly escalate a war**, eventually leading to **nuclear weapon exchange**. The war games have **continued** over the years with increased **sophistication**, but continue to find that conflicts can **rapidly escalate and become global** when space weapons are **involved**, and that even **minor opponents** can create **big problems**. The report back from the 2012 game, which included **NATO partners**, said these insights have become “**virtually axiomatic.”** Participants in the most recent Schriever war games found that when **space weapons** were introduced in a **regional crisis**, it **escalated quickly** and was difficult to **stop from spreading**. The **compressed timelines**, the **global** as well as **dual-use nature** of space assets, the difficulty of **attribution** and **seeing what is happening**, and the **inherent vulnerability of satellites** all contribute to this problem. Satellite vulnerability & solutions Satellites are valuable but, at least on an individual basis, physically vulnerable. Vulnerable in that they are relatively fragile, as launch mass is at a premium and so protective armor is too expensive, and a large number of low-earth-orbiting satellites are no farther from the earth’s surface than the distance from Boston to Washington, DC.

#### Nuke war causes extinction – won’t stay limited

**Edwards 17** [Paul N. Edwards, CISAC’s William J. Perry Fellow in International Security at Stanford’s Freeman Spogli Institute for International Studies. Being interviewed by EarthSky. How nuclear war would affect Earth’s climate. September 8, 2017. earthsky.org/human-world/how-nuclear-war-would-affect-earths-climate] Note, we are only reading parts of the interview that are directly from Paul Edwards – MMG

In the nuclear conversation, what are we not talking about that we should be?

We are **not talking enough** about the **climatic effects** of **nuclear war**. The “nuclear winter” theory of the mid-1980s played a significant role in the arms reductions of that period. But with the collapse of the Soviet Union and the reduction of U.S. and Russian nuclear arsenals, this aspect of nuclear war has **faded from view**. That’s **not good**. In the mid-2000s, climate scientists such as Alan Robock (Rutgers) took **another look** at nuclear winter theory. This time around, they used much-**improved** and much more detailed **climate models** than those available 20 years earlier. They also tested the potential effects of smaller nuclear exchanges. The result: an exchange involving just 50 nuclear weapons — the kind of thing we might see in an India-Pakistan war, for example — could loft 5 billion kilograms of smoke, soot and dust high into the stratosphere. That’s enough to cool the entire planet by about 2 degrees Fahrenheit (1.25 degrees Celsius) — about where we were during the Little Ice Age of the 17th century. Growing seasons could be shortened enough to create really significant food shortages. So the climatic effects of even a relatively small nuclear war would be planet-wide. What about a larger-scale conflict? A U.S.-**Russia** war currently seems unlikely, but if it were to occur, **hundreds** or even **thousands** of **nuclear weapons** might be launched. The **climatic consequences** would be **catastrophic**: global average temperatures would drop as much as **12 degrees** Fahrenheit (7 degrees Celsius) for up to several years — temperatures last seen during the **great ice ages**. Meanwhile, smoke and dust circulating in the stratosphere would darken the atmosphere enough to **inhibit photosynthesis**, causing **disastrous crop failures**, widespread **famine** and **massive ecological disruption**. The effect would be similar to that of the **giant meteor** believed to be responsible for the **extinction of the dinosaurs**. This time, **we would be the dinosaurs**. Many people are concerned about North Korea’s advancing missile capabilities. Is nuclear war likely in your opinion? At this writing, I think we are **closer to a nuclear war** than we have been **since the early 1960s**. In the North Korea case, both Kim Jong-un and President Trump are bullies inclined to escalate confrontations. President **Trump** lacks **impulse control**, and there are precious **few checks** on his ability to initiate a nuclear strike. We have to hope that our generals, both inside and outside the White House, can rein him in. North Korea would most certainly “lose” a nuclear war with the United States. But many millions would die, including hundreds of thousands of Americans currently living in South Korea and Japan (probable North Korean targets). Such vast damage would be wrought in Korea, Japan and Pacific island territories (such as Guam) that any “victory” wouldn’t deserve the name. Not only would that region be left with horrible suffering amongst the survivors; it would also immediately face famine and rampant disease. Radioactive fallout from such a war would spread around the world, including to the U.S. It has been more than 70 years since the last time a nuclear bomb was used in warfare. What would be the effects on the environment and on human health today? To my knowledge, most of the changes in nuclear weapons technology since the 1950s have focused on making them smaller and lighter, and making delivery systems more accurate, rather than on changing their effects on the environment or on human health. So-called “battlefield” weapons with lower explosive yields are part of some arsenals now — but it’s **quite unlikely** that **any exchange** between two nuclear powers would **stay limited** to these smaller, **less destructive** bombs.

#### Appropriation undercuts cooperation- reinforces space as a competitive environment

**Manning, 21** -- senior fellow with the Scowcroft Center for Strategy and Security

[Robert A. Manning, opinion contributor, “The dangers of anarchy in space,” The Hill, 11-29-21, <https://thehill.com/opinion/583317-rethinking-space-the-dangers-of-anarchy-in-the-cosmos>]

I can’t think of a more dramatic illustration of how reckless actions in space put all at **grave risk** than [Russia’s recent anti-satellite (ASAT)](https://www.washingtonpost.com/politics/2021/11/23/russia-proved-it-can-shoot-down-satellite-does-this-make-space-less-secure/) test blowing up one of its own defunct satellites and creating a cloud of more than 1,500 pieces of space debris. All this reflects a troubling anarchy in the cosmos, a militarization of space, one ill-conceived aspect of unrestrained arms racing, the pathology of this era of great power competition. Space junk is inadvertent, but satellites that can kill or disable satellites and cyber jamming highlight the military risks. The anti-space antics also reveal the mutual vulnerabilities that should spark a rethink of current policies in the interest of self-preservation. The private sector has entered the space business with new technologies enabling the miniaturization of satellites, called Cubesats, some no bigger than a shoebox. [Google, Amazon and Elon Musk’s SpaceX](https://www.cnbc.com/2019/12/14/spacex-oneweb-and-amazon-to-launch-thousands-more-satellites-in-2020s.html) plan to launch some 50,000 such satellites in this decade. These are all at risk from [27,000 pieces of space debris](https://www.nasa.gov/mission_pages/station/news/orbital_debris.html), tracked by the Department of Defense’s impressive Space Surveillance Network (SSN), as well as by some half a million smaller pieces, the size of marbles. With both satellites and debris traveling at roughly 17,000 miles an hour, collisions could be catastrophic. Yet there is a paucity of rules governing behavior in space, which, like sea, air and cyber, are global commons. The 1967 Outer Space Treaty (OST) is the one accord signed by all major space-faring nations, 197 nations in all. They agreed to the principles in the OST, which says: “Exploration and use of outer space, including the moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means. and shall be the province of all mankind.” In the real world, the treaty is sadly outdated by both technology (as ASAT tests demonstrate) and geopolitics, as the U.S., Russia and China plan Moon bases and private sector firms plan to exploit minerals on asteroids, for starters. In this era of populist nationalism and major powers **competing for dominance**, fashioning new regimes or codes of conduct for space appears highly problematic. But there are arenas of strategic competition and arenas for cooperation. Some would argue for cooperating only with democracies or like-minded actors. There are some areas – like technology sharing – where this makes sense. But nations cooperate, pooling risks and burdens when they perceive that their interests intersect. The threat of space debris to all nations’ vital economic and national security assets in space would seem one such instance. DOD's space surveillance network is the premier mechanism for monitoring space junk. Russia has some orbital monitoring capacity, but few other states do. Moreover, the U.S. already has [space sharing agreements](https://www.stratcom.mil/Media/News/News-Article-View/Article/1825882/100th-space-sharing-agreement-signed-romania-space-agency-joins/) with over 100 nations to provide data and notifications to avoid collisions. The U.S. gave a heads-up to China about such risks during the Obama administration, according to well-placed sources. In addition, private sector firms and start-ups in Japan and Europe are exploring ways of getting rid of space junk. There is money to be made, and I’d hazard a guess that the engineers at [Jeff Bezos](https://thehill.com/people/jeffrey-jeff-bezos)’s Blue Origin and [Elon Musk](https://thehill.com/people/elon-musk)’s Space X might be interested in a public-private partnership6. It would be faster and cheaper if the space-faring states, pooling resources, invited private sector bids for contracts to help rid the lower Earth orbit of dangerous space junk. Share the burden and the benefits.

#### That shreds the potential for sustainable space development

**Islam 18**

[Mohammad Saiful Islam – Institute for Advanced Judicial Studies, Beijing Institute of Technology; International, “The Sustainable Use of Outer Space: Complications and Legal Challenges to the Peaceful Uses and Benefit of Humankind,” Beijing Law Review, 06-2018, <https://www.scirp.org/journal/paperinformation.aspx?paperid=85201>]

The current situation of use of outer space is so **competitive** to the public and private sectors as well to attain potential benefits in the economic and political field. This aspect indicates that the importance and complexity of space use are increasing to national security and in social, economic and environmental development. From the one side, the increasing of space faring nations, use of outer space by public and private sectors, from the other side, the use of outer space through effective means, environmentally sound as well as use for commercial purposes is a new great challenge to the international community today. Moreover, space law’s simplicity is challenged by the growing, each and every day, different technology as like as newfangled aspect to use of outer space. Another important undertaking is an upholding sustainable use of space for economic, social and environmental development, basically for developing countries. This stressed by general assembly resolution indicated that “The general assembly of UN stresses the importance of promoting effective means of using space technology to assist in the solution of problems of regional or global significance and of strengthening the capabilities of Member States, in particular developing countries, to use the applications of space research for economic, social and cultural development” [(United Nations, 2000)](https://www.scirp.org/journal/paperinformation.aspx?paperid=85201#ref49). The objectives of this research are to make fertile events of present complications of outer space law; to identify the national and international challenges to sustainable uses of outer space; and to attempt to accumulate urgently required development of outer space for peacefully gaining the potential benefits for humankind.

Sustainable development is the **establishing** principle for achieving present human needs without damaging the demands of future generations maintaining integrity and constancy of the natural systems. The modern idea of sustainable development is derived from the Brundtland Report in 1987. Generally considered in modern application and exploration of outer space, fundamental elements are the area must be dedicated to peaceful purposes; and the area must be preserved for future generations [(Heim, 1990)](https://www.scirp.org/journal/paperinformation.aspx?paperid=85201#ref17). It is an **indispensable** and inordinate challenge to confirm uphold the healthy environment and make sure development without destroying the rights of future generations in space. Article IX of The Outer Space Treaty provided, in the exploration and use of outer space, States should pursue studies and conduct exploration of outer space so as to avoid harmful contamination and also adverse changes in the environment of the Earth [(Outer Space Treaty, 1967)](https://www.scirp.org/journal/paperinformation.aspx?paperid=85201#ref35). The issues of what constitutes harmful contamination in Earth’s environment have yet to be interpreted. The legal definition of “adverse” and “harmful” will also modification as Earth, indigenous sciences progress, separately or in concert, with the planetary exploration space sciences [(Robinson, 2005)](https://www.scirp.org/journal/paperinformation.aspx?paperid=85201#ref38). As a result of multifaceted political, economic, scientific, technological, educational, and other global problems, there has been practicing exclusively only international cooperation for sustainable space development among the developed countries [(Noichim, 2005)](https://www.scirp.org/journal/paperinformation.aspx?paperid=85201#ref34). The space faring nations should promote a supportive environment for peaceful and sustainable use of space, decrease environmental effects on Earth and protect the terrestrial environment. We should escape a regime that will ultimately reflect the over-exploitation of resources and environmental havoc [(Fountain, 2002)](https://www.scirp.org/journal/paperinformation.aspx?paperid=85201#ref9).

Adoption of space law treaties and principles at the international level is a foremost landmark in the development of the first era of international space law. Space law treaties and principles arrange a set of rules to ensure the peaceful and sustainable uses of outer space. In the matter of raising space faring nations, implementation of the existing space law is also an abundant challenge. Moreover, some major space faring countries did not ratify some of the treaty and more or less other countries raise the question of the effectiveness of present laws. About the advance notification of space activities, Article XI of the Outer Space Treaty provides, appropriately notify conducting space activities by the space faring State to the United Nations as well as the public together with nature, locations, conduct, general function of the space object and results of such activities [(Outer Space Treaty, 1967)](https://www.scirp.org/journal/paperinformation.aspx?paperid=85201#ref35). The world is now perceiving multiplayer space power, control the use of nuclear weapons and other kinds of weapons in space is excessive undertaking. Article IV delivers, “States Parties to the Treaty undertake not to place in orbit around the earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction, install such weapons on celestial bodies, or station such weapons in outer space in any other manner” [(Outer Space Treaty, 1967)](https://www.scirp.org/journal/paperinformation.aspx?paperid=85201#ref35). This article is one of the most significant provisions on arms control is accompanied by other treaties of arms control. Commercialization of space is widely spread issue in outer space activities and major space faring nations like the U.S. highly promoted commercialization by private and non-governmental sectors. Appropriate administration, supervision and control are a vigorous **concern** for absent of international and national appropriate law. Article VI of the Outer Space Treaty provides that, the activities of non-governmental entities in outer space shall require authorization and provide continuing supervision by way of national legislation or any other means in order to ensure that national activities were carried out in conformity with the provisions of the outer space treaty [(Outer Space Treaty, 1967)](https://www.scirp.org/journal/paperinformation.aspx?paperid=85201#ref35). Preserve environmental balance by decrease adversarial environmental changes. Harmful contamination through the extra environmental matter of the celestial bodies could introduce adverse environmental changes. Article 7.1 of the Moon Agreement states that “States’ Parties shall take measures to prevent the disruption of the existing environmental balance” [(“Moon Agreement”, 1979)](https://www.scirp.org/journal/paperinformation.aspx?paperid=85201#ref31). Article IX of the Outer Space Treaty is required in the exploration and use of outer space “to avoid [its] harmful contamination”. Regarding “the environment of the Earth” treaty required to “avoid adverse changes... resulting from the introduction of extraterrestrial matter and, where necessary shall adopt appropriate measures for this purpose” [(Outer Space Treaty, 1967)](https://www.scirp.org/journal/paperinformation.aspx?paperid=85201#ref35).

#### Sustainable development solves climate change

**Santos 13**

[Filipe Durate Santos—Center for Astrophysics and Gravitation, “Space System for Sustainable Development,” Apogeo Spatial, 03-01-2013, <https://apogeospatial.com/space-system-for-sustainable-development/>]

The space environment is being used by more and more State and private sector entities for an increasingly diverse range of outer space activities. The long-term sustainability of these activities is currently in **danger** due to the proliferation of space debris, the growing probability of collisions, and the congestion of orbital positions and radio frequency spectra, particularly in the low-Earth orbit and geostationary orbit environments. However, space activities contribute decisively to the well-being of humanity and to sustainable development. Sustainability is a relatively recent concept introduced in the 1980s and defined by the United Nations World Commission on the Environment and Development in 1987 as “development which meets the needs of the present without compromising the ability of future generations to meet their own needs.” This definition did not satisfy everyone, and other definitions arose. Gradually, it became clear that sustainable development is not a concept of a strictly scientific nature that can be defined without ambiguities; opinions differ on what precisely should count among the human needs for the application of the principle of intergenerational equity. These needs can be categorized into the social, economic, and environmental realms, but the relative importance of the different components is a matter of opinion. Sustainable development is these days a meeting point for the debate about the state of the world and how to respond to the social, economic, environmental, and institutional challenges we are facing. We are still very far from achieving it but we can identify the main drivers of unsustainability, which can be organized into four leading groups. Space systems play a crucial role in addressing the problems raised by these four groups of drivers, which constitute the “square of unsustainability.” See FIGURE 1. Finally, the fourth driver is anthropogenic climate change, mainly due to CO2 emissions from fossil fuel burning and to land use changes, especially deforestation. All four groups of drivers are strongly interconnected and interdependent. To reach some form of sustainable development, these issues must be addressed in ways that are both simultaneous and integrated. The magnitude and difficulty of this task reveal the perilous state the world is in. **Climate change** is one of the **majo**r environmental risks facing humanity in the 21st century. The scientific community has reached a strong consensus that anthropogenic emissions of greenhouse gases are intensifying the natural greenhouse effect in the atmosphere. These emissions are causing a climate change that will very likely intensify during the 21st century. The signs that this climate change is happening are becoming ever more obvious and unequivocal. According to the Intergovernmental Panel on Climate Change (IPCC), the global average surface temperature (land and ocean) has increased by 0.8° C since preindustrial times and by 1.0° C over land alone. In the Arctic, the average surface temperature increase has been higher, about twice the global value. Earth observation from space over the past 50 years has **fundamentally** changed our understanding and knowledge of the Earth system. See FIGURE 5. With increasingly sophisticated space systems, it is now possible to obtain quantitative measurements of temperatures in the atmosphere, concentrations of atmospheric gases, precipitation and wind speed, elevations of land and water, water movement, types of soils, and vegetation cover. In addition, satellite observations yield continually updated knowledge of the state of the atmosphere, helping meteorologists to devise models that project the weather into the future with much improved accuracy compared to pre-satellite forecasts. Seven-day forecasts have more than doubled in accuracy over the past three decades, particularly in the Southern Hemisphere. Satellites have been used to monitor the stratospheric ozone layer, which blocks damaging ultra-violet light from reaching the Earth’s surface, and to monitor atmospheric aerosol loading. Furthermore, they have contributed decisively to improvements in our understanding of the climate system and of climate change, through monitoring of the atmosphere, sea and land surface temperatures, ice sheet floes, Arctic sea ice extension, the El Niño-Southern Oscillation, and Earth’s carbon cycle. Recently, an ensemble of satellite altimetry, interferometry, and gravimetry datasets has been used to conclude that, since 1992, melting of the polar ice sheets has contributed, on average, 0.59 mm to the annual rate of global sea level rise. Extreme precipitation and floods are very likely to become more frequent because of climate change. Floods are just one example of various types of disasters where satellites are very useful for humanitarian relief, rapidly mapping and assessing local emergency situations and reconstruction activities. Space systems are extensively used these days in the management of disasters related to geophysical, meteorological, hydrological and climatic events. The uses of satellites in disaster management are becoming more integral to reducing reaction time and to providing accurate information for rescue and disaster control operations. Satellites are very useful in disasters for communications, remote sensing and mapping. Meteorological and storm warning satellite technology can also help in predicting water-related disasters and in setting up precautionary activities.

#### That causes extinction- resilience fails

**Beard et al. 21** [S.J. Beard, Lauren Holt, Asaf Tzachor, Luke Kemp, Shahar Avin, Phil Torres, and Haydn Belfield, \* Centre for the Study of Existential Risk, “Assessing climate change’s contribution to global catastrophic risk,” 2021, *Futures*, Vol. 127, https://doi.org/10.1016/j.futures.2020.102673, Table 1 & Fig. 2 Omitted]

3.1. Climate change and planetary boundaries

While most of the impacts of climate change so far have fallen within the range of what was experienced during the Holocene, the rate of change is faster than in the Holocene and we are now beginning to see climate change **push** **beyond** these **boundaries**. In the latest edition of the planetary boundaries’ framework, climate change is placed in the zone of increasing risk, implying that while this boundary has been breached, there remains some potential for normal functioning and recovery (Steffen et al., 2015). It thus lies between what the authors identify as the ‘safe zone’ and other ‘high risk’ transgressions, such as disruption to the biochemical flows of nitrogen and phosphorus and loss of biosphere integrity.

As part of their discussion of BRIHN Baum and Handoh (2014) note that climate change is the planetary boundary for which the risk to humanity has received most meaningful consideration and they suggest that this attention is deserved. Yet little research attention has been paid to climate change’s extreme or catastrophic effects. Kareiva and Carranza (2018) argue that, despite currently falling outside of the area of high risk, climate change has the **clear potential** to push humanity across a threshold of **irreversible** **loss** by “**changing major ocean circulation patterns**, causing massive **sea-level rise**, and **increasing** the **frequency** and **severity** of **extreme** **events**… that displace people, and ruin economies.” Even if humanity was resilient to **each** of these **individual impact**s, a global catastrophe could occur if these impacts were to occur **rapidly** and **simultaneously**.

One scenario that has received comparatively more attention is that of the global climate crossing a tipping point that would trigger **environmental** **feedback** **loops** (such as **declining** **albedo** from melting ice or the release of **methane** from

### Solvency

#### Contention 2: Solvency

#### The appropriation of outer space by private entities is unjust. I advocate that the Public Trust Doctrine is the appropriate principle of justice for outer space.

#### PTD is durable, flexible, and solves- deflates the propensity for conflict and encourages sustainable development

**Babcock, 19** -- Professor of Law, Georgetown University Law Center

[Hope M., B.A., Smith College; L.L.B., Yale, "The Public Trust Doctrine, Outer Space, and the Global Commons: The to Call Home ET", Syracuse Law Review, Vol. 69, No. 2, 2019, p. 191-262, <https://scholarship.law.georgetown.edu/facpub/2201>, accessed 1-14-22]

V. HOW TO MANAGE PROPERTY IN OUTER SPACE

[W]e must accord the highest priority to efforts to solve or avoid the tragedy of the commons, the free rider problem, and the harmful impacts of side effects as they arise in connection with human/environment relations. For the most part, success in this endeavor will depend on our ability both to understand the sources of perverse incentives and to devise systems of rights and rules or, in other words, governance systems capable of altering incentives sufficiently to alleviate problems of this sort.425

The **lack of property lines** or boundaries in outer space make it **difficult to delineate** an individual claim to ownership, which could lead to **overlapping** and **conflicting claims** of development rights. Assertion of ownership rights over space and its resources **conflicts with the ban on appropriation** of outer space in the governing treaties and could lead to **rivalrous conditions**, perhaps **even to war**. Without a management system that assures equitable access to and sharing of celestial resources, any form of property regime runs the risk of violating the equitable principles that animate the OST and Moon Treaty—that space should be developed for the benefit of all mankind.426

The Article, to this point, has established that outer space is closer to a global commons than it is to private property. Yet, treating space as a global commons, as noted previously, poses a unique management problem: how to design a management approach that protects open access commons resources from overconsumption or damage while still incentivizing the development of those resources. Hardin believed that privatization of property was the best way to achieve efficiency and sustainability, Ellickson argued that informal norms were the best way to achieve “sustainable equilibrium,” and Ostrom promoted “a range of management techniques specific to that community in order to redirect the march towards total exhaustion.”427 While these ideas do not work in isolation for space, they each contribute in some way to a solution.

This Part identifies some management approaches designed to achieve those goals from the right of first possession rule to the application of norms, and evaluates each one for its suitability and ability to meet the dual goals of equitably and sustainably allowing the profitable development of outer space resources, as well as for its efficiency, fairness, cost effectiveness, and ease of implementation and enforcement. One conundrum is that

not only does one size not fit all, but also there are apt to be multiple approaches to the development of solutions. To take a single example, any effort to avoid or alleviate the tragedy of the commons must include the creation of some sort of exclusion mechanism or system for rationing available supplies of the relevant good(s) or service(s) among prospective users. But it turns out that there are distinctive ways to meet this condition under structures of private property, common property, or public property.428

This Part also shows that there are a number of solutions whose effects are comparable in terms of conservation, but are significantly different when criteria like “efficiency, equity, or robustness” are examined.429

A. Hybrid Governance Hybrid forms of governance are a way of managing property.430 An example of a hybrid governance regime is a “nested governance system,” in which one form of governance, self- or local governance, is nested in a larger, “centralized governance regime.”431 In this management scenario, the public authority, which acts as a designer and mediator of these co-designed systems, becomes a “collaborative institutional ecosystem [of] manager[s]” enabling “the networks, actions and reactions of others in the ecosystem [to be] independent and free [while] nested within the local government, consistent with a polycentric system.”432 Elected officials “assist, collaborate, and provide technical guidance (data, legal advice, communication strategy, design strategies, sustainability models, etc.) to enable themselves to manage, mediate, and coordinate the ecosystem.”433 The public official becomes a manager who enables and supports “parts of the ecosystem to allow it to ‘nest’ within the larger policy of the city.”434 Arnold calls this nested system of governance a “spatially hybrid property regime.”435 Given the different levels of government that might be involved in outer space— international, national, and even local—nested hybridity might become a reality. Another hybrid form of governing property, particularly commons, which contains separate, yet overlapping power centers is called “subsidiarity.”436 “Subsidiarity is the idea that power should be shared with ‘the lowest practicable tier of social organization, public or private.’”437 It is based on the impression that “governments look for allies at different hierarchical levels to facilitate the initiatives of proactive citizens who, individually or in groups, are willing to take direct care of the commons.”438 Space-faring nations could involve subunits of government in the actual management of space, like states, provinces, and towns, as well as special interest groups that might benefit from the development of space, like universities or space development enterprises.439 Foster and Iaione use horizontal subsidiarity as a means of engaging an active urban citizenry in maintaining the city for the collective welfare of its citizens.440 However, there is no reason to limit the principle’s application to the urban environment. Indeed, the goal of reorienting “public authorities away from the central state to an active citizenry willing to cooperatively govern common resources” seems equally useful in outer space where there are similar sub-governing units.441 Indeed, to the extent this approach breaks the tie between the space development industry and government and the industry’s push to realize the principle of first possession, subsidiarity as a management principle may hold some merit, if adjusted to meet the physical circumstances of outer space.442 And a nested system of governance or subsidiarity could involve interested parties in governance providing for more local resolution of conflicts, if and when there are regulations to apply. B. Application of the Right of First Possession Property Rule As noted previously, the space industry favors allowing ownership of property in outer space because it enables them to profit from their investment in the development of space resources and counter balances the risks of each venture they undertake.443 They argue that “[o]wnership rights would also provide incentives for expeditions to make the initial treks to the moon”444 and “would allow a free market to develop in property rights” on celestial bodies like asteroids or the moon.445 Critical to protecting those investments is the right of first possession.446 But, as also discussed earlier, “full ownership” of property in outer space, like the surface of an asteroid or the moon, violates Article II of the Outer Space Treaty, making any implementing rule a nullity.447 One approach around the ban, allowing application of the principle, might be to create “a real property rights system based on jurisdictional sovereignty” distinguishing “between absolute territorial sovereignty and functional or jurisdictional sovereignty.”448 An essential part of this proposal is to permit “private entities to occupy locations on a first-come, first-served basis so long as the occupation does not interfere with the activities of other entities.”449 The proposal “would permit private property rights in outer space once a private entity made effective use of the property for a period of one year, and continued to use the property in a peaceful way that allowed for free and open use of outer space.”450 The genesis of this proposal, according to Andrew Brehm, are the Homestead Acts, “which similarly encouraged private exploration and settlement in new frontiers.”451 The key elements of this proposal are the non-interference requirement and the diligence requirement.452 But, eventually, the land transferred to the homesteader, which was the incentive for undertaking the hard work in the first place.453 Other scholars have advocated using the General Mining Law of 1872 (GML).454 The GML not only gave the first discoverer of a valuable mineral the exclusive right to develop it, but also to the land around the discovery.455 Ownership of the land remained in the United States until the discovering entity perfected its claim, at which point the land transferred to the miner.456 At that point, the proposal runs afoul of the OST ban, just like using the Homestead Act as a model.457 Another reason the models will not work in outer space is that the United States originally owned the land before it was transferred to a private entity.458 As no sovereign owns land in outer space, there is no sovereign to transfer anything to anybody.459 Therefore, the right of first possession rule under any approach cannot get over the non-appropriation hurdle of the international space treaties, regardless of any other attributes they may have, and is unworkable. C. Establish Exclusive Economic Zones (EEZ) Like Those Under UNCLOS One approach that has captured the attention of some space law scholars is the idea of establishing development or enterprise zones on celestial bodies.460 Under this approach, existing organizations could allocate areas on celestial bodies for the construction of installations by different countries “with the understanding that a certain exclusive economic zone would radiate from that location.”461 Nations could then allow activities to occur in those zones and regulate them.462 “Alternatively, an international organization could divide celestial bodies into shares for each country to presently or eventually exploit, as opposed to a system of arising economic zones.”463 The EEZ proposal is not that different from traditional Euclidian zoning to the extent it “separates incompatible land uses and excludes harmful ones to avoid negative spillovers” from the co-location of conflicting uses.464 Zoning can also be used to “control the kind of users allowed to consume the commons by excluding those who are likely to take out more than what might be considered their fair share of the commons and leave everyone worse off, at least fiscally.”465 Separating incompatible land uses and excluding those who might over-consume the commons might be a useful approach in outer space, if the obstacles to creating it can be overcome, which they cannot. The fact that the proposal assures development rights for countries creates several problems. First, creating an exclusive zone from which some entities are excluded in all likelihood would “directly interfere with the free exploration and use principles in Article I of the Outer Space Treaty.”466 Second, the proposal’s administration requires the presence of an international organization, with its attendant problems.467 Third, given the difficulty tracking asteroids, monitoring and enforcing what happens within these zones may be very difficult.468 Fourth, depending on the perceived fairness of the zones and the allocation process, the proposal could lead to “discord” among various countries causing the possible dissolution of whatever civility norms had been established among spacefaring nations.469 The zoning proposals to date have focused on single uses, principally mining.470 It is possible, however, that as conditions on the moon, for example, become more useful for other uses, such as a place from which to launch ventures into deeper outer space or for extracting water for use in situ or elsewhere, there may be more than one activity occurring in a single zone. One way to avoid one activity interfering with the use by another is the use of “performance zoning,” an idea Lee Anne Fennell proposed to allow for the agglomeration of beneficial uses to produce positive impacts within the zone as well as beneficial spillover impacts.471 Another is to adopt the idea of “poolism,” the “co-production of goods” and adoption of “sharing practices” in a single space, like in a city.472 For such an idea to work, there would have to be a system of assembling uses in a single area of a celestial body, perhaps through performance zoning, and then occupants of that zone would have to be willing and able to collaborate.473 Assuming those obstacles can be surmounted, it is not clear how either of these approaches will overcome the exclusion problems associated with any proposal that excludes some users. D. Lotteries or Tradable Credits Having a lottery or an auction of “ownership rights,” or establishing a system of tradable credits like under the Clean Air Act’s acid rain provision, 474 or under the prior appropriation doctrine for allocating use rights to a quantity of water, might be ways to lessen the equitable problems with the prior proposals, none of which is sensitive to the interests of non-developed countries.475 While an auction theoretically would open up the market in development rights to others than the large spacefaring nations, in practice one would expect that only they would be able to effectively bid on and then secure those rights.476 However, the idea of tradable credits might work.477 Under an outer space trading system, participant nations, “regardless of [their] space-faring capacity, would be allocated a certain number of lunar mining credits. The credits would allow the holder to mine a certain tonnage of natural resources on the moon during a given period.”478 The credits could apply to the amount of the resource a participant was allowed to mine, regardless of location, or could be tied to a particular plot of land on a celestial body.479 Participants could buy and sell their credits to other participants.480 The openness of the process would create an incentive for all countries, regardless of their “spacefaring capacities.”481 Two additional features make this an appealing approach. The first of these, “tonnage limits,” will encourage countries to “make careful choices in where and what to mine,” assuring that valuable resources will still be there for countries that begin mining later, like developing nations.482 The other, a sunset provision, should prevent hoarding and speculative purchases.483 The approach “would allow developing nations to benefit from space exploration and exploitation fairly, without giving them control over an international regime.”484 Another advantage, other than determining the amount of allocable credits, is that there would be no need for an international central authority, because participants will run the market.485 Coffey proposes linking the concept of tradable permits to an exclusive economic zone so that “[w]hen a nation exercises its credits on land, that land will become the exclusive economic zone of that nation,” but would allow others to pass through the zone “as long as they do not disturb it or take resources from it.”486 However, her approach comes close to conflicting with the prohibition against appropriating celestial resources. Yet, there are potential problems even with this promising approach. For example, there is still a need for some international organization to allocate mining credits and to determine the methodology for any allocation, especially how to assure that non-spacefaring nations benefit in some way.487 Some form of international oversight will be needed to “ensure that nations adhere to the rules and do not exceed their allotted tonnage.”488 There is an unresolved question whether commercial mining enterprises would be able to buy credits not only from their own country, but from other countries.489 Then, there is the question of whether space resources may legally be considered personal property, requiring a new international agreement to clarify that “celestial resources may legally belong to those who extract them.”490 Tradable credits would also need to be anchored by a permit, again raising the need for an administering agency.491 To prevent over-consumption of permitted resources, a “timelimited” permit based on something like the prior appropriation doctrine giving the first appropriator superior rights over any later appropriator might be a way to curb over-consumption, but might disadvantage nonspacefaring countries who would come later to the market.492 Therefore, tradable development credits—absent Coffey’s modification—is largely consistent with international law, and could assure equitable distribution of the benefits of space development as well as provide sufficient incentives for development of these resources. However, the approach may be too administratively encumbered and difficult to enforce to be worth adopting. E. Norms as a Management Approach493 Norms are social rules that are promulgated and enforced by the community to which they apply.494 They come from communities and not from an outside organization or governmental entity.495 They provide “social meaning” for individuals in specific communities and thus provide the framework or understandings that guide personal behavior.496 They function as nonlegal rules or obligations that certain individuals feel compelled to follow despite the lack of formal legal sanctions, whether because defiance would subject them to sanctions from others (typically in the form of disapproval, lowered esteem, or even ostracism) or because they would feel guilty for failing to conform to the norm (a so-called internalized norm).497 Concern about esteem is especially important in close-knit groups, which makes norms unlikely to have any effect on the disparate entities that might engage in developing outer space.498 However, if conditions were appropriate for the activation of norms in outer space, it is conceivable that a norm favoring an equitable distribution of space resources could arise. Ellickson’s study of Shasta County, California, demonstrates how norms that originate within a close-knit community can efficiently manage a CPR.499 His theory revolves around the baseline rule that “property rights—be they communal or individual—should be clear and well-known among community members.”500 Besides the absence of any close-knit community in outer space, the fact that property rules in outer space are neither clear nor well known would seem to undercut the application of norms as a management tool in that environment.501 Thus, norms work as a means of controlling individual behavior when individuals see themselves as part of a particular group.502 When this happens, individuals identify with and assimilate the group norm, replacing individual behavior with “group-guided behavior.”503 To the extent that “[i]nformal norms and private ordering seek to identify circumstances that combine the benefits of the unmanaged commons— freedom—with the benefits of privatization—efficiency,” they offer “an appealing degree of autonomy, efficiency, and freedom.”504 But, as in the case of the users of Pearl’s “Ogallala Aquifer,” there is no “close-knit group” of actors in outer space, “no shared workday affairs[,] . . . and the population of users is too large to enable each to sanction the other.”505 Hence, norms as a management approach in outer space, while consistent with international law, inexpensive to administer, implement, and enforce, and capable of responding to inequitable situations, seem unlikely to take hold in that environment.

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

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

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

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

A doctrine that imposes a perpetual duty on the sovereign to preserve trust resources, prevents their **alienation** for private benefit, assures public access to them, and can be invoked by anyone seems particularly useful as a management tool in outer space.528 The fact that public access to trust resources is so central to the doctrine makes it **reflective**, not contradictory, of international space law’s **bar against appropriation** of outer space and of the principle of space being the “province of all mankind.”529 It avoids the problems of alienation and exclusion associated with any of the management approaches associated with some form of private property and requires neither the creation of a new administrative authority nor the presence of a close-knit group of like-minded people.530 Members of the public, both rich and poor, can invoke and enforce the doctrine as easily as the sovereign.531 It is cost effective to the extent that **no separate apparatus** is required to implement it, and the doctrine has shown itself to be **highly adaptable and innovative** as different needs arise.532 It could also fill the gap in international law with respect to managing celestial property. Therefore, of all the management approaches studied here, the PTD seems the most suited to keep order in space until a regulatory regime is imposed.

However, the doctrine provides no incentives for development of trust resources; rather, it might be used to limit or curtail that development, making it an imperfect, perhaps even counter-productive solution by itself to the extent that such development might be beneficial.533 Modifying the doctrine to allow limited use of private property management approaches, like tradable development claims, might buffer that effect—a form of overlapping hybridity between one type of property, a commons, and a management regime from another, private property, enabled by application of the PTD.

CONCLUSION

“Only a legal system that accommodates both the human need for resources and the necessary preservation of mankind’s common heritage can fulfill these criteria.”534

The future is now with regard to the development of outer space and its resources—it is no longer a question of whether humans will engage in these activities, but how soon they will. Technically advanced countries and private commercial enterprises are probing outer space and preparing for landing on an asteroid or the moon to extract their resources.535 Speculators are selling deeds to the moon’s surface and preparing to exploit the tourism potential that space offers.536 But, the legal framework for managing these initiatives is almost nonexistent.537 International treaties came into being before all this activity began in earnest and national laws that might apply are stunted by jurisdictional quandaries like the absence of national boundaries in outer space.538 Thus, there is an urgency to figure out how to control what happens in outer space before its resources are irreparably damaged or permanently monopolized by powerful countries and individuals.

In the absence of regulation, much of the current debate centers on what property regime should be applied in outer space.539 The assumption is that by only allowing private property rights in space, countries and commercial enterprises will undertake the risks and costs of space development.540 However, unless international space law changes, it may prevent this from happening. If it changes, strong management controls will be **necessary** to **prevent destruction** or **over-consumption** of celestial resources, as well as monopolization and **competitive behavior** by participants, which could lead to hostilities and inequities.

This Article examines various private property regimes, including those of less than full fee ownership, to see if any would avoid the conflict with the international prohibition on appropriation of outer space and its resources. It concludes that none will because each retains the right to exclude and each is insensitive to the treaties’ equity concerns. In contrast, considering outer space to be common is consistent with international space law in both respects.

Hypothesizing that private property in outer space may yet prevail, this Article investigates different private property management approaches, such as the right of first possession, lotteries, and tradable development rights, to see if any would be cost effective, easy to implement and equitable, and would also prevent over-consumption, monopolization or the slide into rivalrous behavior. The Article concludes that each comes up short in some respect. Social norms as a management tool for property held in common, although compliant with international law, are also not up to the task. Instead, although ancient, the PTD, with its malleability, easy and cost-effective implementation and enforcement, non-consumption principle, and consistency with the goals that animate international space treaties, seems best suited to the task of protecting the public’s interests in the **global commons** that is **outer space** as it has done for centuries in Earth-bound commons. But, as its principal terrestrial use has been to protect trust resources from development, the doctrine needs some modification to encourage development of celestial resources. Hence, this Article suggests that modifying the PTD to allow the application of private property management tools, like tradable development rights, **will not only allow development**, but also will assure that when it happens, it will not be just profitable for a few, but will also be **sustainable** and **equitable**.

#### Cooperative space development is more efficient

**Raclin 86**

Grier C. Raclin (Partner, Heron, Burchette, Ruckert & Rothwell, Washington, D.C. B.A. 1975, J.D. 1978, Northwestern University). “From Ice to Ether: The Adoption of a Regime to Govern Resource Exploitation in Outer Space.” Northwestern Journal of International Law & Business, Volume 7 Issue 4. Fall 1986. JDN. https://scholarlycommons.law.northwestern.edu/cgi/viewcontent.cgi?article=1214&context=njilb

It must be recognized that more than half of the countries constituting the United Nations won independence within the last twenty years. These countries reject the traditional method of obtaining sovereignty and benefits through simple occupation of territory. 9 2 They seek to develop industrially quite quickly, hoping to establish a new international economic order in which developed countries are called upon to assist developing countries in a modernization campaign.193 Unless the United States seeks to withdraw from the numerous international organizations governed by one-nation-one-vote systems - a move which would render its terrestrial activities extremely difficult - the United States must now recognize, at least to some extent, developing countries' demands to have a voice in the development and exploitation of Antarctic and outer space resources. 194

From a purely practical standpoint, unilateral action by the United States to explore and exploit lunar and other resources would be **extremely inefficient**. Such an undertaking would require duplicative **r**esearch **and** **d**evelopment, construction, transportation, and management efforts and activities that could be shared more profitably among numerous countries. As the United States has recognized the practicality of shared efforts regarding its plan to share the construction of the space station with Japan, Canada, and the European Space Agency, 195 so will **the world's countries undoubtedly find it advantageous to unify in order to explore outer space.** The early establishment of a predictable method of sharing the benefits of extraterrestrial resource development also will lessen the likelihood that **inefficient "get-it-while-you-can" activities** will characterize development efforts.

Finally, adoption of an international accord to regulate commercial activities in outer space and to allocate the benefits of such activities in a predictable manner would appear to be a **prerequisite to financing** these activities. Banks and investors will be reluctant to lend funds to any mining entrepreneur or consortium that did not have the uncontested, or at least predictable, right to the benefits of the resources it plans to develop or prospect. Similarly, it cannot be expected that an entrepreneur will take on the significant risks associated with extraterrestrial mining activities if its ability to obtain the benefits of those activities is open to question. Indeed, were the United States to fail to adopt a regime governing extraterrestrial resource exploration, it must be anticipated that entrepreneurs might seek the protection of parties to such a convention. Thus, the failure of the United States to secure such an agreement may result in the United States losing its ability to participate in such activities. 196

### Framing

#### The standard is maximizing expected wellbeing. That best recognizes the equal moral weight of all which accords everyone their due.

#### Debates about oppression should center on consequences.

Christopher A. **Bracey 6**, Associate Professor of Law, Associate Professor of African & African American Studies, Washington University in St. Louis, September, Southern California Law Review, 79 S. Cal. L. Rev. 1231, p. 1318

Second, **reducing conversation** on race matters **to an ideological contest allows opponents to elide inquiry into whether the results of a particular** preference **policy are desirable. Policy positions masquerading as** principled **ideological stances create the impression that a racial policy is not simply a choice among available alternatives, but the embodiment of some higher moral principle**. Thus, **the "principle" becomes an end in itself, without reference to outcomes. Consider the prevailing view of colorblindness in constitutional discourse. Colorblindness has come to be understood as the embodiment of what is morally just,** independent of its actual effect upon the lives of racial minorities. This explains Justice Thomas's belief in the "moral and constitutional equivalence" between Jim Crow laws and race preferences, and his tragic assertion that "Government cannot make us equal [but] can only recognize, respect, and protect us as equal before the law." [281](http://web.lexis-nexis.com/universe/document?_m=cd9713b340d60abd42c2b34c36d8ef95&_docnum=9&wchp=dGLbVzz-zSkVA&_md5=9645fa92f5740655bdc1c9ae7c82b328#n281) For Thomas, there is no meaningful difference between laws designed to entrench racial subordination and those designed to alleviate conditions of oppression. **Critics may point out that colorblindness in practice has the effect of entrenching existing racial disparities in** health, wealth, and society. **But in framing the debate in purely ideological terms, opponents are able to avoid the contentious issue of outcomes and make viability determinations based exclusively on whether racially progressive measures exude fidelity to the ideological principle of colorblindness. Meaningful policy debate is replaced by ideological exchange, which further exacerbates hostilities and deepens the cycle of resentment.**

#### Also, extinction categorically outweighs all other impacts.

Seth D. **Baum &** Anthony M. **Barrett 18**. Global Catastrophic Risk Institute. 2018. “Global Catastrophes: The Most Extreme Risks.” Risk in Extreme Environments: Preparing, Avoiding, Mitigating, and Managing, edited by Vicki Bier, Routledge, pp. 174–184.

2. What Is GCR And Why Is It Important? Taken **literally**, a global catastrophe can be any event that is in some way catastrophic across the globe. This suggests a rather low threshold for what counts as a global catastrophe. An event causing just one death on each continent (say, from a jet-setting assassin) could rate as a global catastrophe, because surely these deaths would be catastrophic for the deceased and their loved ones. However, in common usage, a global catastrophe would be **catastrophic** for a significant portion of the globe. Minimum thresholds have variously been set around ten thousand to ten million deaths or $10 billion to $10 trillion in damages (Bostrom and Ćirković 2008), or death of one quarter of the human population (Atkinson 1999; Hempsell 2004). Others have emphasized catastrophes that cause **long-term declines in the trajectory of human civilization** (Beckstead 2013), that human civilization **does not recover from** (Maher and Baum 2013), that drastically reduce humanity’s potential for future achievements (Bostrom 2002, using the term “**existential risk**”), or that result in **human extinction** (Matheny 2007; Posner 2004). A common theme across all these treatments of GCR is that **some catastrophes are vastly more important than others**. Carl Sagan was perhaps the first to recognize this, in his commentary on nuclear winter (Sagan 1983). Without nuclear winter, a global nuclear war might kill several hundred million people. This is obviously a major catastrophe, but humanity would presumably carry on. However, with **nuclear winter**, per Sagan, **humanity could go extinct**. The loss would be not just an additional four billion or so deaths, but the loss of **all future generations**. To paraphrase Sagan, the loss would be billions and billions of lives, or even **more**. Sagan estimated **500 trillion lives**, assuming humanity would continue for ten million more years, which he cited as typical for a successful species. Sagan’s 500 trillion number may even be an **underestimate**. The analysis here takes an adventurous turn, hinging on the evolution of the human species and the long-term fate of the universe. On these long time scales, the descendants of contemporary humans may no longer be recognizably “human”. The issue then is whether the descendants are still worth caring about, whatever they are. If they are, then it begs the question of how many of them there will be. Barring major global catastrophe, Earth will remain habitable for about one billion more years 2 until the Sun gets too warm and large. The rest of the Solar System, Milky Way galaxy, universe, and (if it exists) the multiverse will remain habitable for a lot longer than that (Adams and Laughlin 1997), should our descendants gain the capacity to migrate there. An open question in astronomy is whether it is possible for the descendants of humanity to continue living for an **infinite length of time** or instead merely an **astronomically large but finite** length of time (see e.g. Ćirković 2002; Kaku 2005). Either way, the stakes with global catastrophes **could** be **much larger than the loss of 500 trillion lives.** Debates about the infinite vs. the merely astronomical are of theoretical interest (Ng 1991; Bossert et al. 2007), but they have **limited practical significance**. This can be seen when **evaluating GCRs from a standard risk-equals-probability-times-magnitude framework**. Using Sagan’s 500 trillion lives estimate, it follows that reducing the probability of global catastrophe by a mere one-in-500-trillion chance is of the same significance as saving one human life. Phrased differently, society should **try 500 trillion times harder to prevent a global catastrophe than it should to save a person’s life**. Or, preventing one million deaths is equivalent to a one-in500-million reduction in the probability of global catastrophe. This suggests society should **make extremely large investment in GCR reduction, at the expense of virtually all other objectives.** Judge and legal scholar Richard Posner made a similar point in monetary terms (Posner 2004). Posner used $50,000 as the value of a statistical human life (VSL) and 12 billion humans as the total loss of life (double the 2004 world population); he describes both figures as significant underestimates. Multiplying them gives $600 trillion as an underestimate of the value of preventing global catastrophe. For comparison, the United States government typically uses a VSL of around one to ten million dollars (Robinson 2007). Multiplying a $10 million VSL with 500 trillion lives gives $5x1021 as the value of preventing global catastrophe. But even using “just" $600 trillion, society should be willing to spend at least that much to prevent a global catastrophe, which converts to being willing to spend at least $1 million for a one-in-500-million reduction in the probability of global catastrophe. Thus while reasonable disagreement exists on how large of a VSL to use and how much to count future generations, even low-end positions suggest **vast resource allocations** should be redirected to reducing GCR. This conclusion is only **strengthened** when considering the **astronomical size of the stakes**, but the same point holds either way. The bottom line is that, as long as something along the lines of the standard riskequals-probability-times-magnitude framework is being used, then **even tiny GCR reductions** merit significant effort. This point holds especially strongly for risks of catastrophes that would cause **permanent harm to global human civilization**. The discussion thus far has assumed that all human lives are valued equally. This assumption is **not universally held**. People often value some people more than others, favoring themselves, their family and friends, their compatriots, their generation, or others whom they identify with. Great debates rage on across moral philosophy, economics, and other fields about how much people should value others who are distant in space, time, or social relation, as well as the unborn members of future generations. This debate is crucial for all valuations of risk, including GCR. Indeed, if each of us only cares about our immediate selves, then global catastrophes may not be especially important, and we probably have better things to do with our time than worry about them. While everyone has the right to their **own views and feelings**, we find that the strongest arguments are for the **widely held position** that **all human lives should be valued equally**. This position is succinctly stated in the United States Declaration of Independence, updated in the 1848 Declaration of Sentiments: “We hold these truths to be self-evident: that all men and 3 women are created equal”. Philosophers speak of an agent-neutral, objective “view from nowhere” (Nagel 1986) or a “veil of ignorance” (Rawls 1971) in which each person considers what is best for society **irrespective of which member of society they happen to be**. Such a perspective **suggests valuing everyone equally**, regardless of who they are or where or when they live. This in turn suggests a **very high value for reducing GCR**, or a high degree of priority for GCR reduction efforts.

## Ext: Plan

### OV

#### PTD is vital for conflict resolution and sustainable development. This doctrine manages an open access commons as it will allow for common properties to remain in trust in perpetuity. Governmental preservation of space resources benefits the public sector. Solve impacts – this was Babcock 19.

#### Private entities will not fully lose their appropriative ability – appropriation will just be regulated. Trust resources can be alienated in favor of private ownership, as long as alienation serves the public’s interest in those resources and does not interfere with trust uses of the remaining land. Controls on appropriation are needed to prevent over-consumption and unhealthy competition – impact is extinction.

### AT Private Property Rights

#### Private property rights in space make sustainable development impossible

**Babcock, 19** -- Professor of Law, Georgetown University Law Center

[Hope M., B.A., Smith College; L.L.B., Yale, "The Public Trust Doctrine, Outer Space, and the Global Commons: The to Call Home ET", Syracuse Law Review, Vol. 69, No. 2, 2019, p. 191-262, <https://scholarship.law.georgetown.edu/facpub/2201>, accessed 1-14-22]

But, private property can also “**enhance** income disparity, exacerbate economic tensions among individuals, and **consolidate power** among the one percent.”251 M. Alexander Pearl calls property privatization “a **black hole** focused solely on centralization of power and economic wealth without regard to the **sustainability** of an essential resource or the communities that depend upon its continued existence.”252 Hanoch Dagan goes further, quoting Eric Posner and Glen Weyl, by saying, The key remedy for this predicament is to eradicate the institution of private ownership. Since “private ownership of any asset, except homogenous commodities, may hamper allocative efficiency,” we need to reconstruct markets so they are “competitive by design.” More precisely, **we must discard private property** and adopt in its stead a regime that partly transfers property’s “two most important ‘sticks’”— the right to use and the right to exclude—”from the possessor to the public at large.”253 When the value of a resource is increasing, it is more likely to be privatized so that the entity responsible for developing it can “fully capture the resulting benefits.”254 Indeed, a movement from common to private property occurs when the efficiency gains from private property are more than the costs of creating and maintaining it, such as “the basic costs of exclusion (fences, guards, and so on) and the extra vigilance.needed to deter interlopers from absconding with rising-value resources.”255 This balancing of costs and benefits may be irrelevant in outer space, as the costs of establishing private property in the first place would be huge, and the complexity and cost of technological innovations called for in outer space would be magnitudes greater than what is required on Earth.256

“By the time space in capable nations develop the technological prowess and capital reserves to fund meaningful development of outer space, the earlier space-faring nations [and their citizens], left unchecked, might already have locked up the most accessible and valuable resources.”294 This would carry forward current disparities in global wealth distribution into the “Space Age.”295 The argument against a right of first possession gains salience from the fact that prior wrongs inflicted on less developed countries may be the reason they are not “space-capable.”296 This inequitable situation would persist, as those who profit from private property rules like the right of first possession will have the political ties, money, and understanding of the “rules of the game” to prevent their reform.297 An additional problem with the proposal is its enforceability. The fact that outer space is infinite makes it more difficult to “police” and to enforce the various treaties that apply to it.298 In outer space, “a breaching private party could pursue its interests outside the scope of such an agreement with relative impunity before it was discovered by the relevant international authority.”299

However, “[t]here are **drawback**s to forming a new international body to oversee the exploitation of space resources.”322 They can be expensive to establish and support.323 Non-spacefaring nations might not want to invest money in a venture which might “freeze them out of the decision-making process and put them at a disadvantage if they someday are able to participate in lunar missions.”324 There are the inevitable questions that arise whenever a new international governing organization is created, such as whether it should be under the authority of the United Nations or be completely independent, and how power should be allocated between spacefaring nations and developing countries without the expertise of money to venture into space.325 Further, there is an underlying equity question about spending money to create a new administrative authority.326 That authority will spend money that might otherwise have helped **poorer countries** develop the capacity to participate in outer space directly.32

Common property is property, the rights to which belong to more than one entity.356 Like private property, common property is endemic to life in the United States and always has been, even though many Americans view it ambivalently.357 There is considerable overlap between property held in common and that which is privately owned. Carol Rose suggests that collective, but privately owned property, like a tenancy in common, “has all the hallmarks of individual private property,” and, therefore, should not be seen as “fundamentally problematic or prone to inefficient use.”358 Additionally, the plasticity of the commons, demonstrated by the appearance of new commons, like the “knowledge commons, cultural commons, infrastructure commons, and neighborhood commons,” indicates that the concept might fit in outer space.359 A commons, or CPR, is frequently asserted to resist “privatization and/or commodification of those resources,” making it oppositional to a claim that something is private property.360 Sheila Foster and Christian Iaione’s suggestion that the “language of the ‘commons’” is often used to prevent the enclosure of public urban space “by economic elites,” resonates with the situation in outer space where wealthy countries or private companies want to claim or enclose space that the public owns.361 A claim that something is a commons acknowledges that “it is a shared resource that belongs to all of its inhabitants,”362 like outer space, which is the “province of all mankind.”363

The way to prevent a tragedy on land held in common is not necessarily its transformation to private property, which is one solution Hardin called for.386 Oran Young says “institutional innovation,” like individual transferable quotas, “can create a form of private property and, in the process, alleviate the perverse incentives arising from the condition of non-excludability.”387 Creating public property or, in the alternative, using regulatory controls can also avoid the tragedy to the commons.388 The owners of a commons can also self-regulate to control the adverse effects of non-excludability.389

#### Property rights are not necessary to encourage private development. Global commons can solve

**Saletta Sterling & Orrman-Rossiter 18** [Sterling Saletta, Morgan; Orrman-Rossiter, Kevin (2018). Can space mining benefit all of humanity?: The resource fund and citizen's dividend model of Alaska, the ‘last frontier’. Space Policy, (), S0265964616300704–. doi:10.1016/j.spacepol.2018.02.002] CT

The Outer Space Treaty (OST) came into force in 1967 and, having been ratified by all the major space faring governments as well as some 100 other nations, the Outer Space Treaty serves as the basis for international space law, the current corpus juris spatialis. The treaty declares the exploration and use of outer space shall be for, “the benefit and in the interests of all countries [27]” and that outer space, as mentioned previously, “shall be the province of all mankind [27]”.

With the increased commercialization of space, and the entrance of new actors, both national and private, the OST has come under increased scrutiny, with calls to expand, modify, and even to abrogate it [35,36]. Issues surrounding the mining of celestial bodies have received particular attention and debate [37]. Of particular concern is the matter of exploitation licences and property rights [38]. **The OST** expressly **forbids** the “national **appropriation** by claims of sovereignty, by means of use or occupation, or by other means” [27] **of outer space and celestial bodies.** This is frequently interpreted to mean that **the OST denies private property claims in outer space**, some authors and individuals [39–41] have argued that appropriation by non-nationalentities is allowed.

**The Outer Space Treaty**, and its terrestrial analogues, UN Convention on the Law of the Seas (UNCLOS) and the Antarctica Treaty System (ATS) **are ‘global commons regimes'**, though the terminology governing these commons differs and juridical concepts such as “common heritage of humanity” found in UNCLOS (and the Moon Treaty of 1979) and the “common province of mankind” found in the Outer Space Treaty have been interpreted in various manners. Due in part to these varying wordings, interpretations and attendant uncertainties, the need for a more comprehensive framework governing the environmental, ethical, and commercial aspects of space exploration, exploitation and colonization has been highlighted by many authors [30,33,34].

**Some** advocates for the commercial exploitation of space **claim that the absence of property rights is a** **barrier to** such **ventures**, and **in particular to** the **mining** of celestial bodies such as the Moon or near earth asteroids [35]. **Some have gone so far as to suggest an abrogation of the OST in favor of a treaty** **that allows** something like fee-simple **ownership** and what might best be called **a** California **gold rush approach to outer space** resource exploitation [36–38]. Advocates of this approach would give something like fee-simple ownership of outer space resources on a ‘first in time, first in right’ basis with no clear licensing regime for such activities [39]. In recent US law, Title IV of H.R. 2262- the U.S. Commercial Space Launch Competitiveness Act, grants ownership of asteroid resources to entities obtaining them but attempts to walk a fine line between this approach and international treaty obligations. It does not grant ownership of asteroid themselves, and explicitly states that resource exploitation must be in accordance with federal laws and existing treaty obligations, i.e. the OST [40]. How such eventual exploitation occurs, and under what precise national and international regulatory and licensing regimes, is thus still a matter for the future to decide.

On the other hand, it has also been suggested that **modifications** and **additions** to the OST **based on terrestrial models will provide sufficient guarantee of the right to** make **profits** from the exploitation of outer space resources. Henry Hertzfeld and Frans von der Dunk argue the current regime does not pose a problem for exploitation rights and that terrestrial models would allow private ventures the right to reasonable returns on investment from resource exploitation in space [41]. Furthermore, in addition to important, and possibly irreconcilable, differences between a California gold rush style approach and the OST [42], **arguments suggesting** fee-simple or similar **ownership is necessary** for profitable private outer space resource exploitation simply **do not stand in the face of** contrary **evidence from numerous terrestrial examples. These include offshore oil drilling, mining, timber and grazing operations** in the United States and internationally **which are regularly and profitably undertaken without ownership** [43]. Thus P. M. Sterns and L. I. Tennen argue that the current international regime does provide an adequate framework for commercial development in space, that fee-simple ownership is unnecessary and:

“**those who advocate the** renunciation and **abandonment of the nonappropriation principle are** either **seeking to increase their own bottom line by** disingenuous and **deceptive constructs**, or lack an appropriate appreciation and respect for international processes [[44], p. 2439]”.

Thus, claims that a lack of private property rights in outer space will be a deterrent to commercial resource exploitation ventures in space do not reflect an adequate reflection and analysis of the manner in which current terrestrial practices might be extended into outer space without abrogating the current treaty regime**. Nor would a system based on** fee simple **ownership be likely to tangibly benefit more than a small proportion of the world's population.** Instead, **the eventual wealth** from exploiting celestial **bodies would be concentrated in the hands of a few, exacerbating** rather than alleviating **existing problems for humanity and** global **sustainable development.**

## !: DEBRIS

### OV

### Extra Cards

#### Space conflict escalates to nuclear war – US, Russia, China

<https://www.un.org/press/en/2018/gadis3609.doc.htm>

<https://www.washingtonpost.com/opinions/2021/11/30/space-race-china-david-thompson/>

<https://www.nytimes.com/2021/01/24/us/politics/trump-biden-pentagon-space-missiles-satellite.html>

## !: SUSTAINABLE DEVELOPMENT

### OV

**A competitive space environment kills cooperation – anarchy & militarization spiral. Sustainable development is only possibly when competition is limited, competition excludes underdeveloped countries and makes it so that true sustainability is never possible. Without sustainable development, climate change is inevitable – climate only manageable through space systems like sats and new tech. Impact is extinction – ocean circulation, biosphere integrity, extreme weather events, and food scarcity lead to loss of all human life.**

# T-ANSWERS

## T-Appropriation – Bear Plurals/Indefinite Singulars

### We Meet

#### We Meet: The aff doesn’t specify a type of appropriation

### Counter-Interp

#### Counter-interp: affs can specify types of appropriation

#### 1] “The” implies specification

**Random House 6** (Unabridged Dictionary, http://dictionary.reference.com/browse/the)

(used, esp. before a noun, with a **specifying or particularizing effect**, as opposed to the indefinite or generalizing force of the indefinite article *a* or *an*): the book you gave me; Come into the house.

#### 2] Subsets prove generics—their interp is arbitrary. Tessler and Goodman 18

**Michael Henry Tessler (ph.D., post-doc fellow @ MIT) & Noah D. Goodman (Associate Professor of Psychology and Computer Science, and Linguistics @Stanford University), “The Language of Generalization,” Department of Psychology, Stanford University, December 2018,** [**https://arxiv.org/pdf/1608.02926.pdf**](https://arxiv.org/pdf/1608.02926.pdf)**.**

The basic intuition behind our account is that before a listener hears a novel generalization such as “Alligators grow to be 10-feet long”, they do not know how widely distributed the property to be in the category, including whether or not it is present at all. The utterance provides a vague sense of how strongly the generalization applies (e.g., how many alligators grow to be 10-feet long), which the listener derives from their knowledge of how the property (growing to be 10-feet long) is distributed among other categories (e.g., other animals). The decision of whether or not to endorse the generalization is that of a speaker reasoning about how well the utterance would align their interlocutor’s beliefs about the prevalence of the feature in the category with those of their own. We formalize this intuition in a truth-conditional semantics incorporated into a Bayesian model of belief updating. Interpretation model. Our model of interpreting the language of generalizations has three conceptual components: Probability, vagueness, and context. If generalization from observations can be described by a probability p, it is natural to posit that same construct will be at the heart of a semantic theory of the language of generalization (Ingredient 1: Probability). In semantics, belief updating generally passes through Boolean truth values (Montague, 1973). The simplest way to derive a Boolean from a scalar quantity like probability is via a threshold semantics: The utterance is true if the relevant scalar value is above a threshold. For example, the literal meaning of the sentence “Some dogs have four legs” is that there is a non-zero chance that a given dog will have four legs: [[some]](p) := p > 0. “Most dogs have four legs” can also be described as a threshold on prevalence (e.g., the chance that a dog will have four legs is greater than 50%): [[most]](p) := p > 0.5. 3 Thus, the simplest semantics for a generalization would also be a threshold on the prevalence: [[gen]](p, θ) := p > θ. The extreme flexibility of generalizations (e.g., “Mosquitos carry malaria”; “Birds lay eggs” vs. “Birds are female”) suggests that no fixed threshold would suffice. Rather than throw out the threshold-semantics, we posit that the threshold is underspecified in the literal meaning and is contextually-determined in a way analogous to how gradable adjectives like tall have contextually-determined thresholds (e.g., what counts as tall for a person is different than what counts as tall for a building; Kennedy, 2007; Lassiter & Goodman, 2013). We formalize this underspecification of meaning (Ingredient 2: Vagueness) by putting a probability distribution over θ: P(θ) (Lassiter & Goodman, 2013, 2015; cf., Qing & Franke, 2014). Finally, the meanings of linguistic expressions manifest in their capacity to convey information from speaker to hearer (Clark, 1996; Grice, 1975; Levinson, 1995). Thus, the final ingredient to our model is context (Ingredient 3), which must be minimally formalized as a listener’s prior knowledge about the property P(p) and which we describe in the Worked Examples section below. Putting these three ingredients (probability, vagueness, and context) together, we get the following model of interpreting generalizations in language: L(p, θ | u) ∝ δ [[u]](p,θ) · P(θ) · P(p)

#### A2 upward entailment test:

#### We meet the upward entailment test—"appropriation” does entail “[whatever their example is]” because appropriation is a type of [example]. There’s no non-arbitrary way to determine who’s right about the upward entailment test they’ve just made a subjective assertion, which proves semantics are silly

#### They also have no warrant for why the upward entailment test is good—they’re ev just asserts it

#### A2 abverb test:

#### The resolution fails the adverb test because adding “usually” does change the meaning because it means only some appropriation would be unjust which completely changes the topic.

#### Semantics are a floor not a ceiling— we all interpret the resolution to allow specification and can determine the most predictable interp based on factors like clash and limits. If we have a sufficiently predictable interpretation of the topic then division of ground is more important. High schoolers shouldn’t need a PhD-level understanding of semantics to interpret the topic

#### Standards:

#### 1] Clash—allows us to go in-depth on particular parts of the literature which allows for more nuanced debates because different types of appropriation have distinct lit bases—they vastly overlimit

#### 2] Aff Ground—no advantage applies to all appropriation pics since each is different – pics are worse than aff spec since negs have generics like the property rights nc, cap good, and the set col k but affs don’t have anything to restart with vs pics and the barrier to entry for pics is lower because they don’t require solvency advocates or robust lit - not potential abuse

#### 3] Functional limits: only so many affs have impacts and solvency advocates—small affs lose to generics because they have no offense specific to that type of appropriation. Even if they have a big case list it doesn’t matter because the same arguments apply to all of those affs

#### 4] Reasonability—good is good enough and key to avoid substance crowdout

## T-Appropriation- Harker

### 1AR – T Appropriation

#### 1.Counter- Interp – appropriation is a lenient definition that is reliant upon the context in which it is used

#### Gorove concludes:

Stephen Gorove (1917-2001) was a space law education pioneer. He served as a professor of space law and director of space studies and policy, from 1991-1998, at the University of Mississippi., 1969" Interpreting Article II of the Outer Space Treaty" Fordham Law Review, https://ir.lawnet.fordham.edu/cgi/viewcontent.cgi?article=1966&context=flr

In attempting to give answers to these questions, it may be pointed out, first of all, that, in the absence of some special circumstance, little would be gained by insisting on the nonappropriation of resources such as cosmic rays or gases, which are available in inexhaustible quantities. At the same time, the Treaty as it stands seems to make little allowance for national acquisition of exhaustible spatial resources. The question may also be asked whether or not the purpose of appropriation, that is whether it takes place in the name of science, for enrichment, or for any other purpose would have a bearing on the question of its **lawfulness**. Normally, the purpose of appropriation should have little bearing on the prohibition except that to constitute appropriation, the acquisition must be carried out for the purpose of one's own or exclusive use. Under such interpretation, the **temporary use** of a spatial resource without the latter's transformation or deterioration may be permissible, whereas the consumption or destruction of a resource may not. Furthermore, insofar as the exercise of authority is concerned, the state on whose registry an object launched into space is carried must retain jurisdiction and control over such object, and over its personnel, while in outer space or on a celestial body.' It is not the purpose of the foregoing brief analysis to attempt to resolve the **complex problems** which may arise in connection with the interpretation of Article II of the Outer Space Treaty. The purpose is rather to draw attention to the existence of these problems which will have to be resolved if man's exploration of the cosmos is to be guarded by law and order

**Their ev is a small part of a large review – Gorove actually concludes that the definition of appropriation as used by the OST is arbitrary and bad as permanent appropriation of resources in space is never possible. This review literally states that the definition of appropriation needs to be changed in future treaties to avoid “complex issues.”**

#### 2.Plan text in a vacuum good – creates diversity in a topic that is already incredibly narrow. They say that we need to be held to reading a plan text defined contextually with the advantage, but they also violate:

[Inset violation here]

#### Standards:

#### 1] Clash—allows us to go in-depth on particular parts of the literature which allows for more nuanced debates because different mechanisms of appropriation have distinct lit bases—they vastly overlimit

#### 2] Functional limits: only so many affs have impacts and solvency advocates—small affs lose to generics because they have no offense specific to that type of appropriation. Even if they have a big case list it doesn’t matter because the same arguments apply to all of those affs

#### 3] Ground – lenient appropriation is key to diverse and interesting debates - aff disclosure solves predictability.

#### 4] Reasonability—good is good enough and key to avoid substance crowdout

## T – Whole Res

### 1AR – T Whole Rez

#### 1.We meet – we enact the entirety of the resolution. Your definition doesn’t exclude specifying a mechanism by which the resolution can take place.

#### 2.Counter-interp – the aff must defend an instance in which the resolution is true.

#### Standards:

#### 1] Clash—allows us to go in-depth on particular parts of the literature which allows for more nuanced debates because different types of appropriation have distinct lit bases—they vastly overlimit

#### 2] Aff Ground—no advantage applies to all res pics since each is different – pics are worse than aff spec since negs have generics like the property rights nc, cap good, and the set col k but affs don’t have anything to restart with vs pics and the barrier to entry for pics is lower because they don’t require solvency advocates or robust lit - not potential abuse

#### 3] Functional limits: only so many affs have impacts and solvency advocates—small affs lose to generics because they have no offense specific to that type of appropriation. Even if they have a big case list it doesn’t matter because the same arguments apply to all of those affs

#### 4] Reasonability—good is good enough and key to avoid substance crowdout

# CP ANSWERS

## Generic CP

### 1AR Template

#### 1.Perm do both – there is no reason why the CP and plan are mutually exclusive.

#### 2.Only multilateralism can solve for space debris and sustainable development. PTD assures that cooperation under an open access commons will prevent dangerous appropriation and will allocate resources to the public.

#### 3.Conditionality is a voter

#### Multiple worlds skews 2AC time and strategy—can’t justify a world and action in that world at the same time—neg wins on inevitable tactical errors not strategy.

#### Kills advocacy skills—1NC construction is just an exercise in throwing different shells in the doc not thinking about interactions between them

#### It’s a voter for education and fairness—dispo solves all their offense.

## Public Guardianship CP

### 1AR – Public Guardianship CP

#### 1.No solvency – CP has no mechanism for assuring that principles of non-ownership will succeed – can’t solve sustainable development EXPAND MORE

#### 2.Anthropocentric views are the only way to allow for ecological movements to become social ecology

<https://www.researchgate.net/publication/231991798_Beyond_Anthropocentrism>

#### 3.Adler advocates for PTD

<https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3542342>

#### 4.Their Adler cards are specific to a small portion of water rights –they state that the only reason PTD won’t work for is because of geographic boundaries and pre-existing private property. Space won’t have any geographic boundaries or private property with PTD, this means MOST of their cards don’t apply

#### 5.International courts prevent liberation of public doctrines - prevents recessions, means PTD solves

<https://www.oxfordbibliographies.com/view/document/obo-9780199796953/obo-9780199796953-0207.xml>

#### 6.Huffman 15 speaks about PTD in relation to “vested property rights.” Aff removes the ability vested property rights in space, it puts everything under an open access commons. This means that the reasons for “PTD expansion bad” won’t exist – the legal regulatory balance won’t be shattered because this version of PTD isn’t contingent upon existing property rights.

#### 7.Adler concludes that PTD is only way to solve for economic growth

https://books.google.com/books?id=0jaGvnlMZqYC&pg=PA201&lpg=PA201&dq=The+Law+at+the+Water%27s+Edge:+Limits+to+%22Ownership%22+of+Aquatic+Ecosystems,+in+Wet+Growth:+Should+Water+Law+Control+Land+Use%3F&source=bl&ots=NQqzveqJPU&sig=qCMxDdHqnUI5815S2lAEAWixftE&hl=en&ei=a5ySTNDcGoS6sQPN04DACg&sa=X&oi=book\_result&ct=result#v=onepage&q&f=false

## OST CP

### 1AR – OST CP

#### 1.Perm do both – there is no reason why the CP and plan are mutually exclusive.

#### 2.Only multilateralism can solve for space debris and sustainable development. PTD assures that cooperation under an open access commons will prevent dangerous appropriation and will allocate resources to the public.

#### 3.Private company appropriation undermines OST – private entity appropriation worsens public sector and CP doesn’t solve for private surveillance loophole

**Stockwell 20**

(Samuel Stockwell, “Legal ‘Black holes’ in Outer Space: The Regulation of Private Space,” E-International Relations, 06-20-2020, <https://www.e-ir.info/2020/07/20/legal-black-holes-in-outer-space-the-regulation-of-private-space-companies/>)

On 30th April 2020, NASA – the US government’s space agency – awarded three private space companies a joint-contract worth $967m to complete a lunar mission by 2024, in what was celebrated as “the last piece that [America] need[s] in order to get to the moon” by NASA administrator Jim Brindestine (The Telegraph, 2020). Yet, whilst this development was widely covered in the media, less coverage has focused on the extent to which existing international legislation surrounding outer space endeavours appropriately applies to private entities. Indeed, the prospect of a corporate foothold within the extra-terrestrial do has thrown up both a mixture of optimism and concern regarding the potential benefits of expanding capital projects into space (Adolph, 2006; Dickens & Ormrod, 2007).

The US government’s support for private space companies is also likely to lead to the **reinforcement** of Earth-bound wealth **inequalities in space**. Many NewSpace actors frame their long-term ambitions in space with strong anthropogenic undertones, by offering the salvation of the human race from impending extinction through off-world colonial developments (Kearnes & Dooren: 2017: 182). Yet, this type of discourse disguises the highly exclusive nature of these missions. Whilst they seem to suggest that there is a stake for ordinary citizens in the vast space frontier, the reality is that these self-described space pioneers are a member of **a narrow ‘cosmic elite’** – “founders of Amazon.com, Microsoft, Pay Pal… and a smattering of games designers and hotel magnates” (Parker, 2009: 91).

Indeed, private space enterprises have themselves suggested that they have **no obligation** to share mineral resources extracted in space with the **global community** (Klinger, 2017: 208). This is reflected in the speeches of individuals such as Nathan Ingraham, a senior editor at the tech site EngadAsteroid mining, who claimed that asteroid mining was “how [America is] going to move into space and develop the next Vegas Strip” (Shaer, 2016: 50). Such comments highlight a form of what Beery (2016) defines as ‘scalar politics’. In similar ways to the ‘scaling’ of unequal international relations that has constituted our relationship with outer space under the guise of the ‘global commons’ (Beery, 2016: 99), private companies – through their anthropogenic discourse – are scaling existing Earth-bound wealth inequalities and social relations into space by siphoning off extra-terrestrial resources. By constructing their endeavours in ways that appeal to the common good, NewSpace actors are therefore concealing the reality of how commercial resource extraction serves the exclusive interests of their private shareholders at the expense of the vast majority of the global population.

Starting in 2013, the leaking of classified information by former US National Security Agency employee Edward Snowden revealed the extent to which American intelligence agencies were collaborating with the private sector in mass surveillance operations (Bauman *et al*., 2014). In what has been described as the ‘securitisation’ of society, contemporary states have shifted from “politics to policing and from governing to managing” the public, which has often occurred without the consent or knowledge of their citizens (Petit, 2020: 31). While such practices have conventionally been Earth-bound in nature, the space domain provides an entirely radical and strategically beneficial perspective for conducting surveillance through satellites.

Although many commercial US satellites provide an array of environmental and internet capabilities on Earth, they are also absolutely essential from a national security perspective of maintaining US space superiority (Chatters IV & Crothers, 2009: 257). This is known as the “dual-use” nature of satellites, where civilian and military purposes are blurred into a single observational system and can be adapted for different functions when necessary (Lubojemski, 2019: 128-129). Dual-use satellite technology has been vital for the US military in offering a tactical edge on the battlefield, with 80% of its satellite communications needs being derived from commercial satellites (Hampson, 2017: 7). The reliance on these networks forms a component of the broader US military doctrine of ‘space control’, part of which aims to secure the transmission of commercial satellite data that will prevent the exposure of sensitive military tactics (Peña & Hudgins, 2002).

Whilst the OST does not contain any clauses specifying the rules or regulations of data monitoring in space, any form of malicious or illegal surveillance can be seen to violate Article XI, which requires states to: “Inform the Secretary-General of the United Nations as well as to the public and international scientific community, to the greatest extent feasible and practical, of the nature, conduct, locations and results of [space] activities” (UN, 1967). Yet, legal scholars have claimed that this clause is significantly weak, since states can withhold vital information about their space activities on the basis that the dissemination of such information is neither ‘feasible’ nor ‘practical’ (Chatterjee, 2014: 31-32). The absence of any clear UN guidelines has also meant that American satellite corporations are increasingly capable of refusing to state their intentions, or who their customers are – with the US government being one of these elusive clients.

In many ways this strategy can also be seen as facilitating a ‘global panoptical’ intelligence network (Backer, 2008). By extending the private-public hybrid structure of surveillance into outer space, businesses and governments have the opportunity to observe millions of global citizens unknowingly at any one point – and with it – immense amounts of data. Given that GeoEye received nearly two million dollars in contract-related fees from the US government for its Ikonos pictures (The New York Times, 2001), this could incentivise the commercial satellite industry to continue to restrict data that might serve the interests of citizens globally. As such, satellite imaging may turn into a form of orbital data-siphoning where companies conducting observations in space could sell off their data to the highest bidder, with a **concerning** disregard for privacy rights. Indeed, the revelations surrounding Cambridge Analytica and Facebook have underscored the extent to which private entities are monetising off the sensitive information of their consumers unknowingly (Balkin, 2018: 2050-2051).

The inability of the OST to properly promote environmental considerations in space has been mirrored in the NewSpace community, where there has been a woeful lack of ecological consideration: “The hundreds of articles and books on outer space resource development seldom mention that such actions may adversely affect the environment in ways that will potentially disadvantage their enterprises and the humans that will be required to implement them” (Kramer, 2017: 136). Such images evoke the types of difficulties that private firms have encountered on Earth reconciling capital with the environment in a way that doesn’t damage profit margins (Magdoff & Foster, 2011: 61-66). Yet in doing so, this neglect is only likely to result in the proliferation of extra-terrestrial debris that the UN OST failed to address. Indeed, despite its vastness there is only a narrow region of orbital space that is either useable or beneficial for prolonged human missions (Brearley, 2005: 2), meaning that the increase in space debris from these massive commercial satellite constellations will likely be at the detriment of developing nations who have yet fostered spacefaring capabilities.

#### 4. Private property rights in space make sustainable development impossible

**Babcock, 19** -- Professor of Law, Georgetown University Law Center

[Hope M., B.A., Smith College; L.L.B., Yale, "The Public Trust Doctrine, Outer Space, and the Global Commons: The to Call Home ET", Syracuse Law Review, Vol. 69, No. 2, 2019, p. 191-262, <https://scholarship.law.georgetown.edu/facpub/2201>, accessed 1-14-22]

But, private property can also “**enhance** income disparity, exacerbate economic tensions among individuals, and **consolidate power** among the one percent.”251 M. Alexander Pearl calls property privatization “a **black hole** focused solely on centralization of power and economic wealth without regard to the **sustainability** of an essential resource or the communities that depend upon its continued existence.”252 Hanoch Dagan goes further, quoting Eric Posner and Glen Weyl, by saying, The key remedy for this predicament is to eradicate the institution of private ownership. Since “private ownership of any asset, except homogenous commodities, may hamper allocative efficiency,” we need to reconstruct markets so they are “competitive by design.” More precisely, **we must discard private property** and adopt in its stead a regime that partly transfers property’s “two most important ‘sticks’”— the right to use and the right to exclude—”from the possessor to the public at large.”253 When the value of a resource is increasing, it is more likely to be privatized so that the entity responsible for developing it can “fully capture the resulting benefits.”254 Indeed, a movement from common to private property occurs when the efficiency gains from private property are more than the costs of creating and maintaining it, such as “the basic costs of exclusion (fences, guards, and so on) and the extra vigilance.needed to deter interlopers from absconding with rising-value resources.”255 This balancing of costs and benefits may be irrelevant in outer space, as the costs of establishing private property in the first place would be huge, and the complexity and cost of technological innovations called for in outer space would be magnitudes greater than what is required on Earth.256

“By the time space in capable nations develop the technological prowess and capital reserves to fund meaningful development of outer space, the earlier space-faring nations [and their citizens], left unchecked, might already have locked up the most accessible and valuable resources.”294 This would carry forward current disparities in global wealth distribution into the “Space Age.”295 The argument against a right of first possession gains salience from the fact that prior wrongs inflicted on less developed countries may be the reason they are not “space-capable.”296 This inequitable situation would persist, as those who profit from private property rules like the right of first possession will have the political ties, money, and understanding of the “rules of the game” to prevent their reform.297 An additional problem with the proposal is its enforceability. The fact that outer space is infinite makes it more difficult to “police” and to enforce the various treaties that apply to it.298 In outer space, “a breaching private party could pursue its interests outside the scope of such an agreement with relative impunity before it was discovered by the relevant international authority.”299

However, “[t]here are **drawback**s to forming a new international body to oversee the exploitation of space resources.”322 They can be expensive to establish and support.323 Non-spacefaring nations might not want to invest money in a venture which might “freeze them out of the decision-making process and put them at a disadvantage if they someday are able to participate in lunar missions.”324 There are the inevitable questions that arise whenever a new international governing organization is created, such as whether it should be under the authority of the United Nations or be completely independent, and how power should be allocated between spacefaring nations and developing countries without the expertise of money to venture into space.325 Further, there is an underlying equity question about spending money to create a new administrative authority.326 That authority will spend money that might otherwise have helped **poorer countries** develop the capacity to participate in outer space directly.32

Common property is property, the rights to which belong to more than one entity.356 Like private property, common property is endemic to life in the United States and always has been, even though many Americans view it ambivalently.357 There is considerable overlap between property held in common and that which is privately owned. Carol Rose suggests that collective, but privately owned property, like a tenancy in common, “has all the hallmarks of individual private property,” and, therefore, should not be seen as “fundamentally problematic or prone to inefficient use.”358 Additionally, the plasticity of the commons, demonstrated by the appearance of new commons, like the “knowledge commons, cultural commons, infrastructure commons, and neighborhood commons,” indicates that the concept might fit in outer space.359 A commons, or CPR, is frequently asserted to resist “privatization and/or commodification of those resources,” making it oppositional to a claim that something is private property.360 Sheila Foster and Christian Iaione’s suggestion that the “language of the ‘commons’” is often used to prevent the enclosure of public urban space “by economic elites,” resonates with the situation in outer space where wealthy countries or private companies want to claim or enclose space that the public owns.361 A claim that something is a commons acknowledges that “it is a shared resource that belongs to all of its inhabitants,”362 like outer space, which is the “province of all mankind.”363

The way to prevent a tragedy on land held in common is not necessarily its transformation to private property, which is one solution Hardin called for.386 Oran Young says “institutional innovation,” like individual transferable quotas, “can create a form of private property and, in the process, alleviate the perverse incentives arising from the condition of non-excludability.”387 Creating public property or, in the alternative, using regulatory controls can also avoid the tragedy to the commons.388 The owners of a commons can also self-regulate to control the adverse effects of non-excludability.389

#### AND

#### Turn – the costs of establishing private property rights in the first place bury the possibility for sustainable development. They can’t gain access to solvency without the establishment of private property rights, and this means that my impacts are going to be worsened in the meantime. The ATTEMPT to establish private property rights destroy sustainable development and entrenches inequality, meaning that competition spirals. That was Islam 18. Before we can even get into space in the first place, we are going to be dead because of climate change.

**5.Allowing for private companies to appropriate space resources undermines cooperation – companies are in it for profit, not the common good. A “trust” could easily be bought out by Bezos or Musk, no regulatory assurance.**

#### 5.Conditionality is a voter

#### Multiple worlds skews 2AC time and strategy—can’t justify a world and action in that world at the same time—neg wins on inevitable tactical errors not strategy.

#### Kills advocacy skills—1NC construction is just an exercise in throwing different shells in the doc not thinking about interactions between them

1. **Mutiple CP’s are bad in and of themselves, but multiple conditional counterplans wreck aff ground. The 1AR has four minutes to defend case as well as respond to everything that the neg says, allowing for the neg to run 6 off with multiple conditional counterplans is abusive. Reject the team.**

#### It’s a voter for education and fairness—dispo solves all their offense.

## Maritime Law CP

### 1AR – Maritime Law CP

#### 1.No solvency for sustainable development. Climate change causes extinction, resilience fails – it worsens every impact.

#### 2. Space debris is best resolved through regulation – regulating private entities’ ability to continuously put satellites in space deters the ability for debris to become harmful.

#### 3.They can fiat the declaration, they can’t fiat companies actually enacting the plan. Private companies won’t follow through, this would disrupt their interest.

#### 4. Can't solve small space debris. Small debris can't be profitable but can cause collisions at high speed. 5. Timeframe solvency deficit - the development, launching, and profitability of private sector space debris removal is a long way away. They can't fiat out of this delay.

## US PIC

### 1AR – US PIC

#### 1.No solvency, global cooperation is defeated if a major international actor decides that they don’t want to participate. Other countries will follow suite if the US doesn’t go with PTD.

#### 2.PIC’s are illegit –

**A. Infinitely regressive – they can just narrow down the aff however they choose - the aff can never fully be prepared**

**B. Steal aff ground – they don’t have to do any research for their own DA’s or CP’s, they can just change a few words of the aff and call it good**

#### 3.No terminal impact – extinction outweighs

## Orbital Fees CP

### 1AR – Orbital Fees

#### 1.Perm do both – there is no reason why the CP and plan are mutually exclusive.

#### 2.No impact – extinction outweighs. No reason why we should care about the economy.

## Space Debris CP

### 1AR – Space Debris CP

#### 1. Perm do both – there is no reason why the CP and plan are mutually exclusive.

#### 2.No solvency for sustainable development. Climate change causes extinction, resilience fails – it worsens every impact.

#### 3. Space debris is best resolved through regulation – regulating private entities’ ability to continuously put satellites in space deters the ability for debris to become harmful.

#### 4.They can fiat the declaration, they can’t fiat companies actually enacting the plan. Private companies won’t follow through, this would disrupt their interest.

# DA ANSWERS

## Space Shock DA

### 1AR – Space Shock DA

#### 1.Card is in reference to “space shock” that would happen if US and China solely decided to coop, PTD solves. No reason for shock when everyone is involved.

## Politics DA – Harker

## Mining DA

### 1AR Mining DA

#### 1. TURN- PTD solves mining better-

#### (A) Duplication- Private ventures result in wasted efforts to develop and deploy resources- PTD better for sharing methods and efforts among countries

#### (B) Racing- private appropriation results in inefficient “get-it-while-you can” activities- that’s Raclin.

#### 2. Case outweighs and turns the DA-

#### (A) Space war- destroys all infrastructure and crushes the economy- that’s Grego

#### (B) Debris- Kessler means you can’t leave the planet- that’s Johnson

#### Also mining independently causes debris

**Scoles, 15** -- Reporter at New Scientist

[Sarah, "Dust from asteroid mining spells danger for satellites," New Scientist, 5-27-15, https://www.newscientist.com/article/mg22630235-100-dust-from-asteroid-mining-spells-danger-for-satellites/, accessed 6-25-21]

IF THE gold mine is too far from home, why not move it nearby? It sounds like a fantasy, but would-be miners are already dreaming up ways to drag resource-rich space rocks closer to home. Trouble is, that could **threaten** the web of **satellites** around Earth. Asteroids are not only stepping stones for cosmic colonisation, but may contain metals like gold, platinum, iron and titanium, plus life-sustaining hydrogen and oxygen, and rocket-fuelling ammonia. Space age forty-niners can either try to work an asteroid where it is, or tug it into a more convenient orbit. NASA chose the second option for its Asteroid Redirect Mission, which aims to pluck a boulder from an asteroid’s surface and relocate it to a stable orbit around the moon. But an asteroid’s gravity is **so weak** that it’s not hard for surface particles to **escape into space**. Now a new model warns that debris shed by such transplanted rocks could **intrude** where many defence and communication satellites live – in geosynchronous orbit. According to Casey Handmer of the California Institute of Technology in Pasadena and Javier Roa of the Technical University of Madrid in Spain, 5 per cent of the escaped debris will end up in regions traversed by satellites. Over 10 years, it would cross geosynchronous orbit **63 times** on average. A satellite in the wrong spot at the wrong time will suffer a **damaging high-speed collision** with that dust. The study also looks at the “catastrophic disruption” of an asteroid 5 metres across or bigger. Its total break-up into a pile of rubble would increase the risk to satellites by more than 30 per cent (arxiv.org/abs/1505.03800). That may not have immediate consequences. But as Earth orbits get **more crowded** with spent rocket stages and satellites, we will have to worry about **cascades of collisions** like the one depicted in the movie Gravity.

#### (C) Coop- key to effectively implementing climate resilience which means case solves the DA- that’s Santos

#### 3. Appropriation not key-

#### (A) Empirically false- companies are going into space now without appropriation

#### (B) PTD solves- it allows private entities to use trust resources AND also allows things like permitting which solves better because they will only be granted to the firms that will invest in sustainably harvesting resources

#### (C) Property rights worse- appropriation leads to indeterminate rights claims since there is no legal authority nor geographical boundary to determine or enforce property rights. That leads to inefficiency scrambles that inevitably spiral into war because there’s no way to enforce breaches

#### (D) Speculation- firms will not efficiently use resources but hold them to sell for profit which reduces incentives- that’s all Babcock

#### 4. Sustainable development turns the DA-

#### (A) Over-consumption- they strip resources faster than we can get to them- depletion creates shocks to the system which cascade

#### (B) Vicious rivalry- firms inefficiently expend resources vying for territory which creates drags on efficiency and risk accidents and war- that’s also all Babcock

### Asteroids

#### Unregulated mining causes asteroid deflection and astroterror

**Drmola and Mareš 15** - Jakub Drmola is a PhD student and Miroslav Mareš professor, at the Divison of Security and Strategic Studies, Masaryk University, Czech Republic, "Revisiting the deflection dilemma", *Astronomy & Geophysics*, Volume 56, Issue 5, October 2015, Pages 5.15–5.18, <https://academic.oup.com/astrogeo/article/56/5/5.15/235650>

There are two basic ways to go about moving the resources contained within a given asteroid to the Earth. They can be extracted from the asteroid during its natural orbit and then transported to the Earth, or the entire asteroid might be moved closer to a more convenient location before starting mining. Thus repositioned, it might even be used as a shielded habitat, once hollowed out (Ostro 1999). There are different speculative costs and benefits associated with either option, which would vary with the size, orbit and composition of the asteroid. But, crucially, the second option would entail putting asteroids into orbit around the Earth, the Moon or possibly at one of the Earth’s Lagrangian points. Indeed, NASA has already planned a mission to capture a small asteroid and place it in a high cislunar orbit, where it would serve as a destination for future manned missions and experiments. This “Asteroid Redirect Mission” is to take place in the next decade and is being pitched mainly as a stepping stone towards a future mission to Mars (see box “NASA’s Asteroid Redirect Mission”; Brophy et al. 2012, Burchell 2014, Gates et al. 2015). Programmes to redirect asteroids and, especially, plans to mine asteroids on an industrial scale essentially resurrect the deflection dilemma. But it is no longer a matter of superpowers intentionally misusing technology designed to prevent dangerous impacts. It becomes an issue of proliferation among private entities. Once private mining companies acquire the technical ability to redirect suitable NEOs (Baoyin et al. 2011) in order to extract platinum or water from them, perilous inflections become more likely. The probability of accidents will rise with the number of asteroids whose trajectories we decide to manipulate. Such accidents might be very unlikely, but even a tiny technical or human error in the execution of an inflection meant to place an asteroid into the lunar or geocentric orbit might send it crashing into the Earth with potentially devastating consequences.And while we might find solace in the low probabilities associated with such an accident, even contemporary industries which are considered very safe suffer from unlikely tragedies. Despite being dependable and reliable, airliners do crash; there are a lot of them flying and very improbable accidents do happen if the dice are rolled often enough. Undoubtedly, we will not be steering as many asteroids as we steer planes any time soon, but industries tend to be more accident-prone during their infancy. Furthermore, a single asteroid can do a lot more damage than a single plane. And who is to say how much metal or water we are going to need in space over the course of the 21st century, or the next? The second source of risk is the intentional misuse, similar to the original deflection dilemma. But the entry barrier for asteroid weaponization gets much lower if mining them and moving them around becomes a common industrial activity. This is in stark contrast to the original scenario which envisioned this technology to be used solely for planetary defence and under control of a very small number of the most powerful countries (Morrison 2010). If such a powerful technology becomes widely and commercially available, even rogue states and wellfunded terrorist groups might be tempted to use it for an unexpected and devastating attack. In addition, an active asteroid mining industry would make it more difficult to detect any hostile inflection attempts among the number of legitimate and benign ones. Policy implications Considering these possible future dangers, it seems prudent to consider what to do about them sooner rather than later. The most obvious “solution” would be a blanket ban on the development of any technology that might lead to artificially inflected asteroids crashing into the Earth. However, such a ban would be incompatible with the dream of increased presence of humans in the solar system. It would stymie both scientific exploration and economic development here on Earth, which is increasingly dependent on precious metals and spacebased technologies. Furthermore, this approach would leave us more vulnerable to natural impacts which, in the long view, seems less than desirable. Another approach might be similar to the current regime of non-proliferation of nuclear weapons, aiming to support peaceful civilian use of nuclear power while at the same time prohibiting the spread of weapons of mass destruction. The regime mostly works (with caveats, see Wood et al. 2008) because these applications require different infrastructures and fissile materials enriched to different levels of purity. This makes it possible, at least in principle, to tell apart operations meant for the production of electricity and those designed to create weapons. Unfortunately, the difference between legitimate and hostile trajectory modification would lie only in the acceleration imparted on the asteroid and not in the technical means to do it. As the spacecraft launched with the intent to cause impact with the Earth might be identical to those sent off to retrieve resources, telling them apart would be nearly impossible, until it was too late. And this approach makes no difference to the chances of an industrial accident. If monitoring equipment on Earth is unhelpful, the focus changes to space. In other words, all asteroid movement missions should be constantly monitored. For an attacker, it would make most sense to delay the final course adjustment for as long as possible in order to give the least warning and make the timeframe for reaction as short as possible. So an asteroid might head towards a safe orbit fit for resource extraction for most of its altered flight time, but be further accelerated at the last possible moment onto an impact trajectory, perhaps mere days before it hits a major city. Our current programmes cataloguing NEOs (such as CSS or Pan-STARRS), which look for new, previously unknown objects, are not ideally suited for the task of constantly tracking a number of different, already known asteroids. New instruments would be needed to track them in order to immediately detect any hazardous inflection, whether intentional or accidental. Once such a detection is made, emergency measures to evacuate the population or, preferably, to “re-deflect” the incoming object can be executed right away, regardless of the cause. Accidents and hostilities could be treated the same way and countered by the same system (initially, at least). Such a system would be more akin to an air traffic control than a non-proliferation regulation, offering security through vigilance, rather than absence. Additionally, development of a system able to deflect incoming objects at relatively short notice would be beneficial in case of an impending natural impact. Conclusion Perhaps none of these concerns will become relevant. Maybe the idea of asteroid mining will soon fizzle out because we will discover cheaper and more efficient local alternatives. Maybe humanity will lose the will or the capability to explore space any further. Or perhaps manipulating asteroid trajectories will prove impractical or too costly. Certainly, it would not be the first time that a promising and seemingly obvious future does not come about. In the 1960s it seemed almost self-evident that by the second decade of the 21st century we would have flying cars and a base on the Moon. Yet we do not. Asteroid mining might be a similar case of unfulfilled promises and misplaced visions. On the other hand, there are examples of industries that developed surprisingly fast despite being considered unrealistic, not too long ago**:** air travel, nuclear power generation, or commercial satellites. The spread of the internet and the accompanying digital information revolution is another example; hardly anyone anticipated having virtually the entire repository of human knowledge at our fingertip**s** at all times (except Douglas Adams). Whether the deflection dilemma forever remains an unmaterialized threat or it becomes a palpable problem, it is something to be mindful of now, as the foundations of the prospective asteroid mining industry are being laid. In the end, the purpose of this paper is not to predict the future. Instead it aims to merely update a conscientious warning which called for our diligence more than 20 years ago. While the world has changed somewhat, the basic idea remains valid. Whether the danger comes from warring superpowers, terrorists or negligent corporations, we must be aware of the realistic risks in order to avoid being either stumped by unforeseen catastrophes or paralysed by unwarranted fear. Either extreme would be harmful for our future.●

### Gold Rush

#### Private entities will “dry up” every resource

**Sample, 19** -- PhD, science editor of the Guardian

[Ian, PhD in biomedical materials from Queen Mary's, University of London, "Protect solar system from mining 'gold rush', say scientists," The Guardian, 5-12-19, <https://www.theguardian.com/science/2019/may/12/protect-solar-system-space-mining-gold-rush-say-scientists>, accessed 1-14-22]

Great swathes of the solar system should be preserved as official “space wilderness” to protect planets, moons and other heavenly bodies from **rampant mining** and other forms of industrial **exploitation**, scientists say.

The proposal calls for more than 85% of the solar system to be placed off-limits to human development, leaving little more than an eighth for space firms to mine for precious metals, minerals and other valuable materials.

While the limit would protect pristine worlds from the worst excesses of human activity, its primary goal is to ensure that humanity avoids a **catastrophic future** in which all of the resources within its reach are **permanently used up**.

“If we don’t think about this now, we will go ahead as we always have, and in a few hundred years we will face an **extreme crisis**, much worse than we have on Earth now,” said Martin Elvis, a senior astrophysicist at the Smithsonian Astrophysical Observatory in Cambridge, Massachusetts. “Once you’ve exploited the solar system, there’s nowhere left to go.”

Fledgling space mining companies have set their sights on trillions of pounds worth of iron and precious metals locked up in asteroids, along with valuable minerals and trillions of tonnes of water on the moon. In Britain, the Asteroid Mining Corporation hopes to send a satellite into orbit in the coming years to prospect for nearby asteroids.

Precious metals such as platinum and gold could be ferried back to Earth, but much of the mined material would be used in space to build habitats on the moon and make rocket fuel. The European Space Agency has plans for a moon village that foresees buildings and equipment installed on the lunar surface. Meanwhile water ice, such as that beneath the lunar poles, can be split into hydrogen and oxygen and used to make fuel for probes that launch from space instead of Earth.

Working with Tony Milligan, a philosopher at King’s College London, Elvis analysed how soon humans might use up the solar system’s most accessible resources should space mining take off. They found that an annual growth rate of 3.5% would use up an eighth of the solar system’s realistic resources in 400 years. At that point, humanity would have **only 60 years** to apply the brakes and **avoid exhausting the supply completely**.

Because humans might struggle to mine the sun, or extract useful materials from Jupiter, a gas giant with more mass than the rest of the solar system’s planets combined, the researchers see asteroids, the moon, Mars and other rocky planets as the most realistic targets for space miners. Elvis points out that one eighth of the iron in the asteroid belt is more than a million times greater that the estimated iron ore reserves on Earth, which may suffice for centuries.

But which areas to protect from mining is a nuanced decision, the scientists write in a forthcoming issue of Acta Astronautica. The Valles Marineris on Mars, the largest canyon in the solar system, might deserve protection as much as the Grand Canyon is protected on Earth. But there are other sites too, said Elvis. “Do we want cities on the near side of the moon that light up at night? Would that be inspiring or horrifying? And what about the rings of Saturn? They are beautiful, almost pure water ice. Is it OK to mine those so that in 100 years they are gone?”

“If everything goes right, we could be sending our first mining missions into space within 10 years,” he added. “Once it starts and somebody makes an enormous profit, there will be the equivalent of a **gold rush**. We need to take it seriously.”

#### Turn - A mining gold rush in space dries up resources in the solar system within a few decades – that’s existential

**Khan 19** Sieeka Khan [Providing the latest research, discoveries and scientific breakthroughs for science enthusiasts.], 5-15-2019, "Space Mining Could Ruin Our Solar System, Researchers Warn," Science Times, <https://www.sciencetimes.com/articles/21813/20190515/space-mining-could-ruin-our-solar-system-researchers-warn.htm> DD AG

The government has been passing laws regarding the protection of the Earth's most vulnerable places from the ravages of different industries, but a new study suggests **that** our planet is not the only one that needs protecting from human exploitation. A study published on April 16 in the journal Acta Astronautica makes a case for designating at least 85% of the solar system should be protected wilderness similar to the Earth's national parks. This leaves just 1/8th of moons, asteroids and eligible planets free to be mined or developed by human interest.In the study, it mention if the growth of space economy is similar to the exponential growth of terrestrial economies since the Industrial Revolution, then humans could deplete the solar system of all its iron, water and other resources that are mineable, in a matter of centuries. This could potentially leave the solar system all dried up in just 500 years. "On a timescale of less than a millennium we could have super-exploitation of the entire solar system out to its most distant edges," the authors wrote. "Then, we are done." Limiting the exploitation of resources on other planets now, before the space economy progresses, is needed to avoid what the authors call "a crisis of potentially catastrophic proportions". Limiting the galactic consumption to 1/8th of the available resources may sound like a bad deal, but space is a huge place and even a small fraction of our solar system's bounty could set humans up for generations."One-eighth of the iron in the asteroid belt is more than a million times greater than all of the Earth's currently estimated iron ore reserves," the authors wrote, "and it may well suffice for centuries." The researchers looked at the estimated iron use on Earth since the beginning of the Industrial Revolution and come up with the "1/8th principle". According to a survey in 1994 regarding the environmental impacts of the revolution, the global production of crude iron increased from half a million tons in 1800 to half a billion tons of steel produced in 1994. This rate is equivalent to the world's iron production doubling once every 20 years. The new data from the U.S Geological Survey supports this estimate as the world's iron production increased from 1 billion tons in 994 to 2.2 billion tons in 2016.If humans show the same level of industriousness when mining the resources on moons, asteroids and nearby planets, we could reach the hypothetical 1/8th point after 400 years. If the production continues to double every 20 years after **that, all of the resources in the solar system would be depleted in just 60 years**. This would give humans 60 years to change from a space resource-based economy to an unhopeful prospect, given the nonchalant response to the current environmental crises that we are facing, such as climate change and population growth.

### Space Conflicts

#### Appropriation causes space conflicts

Ramin **Skibba 18**, science writer and astrophysicist based in Santa Cruz and San Diego., “ Mining in Space Could Lead to Conflicts on Earth,” Nautilus, 5-2-2018, <https://nautil.us/blog/-mining-in-space-could-lead-to-conflicts-on-earth>

Space mining is no longer science fiction. By the 2020s, Planetary Resources and Deep Space Industries—for-profit space-mining companies cooperating with NASA—will be sending out swarms of tiny satellites to assess the composition of hurtling hunks of cosmic debris, identify the most lucrative ones, and harvest them. They’ve already developed prototype spacecraft to do the job. Some people—like Massachusetts Institute of Technology planetary scientist Sara Seager, former NASA deputy administrator Lori Garver, and science writer Phil Plait—argue that, to continue advancing as a space-faring species, we need to embrace this commercial space mining industry, and perhaps even facilitate it, too. But should we? This question concerns me, as both an astrophysicist and a space enthusiast. Before becoming a science communicator, I worked for 15 years researching the evolution of galaxies, the properties of dark matter, and the expansion of the universe. From that perspective, the distance from us to the asteroid belt is actually rather small, so the question of whether to mine it, and in what way, hits close to home. The Space Act of 2015 authorizes the U.S. president “to facilitate the commercial exploration and utilization of space resources to meet national needs.” It’s an exciting prospect, to be sure, but also a troubling one. **For one thing, it appears to violate international law**, according to Congressional testimony by Joanne Gabrynowicz, a space law expert at the University of Mississippi. Before NASA’s moon landing, the United States—along with other United Nations Security Council members and many other countries—signed the 1967 Outer Space Treaty. “Outer space, including the moon and other celestial bodies,” it states, “is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means.” The 1979 Moon Agreement went further, declaring outer space to be the “common heritage of mankind” and explicitly forbidding any state or organization from annexing (non-Earth) natural resources in the solar system. Major space-faring nations are not among the 16 countries party to the treaty, but they should arguably come to some equitable agreement, **since international competition over natural resources in space may very well transform into conflict**. Take platinum-group metals. Mining companies have found about 100,000 metric tons of the stuff in deposits worldwide, mostly in South Africa and Russia, amounting to $10 billion worth of production per year, according to the U.S. Geological Survey. These supplies should last several decades if demand for them doesn’t rise dramatically. (According to Bloomberg, supply for platinum-group metals is constrained while demand is increasing.) Palladium, for example, valued for its conductive properties and chemical stability, is used in hundreds of millions of electronic devices sold annually for electrodes and connector platings, but it’s relatively scarce on Earth. A single giant, platinum-rich asteroid could contain as much platinum-group metals as all reserves on Earth, the Google-backed Planetary Resources claims. That’s a massive bounty. As Planetary Resources and other U.S. and foreign companies scramble for control over these valuable space minerals, competing “land grabs” **by armed satellites may come next.** Platinum-group metals in space may serve the same role as oil has on Earth, **threatening to extend geopolitical struggles into astropolitical ones**, something Trump is keen on preparing for. Yesterday he said he’s seriously weighing the idea of a “Space Force” military branch. Moreover, the technology that might enable this free-for-all—versatile “nanosatellites,” no larger than a loaf of bread—is relatively inexpensive. While reporting for a story about these tiny satellites, also known as CubeSats, I came across some missions applicable to mining asteroids. In November, NASA will launch a satellite for a mission called Near-Earth Asteroid Scout, for example. It will deploy a solar sail, propel itself with sunlight, and journey to the asteroid belt, where it will scope out a particular asteroid and analyze its properties. NASA has also awarded grants to Planetary Resources to advance the designs of spectral imagers and propulsion systems for CubeSats, and other missions will develop the satellites’ abilities to communicate and network with each other. NASA also awarded Deep Space Industries contracts to assess commercial approaches for NASA’s asteroid goals, which may involve hosting DSI’s asteroid-prospecting equipment on its missions. Like all forms of mining, it will be dangerous. If **space-mining activities break up asteroids, the resulting debris could be hazardous for satellites, other spacecraft, and astronauts nearby**. On the other hand, in a best-case scenario, space mining could be environmentally safe, capture only necessary minerals and water, and, in the more distant future even lead to the construction of a far-flung space station led by NASA and other space agencies, orbiting 200 million miles from Earth and serving as both a mining depot and a pit-stop for passing spacecraft. But it’s not clear that a pact between the commercial space mining industry and NASA would align with the public’s interest. NASA’s increasing collaboration with space mining companies could distort and divert efforts previously focused on space exploration and basic research, and discourage public interest and engagement in astronomy. For example, Seager advocated for space mining at a science writing conference I attended in 2015. She’s part of a motley group of advisors for Planetary Resources, including the movie director James Cameron, a lawyer for a prominent Washington D.C. firm, and Dante Lauretta, another astronomer whom I respect. Seager seems to believe that encouraging private space mining will lead to more investments and technological innovation that would enable more scientific research. In a 2012 interview with The Atlantic, for instance, she said, “The bottom line is that NASA is not working the best that it could for space science right now, and so in order for people like me to succeed with my own research goals, the commercial space industry needs to be able to succeed independently of government contracts.” But if the U.S. and U.S.-based companies lay claim to the richest and most easily accessible prospecting sites, not allowing other companies and nations to share in the wealth, **economic and political relations could be damaged**. That’s why this seems to be a dangerous path for space explorers. Once you’re on board with the commercial space industry, then you as a researcher must accept, if not support, everything that comes with it. Seager and a few other researchers may be willing to take this risk, but what about the rest of the space science community? Moreover, to succeed, these businesses will seek profitable missions, while science, exploration, and discovery—goals that stimulate public interest—will inevitably have lower priority. (Other commercial spaceflight companies, like Elon Musk’s SpaceX, do generate public interest, but they’re not directly involved in mining asteroids.) NASA may have its shortcomings, but at least its missions and research goals answer to the public. It’s not exactly a welcome thought to imagine more and more of our presence and activity in space being ceded, with NASA’s help, to private industry. What should happen instead? Commercial space mining and science would both be served well by decoupling from each other. We should treat outer space like we do Antarctica. That icy landscape is humankind’s common heritage, where we encourage scientific investigations and conservation and forbid territorial claims. **If some organizations want to mine asteroids, then we should take the time to develop and establish an international framework to regulate it properly.** Space-mining is an exciting opportunity to articulate our species’ role in our little galactic fragment. But it’s not just about sustainably managing limited or dwindling resources. It’s about our interactions with the nature beyond our humble world. We should explore the solar system as its steward without repeating our economically rapacious past.

### AT Private Actors Key

#### Private actors not key-

#### 1. History- the Space Race, Internet, and COVID vaccines were all extremely innovative and the result of public investment

#### 2. TURN- public appropriation creates private incentives and not vice versa since nations in space will lead to more private investment- BUT private entities are worse because they undermine sustainability and compete unproductively by creating duplicative efforts and undercutting cooperation

### Dangerous Mining

#### Private appropriation causes dangerous space mining and deregulation globally

Edd **Gent 20,** freelance science and technology writer, “Space Mining Should Be a Global Project—But It's Not Starting Off That Way,” Singularity Hub, 10-12-2020, <https://singularityhub.com/2020/10/12/the-us-is-trying-to-hijack-space-mining-and-there-could-be-disastrous-consequences/>

Exploiting the resources of outer space might be key to the future expansion of the human species. But researchers argue that the US is trying to skew the game in its favor, **with potentially disastrous consequences.** The enormous cost of lifting material into space means that any serious effort to colonize the solar system will require us to rely on resources beyond our atmosphere. Water will be the new gold thanks to its crucial role in sustaining life, as well as the fact it can be split into hydrogen fuel and oxygen for breathing. Regolith found on the surface of rocky bodies like the moon and Mars will be a crucial building material, while some companies think it will eventually be profitable to extract precious metals and rare earth elements from asteroids and return them to Earth. But so far, there’s little in the way of regulation designed to govern how these activities should be managed. Now two Canadian researchers argue in a paper in Science that recent policy moves by the US are part of a concerted effort to refocus international space cooperation **towards short-term commercial interests, which could precipitate a “race to the bottom” that sabotages efforts to safely manage the development of space.** Aaron Boley and Michael Byers at the University of British Columbia trace back the start of this push to the 2015 Commercial Space Launch Competitiveness Act, which gave US citizens and companies the right to own and sell space resources under US law. In April this year, President Trump doubled down with an executive order affirming the right to commercial space mining and explicitly rejecting the idea that space is a “global commons,” flying in the face of established international norms. Since then, NASA has announced that any countries wishing to partner on its forthcoming Artemis missions designed to establish a permanent human presence on the moon will have to sign bilateral agreements known as Artemis Accords. These agreements will enshrine the idea that commercial space mining will be governed by national laws rather than international ones, the authors write, and that companies can declare “safety zones” around their operations to exclude others. Speaking to Space.com Mike Gold, the acting associate administrator for NASA’s Office of International and Interagency Relations, disputes the authors’ characterization of the accords and says they are based on the internationally-recognized Outer Space Treaty. He says they don’t include agreement on national regulation of mining or companies’ rights to establish safety zones, though they do assert the right to extract and use space resources. But given that they’ve yet to be released or even finalized, it’s not clear how far these rights extend or how they are enshrined in the agreements. And the authors point out that the fact that they are being negotiated bilaterally means the US will be able to use its dominant position to push its interpretation of international law and its overtly commercial goals for space development. Space policy designed around the exploitation of resources holds many dangers, say the paper authors. For a start, loosely-regulated space mining could result in the destruction of deposits that could hold invaluable scientific information. **It could also kick up dangerous amounts of lunar dust that can cause serious damage to space vehicles, increase the amount of space debris, or in a worst-case scenario, create meteorites that could threaten satellites or even impact Earth.** By eschewing a multilateral approach to setting space policy, **the US also opens the door to a free-for-all where every country makes up its own rules**. Russia is highly critical of the Artemis Accords process and China appears to be frozen out of it, suggesting that two major space powers will not be bound by the new rules. That potentially sets the scene for a race to the bottom, where countries compete to set the laxest rules for space mining to attract investment. The authors call on other nations to speak up and attempt to set rules through the UN Committee on the Peaceful Uses of Outer Space. Writing in The Conversation, Scott Shackelford from Indiana University suggests a good model could be the 1959 Antarctic Treaty, which froze territorial claims and reserved the continent for “peaceful purposes” and “scientific investigation.” But the momentum behind the US’ push might be difficult to overcome. Last month, the agency announced it would pay companies to excavate small amounts of regolith on the moon. Boley and Byers admit that if this went ahead and was not protested by other nations, **it could set a precedent in international law that would be hard to overcome.** For better or worse, it seems that US dominance in space exploration means it’s in the driver’s seat when it comes to setting the rules. As they say, to the victor go the spoils.

### No Asteroids

#### At most, there are only 10 asteroids that we can access, meaning that the climate change benefits are limited.

**Physics arXiv Blog, 13**

Physics arXiv Blog, “‘Elvis Equation’ Estimates Number of Asteroids Worth Mining (Spoiler: Not Very Many),” January 2014, Medium, Accessed July 16, 2021, <https://medium.com/the-physics-arxiv-blog/elvis-equation-estimates-number-of-asteroids-worth-mining-spoiler-not-very-many-e0063699d199>

The process of calculating the number of mineable asteroids is straightforward in principle. Simply start with the total number of asteroids and determine the fraction that meet the requirements for commercial mining.

That’s similar in principle to the approach Frank Drake took in the 1960s to determine the number of intelligent civilisations: start with the total number of stars in the galaxy and work out the fraction that meet the requirements for the presence of intelligent life. His eponymous equation has since become hugely famous.

Elvis’s approach is similar. He essentially works out the factors that determine whether an asteroid is commercially viable to mine and the proportion of space rocks that meet this requirement.

First of all, the asteroid has to be relatively **easy to get to.** That rules out all but the nearest objects that orbit the Sun close to Earth. The key parameter here is the change in velocity, or delta-v, needed to send mining equipment to such an asteroid and to return with a much larger mass of ore that has been extracted.

Elvis says that a delta-v of 4.5 kilometres per second is a reasonable goal for today’s rocket technology. This makes only 2.5 per cent of known Near Earth Objects accessible (although this figure rises to 25 per cent if the delta-v can be increased to 5.7 km/s).

Next, the asteroid has to contain the required ore. Platinum group metals—platinum, rhodium, osmium, iridium, palladium and rhenium— are rare in the Earth’s crust because they dissolve easily in molten iron and so are mainly concentrated in the our planet’s interior. So the most promising asteroids are probably those rich in iron and nickel and known as M-type. Elvis reckons these make up about 4 per cent of known space rocks.

These asteroids must also contain a high enough concentration of platinum group metals to make them worth mining. Meteorite studies suggest that perhaps 50 per cent of M-type asteroids will make the grade.

Finally, it is not worth mining small asteroids because the total amount of ore they can produce will not cover the mission costs, which Elvis estimates in the billion dollar range. So that rules out asteroids smaller than a certain threshold.

To determine this threshold, Elvis has to work out the value of the ore that a mining mission would produce. That raises the interesting question of how valuable this ore would be if it were returned to Earth.

Platinum currently sells for about $50,000/kg. Elvis says the annual production on Earth is about 200 metric tonnes per year, which is about ten times more than a decent mission might return. For that reason, he says: “I am assuming here that asteroid mining does not flood the market and depress platinum group metal prices, which is plausible for the first deliveries.”

However, he also points out with an element of understatement that markets do not always respond linearly to changes in supply.

Supposing that Elvis is right about the price, then a 100-metre asteroid satisfying all the above criteria would bring in about $1.2 billion. That makes the 100-metre size the minimum that is worth targeting.

It’s worth pointing out here that most of the estimates here have huge error bars. But taking these and plugging them into Elvis’s Drake-like equation gives a lower bound on the number of asteroids worth mining.

That number is likely to be **about 10**, he says. (arg 3)

### Space Mining Fails

#### Space mining fails

**Fickling, 20** -- Bloomberg Opinion columnist covering commodities

[David, has been a reporter for Bloomberg News, Dow Jones, the Wall Street Journal, the Financial Times and the Guardian, "We’re Never Going to Mine the Asteroid Belt," Bloomberg, 12-21-20, https://www.bloomberg.com/opinion/articles/2020-12-21/space-mining-on-asteroids-is-never-going-to-happen, accessed 6-24-21]

Where would science fiction be without space mining?

From Ellen Ripley in Alien and Dave Lister in Red Dwarf, to Sam Bell in Moon and The Expanse’s Naomi Nagata, the grittier end of interstellar drama would be bereft if it weren’t for overalled engineers and their mineral-processing operations.

It’s such an alluring vision that real money has been put toward its realization. Alphabet Inc.’s Larry Page and Eric Schmidt, and Hollywood filmmaker James Cameron (director of the Alien sequel Aliens) all invested in Planetary Resources Inc., which raised venture finance with its mission of mining high-value minerals from asteroids and refining them into metal foams that could be shot back down to Earth. Deep Space Industries Inc., a rival startup, also had bold plans to extract resources from space. Though both companies have now been bought out and their projects put into mothballs, the idea of a space mining industry has refused to die.

It’s wonderful that people are shooting for the stars — but those who declined to fund the expansive plans of the nascent space mining industry were right about the fundamentals. Space mining **won’t get off the ground** in any foreseeable future — and you only have to look at the history of civilization to see why.

One factor rules out most space mining at the outset: **gravity**. On one hand, it guarantees that most of the solar system’s best mineral resources are to be found under our feet. Earth is the largest rocky planet orbiting the sun. As a result, the cornucopia of minerals the globe attracted as it coalesced is as rich as will be found this side of Alpha Centauri.

Gravity poses a more technical problem, too. Escaping Earth’s gravitational field makes transporting the volumes of material needed in a mining operation **hugely expensive**. On Falcon Heavy, the large rocket being developed by Elon Musk’s SpaceX, transporting a payload to the orbit of Mars comes to as little as $5,357 per kilogram — a drastic reduction in normal launch costs. Still, at those prices just lofting a **single** half-ton drilling rig to the asteroid belt would use up the **annual exploration budget of a small mining company**.

Power is another issue. The international space station, with 35,000 square feet of solar arrays, generates up to 120 kilowatts of electricity. That drill would need a **similar-sized power plant** — and most mining companies operate multiple rigs at a time. Power demands rise drastically once you move from exploration drilling to mining and processing. Bringing material back to Earth would **raise the costs even more**. Japan’s Hayabusa2 satellite spent six years and 16.4 billion yen ($**157 million**) recovering a **single gram of material** from the asteroid Ryugu and returning it to Earth earlier this month.

What might you want to mine from space? Water is an essential component of most earth-bound mining operations and a potential raw material for hydrogen-oxygen fuel that could be used in space. The discovery in October of ice molecules in craters on the Moon was taken as a major breakthrough. Still, the concentrations of 100 to 412 parts per million are extraordinarily low by terrestrial standards. Copper, which typically costs about $4,500 per metric ton to refine, has an average ore grade of about 6,000 ppm.

The more promising commodities are platinum, palladium, gold and a handful of rare related metals. Because of their affinity for iron, these so-called siderophile elements mostly sunk toward the metallic core of our planet early in its formation, and are relatively scarce in the Earth’s crust. Estimates of their abundance on some asteroids, such as the enigmatic Psyche 16 beyond the orbit of Mars, suggest concentrations several times higher than can be found in terrestrial mines.

Still, human ingenuity is all about cutting our coat according to our cloth. If such platinum-group metals are going to justify the literally **astronomical costs of space mining**, they’ll need to count on **sustained high prices** for the decade or so that would be needed to get such an operation up and running — and that sort of situation is **all but unheard-of in the materials industry**.

When prices of an essential commodity get excessively high, chemists get extraordinarily good at finding ways to **avoid using it**, scrap merchants improve their **recycling rates**, and miners **discover new deposits** that wouldn’t have been viable at lower prices. Even criminals get in on the game. That eventually pushes supply up and demand down, so that **prices rebalance** — a dynamic we’ve seen play out in the markets for rare earths, lithium and cobalt in recent years. The world mines about three times more platinum than it did in the early 1970s, but prices have barely changed once adjusted for inflation.

That might sound a disappointing prospect to those looking for excuses for humanity to colonize space — but really it should be seen as a tribute to our ingenuity. Humanity’s failure to exploit extraterrestrial ore reserves isn’t a sign that we lack imagination. If anything, it’s a sign of the adaptive genius that put us in orbit in the first place.

### China / Russia

#### Asteroid mining furthers tensions between the US, China and Russia and escalates

**Jamasmie 21** Cecilia Jamasmie [Cecilia has covered mining for more than a decade. She is particularly interested in Corporate Social Responsibility (CSR), Diamonds and Latin America. Cecilia has been interviewed by BBC News and CBC among others and has been a guest speaker at mining conventions, including MINExpo 2016 and the World’s Copper Conference 2018. She is also member of the expert panel on Social License to Operate (SLO) at the European project MIREU (Mining and Metallurgic Regions EU). She holds a Master of Journalism from the University of British Columbia, and is based in Nova Scotia.], 2-2-2021, "Experts warn of brewing space mining war among US, China and Russia," MINING, <https://www.mining.com/experts-warn-of-brewing-space-mining-war-among-us-china-and-russia/> DD AG

A brewing war to set a mining base in space is likely to see China and Russia joining forces to keep the US increasing attempts to dominate extra-terrestrial commerce at bay**, experts warn. The** Trump Administration took an active interest in space**,** announcing that America would return astronauts to the moon by 2024 andcreating the Space Force as the newest branch of the US military.**It also proposed global legal framework for mining on the moon, called the Artemis Accords, encouraging citizens to mine the Earth’s natural satellite** and other celestial bodies with commercial purposes. The directive classified outer space as a “legally and physically unique domain of human activity” instead of a “global commons,” paving the way for mining the moon without any sort of international treaty. Spearheaded by the US National Aeronautics and Space Administration (NASA), the Artemis Accords were signed in October by Australia, Canada, England, Japan, Luxembourg, Italy and the United Emirates “Unfortunately, **the Trump Administration exacerbated a national security threat and risked the economic opportunity it hoped to secure in outer space by failing to engage Russia or China as potential partners**,” says Elya Taichman, former legislative director for then-Republican Michelle Lujan Grisham. “Instead, **the Artemis Accords have driven China and Russia toward increased cooperation in space out of fear and necessity**,” he writes.Russia’s space agency Roscosmos was the first to speak up, likening the policy to colonialism. “There have already been examples in history when one country decided to start seizing territories in its interest — everyone remembers what came of it,” Roscosmos’ deputy general director for international cooperation, Sergey Saveliev, said at the time.China, which made history in 2019 by becoming the first country to land a probe on the far side of the Moon, chose a different approach. Since the Artemis Accords were first announced, Beijing has approached Russia to jointly build a lunar research base. President Xi Jinping has also he made sure China planted its flag on the Moon, which happened in December 2020, more than 50 years after the US reached the lunar surface.

## Innovation DA

### 1AR Innovation DA

#### 1. TURN- PTD solves better-

#### (A) Duplication- Private ventures result in wasted efforts to develop and deploy resources- PTD better for sharing methods and efforts among countries

#### (B) Racing- private appropriation results in inefficient “get-it-while-you can” activities- that’s Raclin.

#### 2. Case outweighs and turns the DA-

#### (A) Space war- destroys all infrastructure and crushes the economy- that’s Grego

#### (B) Debris- Kessler means you can’t leave the planet- that’s Johnson

#### 3.Private actors not key-

#### A. History- the Space Race, Internet, and COVID vaccines were all extremely innovative and the result of public investment

#### B. TURN- public appropriation creates private incentives and not vice versa since nations in space will lead to more private investment- BUT private entities are worse because they undermine sustainability and compete unproductively by creating duplicative efforts and undercutting cooperation

**4. Cooperation is the only way for further space exploration to become possible – key for innovation**

**Stofan 17**

(Ellen Stofan, “When We Explore Space, We Go Together,” Slate, 03-07-2017,<https://slate.com/technology/2017/03/space-exploration-requires-international-collaboration.html>)

The next NASA rover to Mars will launch in 2020. It will be built in the United States, and it will measure wind with a tool from Spain, study rock chemistry with an instrument partially built by the French, and examine the subsurface with a sounder from Finland. This kind of international mashup is actually fairly typical for space missions, which are typically composed of scientists and instruments from countries all over the world.Partnerships with international space agencies have always been key to NASA’s success. (Little-known fact: The first flag deployed on the moon was that of Switzerland, as part of a [solar wind experiment](http://www.esa.int/About_Us/Welcome_to_ESA/ESA_history/First_flag_on_the_Moon) with Apollo 11.) When you are exploring space, going it alone has **never** been, and **will never be**, an option.

When it comes to peering outside our solar system, the partnerships continue. The stunning recent announcement of a [seven-planet system around the star TRAPPIST-1](https://www.nytimes.com/2017/02/22/science/trappist-1-exoplanets-nasa.html), a mere 39.5 light-years away from Earth, involved a multinational team and telescopes, both in space and on the ground. A Belgian astronomer originally discovered some of the planets using a telescope in Chile, then further observations with the Paranal telescope in Chile and NASA’s Spitzer Space Telescope confirmed the seven-planet system. Three of the planets are located in the habitable zone, where liquid water, critical for life, could be stable on the surface. The flagship example of partnerships in space is literally the flagship: the International Space Station. The U.S., Russian, Japanese, Canadian, and European space agencies have been operating this amazing orbiting laboratory for more than 16 years, continuously human tended. The astronauts have come from 18 different nations, and experiments from 93 countries have been carried out on the ISS. Every day, astronauts on the International Space Station carry out research that will enable humans to travel to Mars and back. In the microgravity environment of space, our bones lose density, our muscles waste, our cardiovascular system undergoes change. Research carried out on the ISS is helping us develop ways to mitigate these human health effects, which will make it possible for humans to arrive at Mars, after a seven- to eight-month journey, healthy and ready to cope with any potential emergency.

The International Space Exploration Coordination Group comprises 14 space agencies, including the expected bodies like NASA, the European Space Agency, and the Russian space agency. But it also involves space agencies from China, India, South Korea, and Ukraine. The group has [produced a road map for human exploration](https://www.nasa.gov/sites/default/files/files/GER-2013_Small.pdf) beyond Earth and provides a forum for space agencies to coordinate efforts. While some nations are more focused on the Moon and some on Mars, all realize that **no single** agency is capable of such a large undertaking alone. While people often think of space exploration as a way to promote national pride, the truth is that the future of space is international. These partnerships are expanding our knowledge of the universe, helping us search for life on other worlds, making critical observations of our own planet, and moving humans outward into space in a much more rapid time frame, and more comprehensively, than would be possible otherwise. In addition, innovations in technology and science are not restricted to one country. Diverse, innovative teams solve problems, and no one country or company can go it alone when it comes to the final frontier of space.

#### 5. International coop the only way to fight the barriers to space exploration, private companies don’t have the tools – diplomatic prestige, political sustainability, workforce sustainability

**Bronaitowski 06**

(D. A. Broniatowski, G. Ryan Faith, and Vincent G. Sabathier, “The Case for Managed International Cooperation in Space Exploration,” International Space Exploration Update – Center for Strategic and International Studies, 2006, <https://web.mit.edu/adamross/www/BRONIATOWSKI_ISU07.pdf>)

International cooperation in space exploration has the potential to provide significant benefits to all participants, particularly if managed well. Benefits in the form of monetary efficiency, programmatic and political sustainability, and workforce stability will accrue to those partners who choose to approach space exploration as a mutually beneficial endeavor. Furthermore, international cooperation must be explicitly incorporated as an aspect, and goal, of a modern space exploration program to enable coordination prior to the construction of new hardware. Such coordination can happen on both the government and industry levels and allows for advance planning and standardization that can enhance the strategic use of redundancy through interoperability. Finally, the promotion of a set of industrial standards for cooperation in space exploration will enable the exercise of leadership in future stages of the Vision for Space Exploration (VSE). If the vision is to succeed, the United States, in particular, must engage its partners by reaffirming and strengthening its commitment to the International Space Station (ISS) to maintain its diplomatic credibility for future exploration endeavors. International cooperation must be an integral part of the way in which the United States, and all space-faring powers, approach space exploration. Management of this cooperation up-front can have high payoffs in terms of both political and programmatic sustainability, diplomatic benefits, and ultimately, the development of free-market forces in space. The first step toward making the most of international cooperation in space exploration is the completion and utilization of the ISS. The ISS program is not complete. Therefore, the program’s utility has not yet been fully realized. To the extent that a completed ISS is beneficial, the program will deliver positive utility. Nevertheless, for each passing year that these benefits are delayed, their perceived probability of delivering value is decreased, concomitantly decreasing their expected utility. Given that the ISS program is significantly over budget, 10 years behind schedule, and far from complete, we may expect that the practical benefits of ISS utilization may not be a major factor in current utility calculations. Similarly, many space exploration endeavors promise practical benefits that can only be delivered on time scales that are significantly longer than what is required to make an adequate business case. As such, we may assume that the purely economic benefits of space exploration are not the primary driver for exploration in the short term. Rather, space exploration is an activity that delivers immediate value in noneconomic areas, while allowing for longer-term practical and economic benefits. As will be demonstrated below, each of these benefits can be strengthened through correctly managed international cooperation.

**6.EDF 21 and Derr 17 are both speaking about sustainable development. The “tech” that these cards are mentioning are the sustainable development tools that Santos 13 speaks about. What their link chain doesn’t mention is that technological innovation through sustainable development isn’t possible with a competitive environment. Competition means that companies will place profit over actual innovation and results - it kills sustainable development through commercialization and creates an environment where true progress is never possible because of duplication - Islam 18**

**7. Their EDF 21 card is from a public non-profit. It speaks about the technology that this organization is developing in the squo to combat the climate change caused by private oil and gas companies. This card is literally a reason why we need PTD – public cooperation and resource allocation is the only way to solve for climate**

**8. Derr 17 is a card that speaks about the innovative tech that public organizations like NASA and the Intergovernmental Panel on Climate Change are developing. – not related to private company tech innovation at all**

## US Innovation DA

### 1AR US Innovation DA

#### 1.US space skew dangerous– multilateralism solves.

Edd **Gent 20,** freelance science and technology writer, “Space Mining Should Be a Global Project—But It's Not Starting Off That Way,” Singularity Hub, 10-12-2020, https://singularityhub.com/2020/10/12/the-us-is-trying-to-hijack-space-mining-and-there-could-be-disastrous-consequences/

Exploiting the resources of outer space might be key to the future expansion of the human species. But researchers argue that the US is trying to skew the game in its favor, with potentially disastrous consequences. The enormous cost of lifting material into space means that any serious effort to colonize the solar system will require us to rely on resources beyond our atmosphere. Water will be the new gold thanks to its crucial role in sustaining life, as well as the fact it can be split into hydrogen fuel and oxygen for breathing. Regolith found on the surface of rocky bodies like the moon and Mars will be a crucial building material, while some companies think it will eventually be profitable to extract precious metals and rare earth elements from asteroids and return them to Earth. But so far, there’s little in the way of regulation designed to govern how these activities should be managed. Now two Canadian researchers argue in a paper in Science that recent policy moves by the US are part of a concerted effort to refocus international space cooperation towards short-term commercial interests, which could precipitate a “race to the bottom” that sabotages efforts to safely manage the development of space. Aaron Boley and Michael Byers at the University of British Columbia trace back the start of this push to the 2015 Commercial Space Launch Competitiveness Act, which gave US citizens and companies the right to own and sell space resources under US law. In April this year, President Trump doubled down with an executive order affirming the right to commercial space mining and explicitly rejecting the idea that space is a “global commons,” flying in the face of established international norms. Since then, NASA has announced that any countries wishing to partner on its forthcoming Artemis missions designed to establish a permanent human presence on the moon will have to sign bilateral agreements known as Artemis Accords. These agreements will enshrine the idea that commercial space mining will be governed by national laws rather than international ones, the authors write, and that companies can declare “safety zones” around their operations to exclude others. Speaking to Space.com Mike Gold, the acting associate administrator for NASA’s Office of International and Interagency Relations, disputes the authors’ characterization of the accords and says they are based on the internationally-recognized Outer Space Treaty. He says they don’t include agreement on national regulation of mining or companies’ rights to establish safety zones, though they do assert the right to extract and use space resources. But given that they’ve yet to be released or even finalized, it’s not clear how far these rights extend or how they are enshrined in the agreements. And the authors point out that the fact that they are being negotiated bilaterally means the US will be able to use its dominant position to push its interpretation of international law and its overtly commercial goals for space development. Space policy designed around the exploitation of resources holds many dangers, say the paper authors. For a start, loosely-regulated space mining could result in the destruction of deposits that could hold invaluable scientific information. It could also kick up dangerous amounts of lunar dust that can cause serious damage to space vehicles, increase the amount of space debris, or in a worst-case scenario, create meteorites that could threaten satellites or even impact Earth. By eschewing a multilateral approach to setting space policy, the US also opens the door to a free-for-all where every country makes up its own rules. Russia is highly critical of the Artemis Accords process and China appears to be frozen out of it, suggesting that two major space powers will not be bound by the new rules. That potentially sets the scene for a race to the bottom, where countries compete to set the laxest rules for space mining to attract investment. The authors call on other nations to speak up and attempt to set rules through the UN Committee on the Peaceful Uses of Outer Space. Writing in The Conversation, Scott Shackelford from Indiana University suggests a good model could be the 1959 Antarctic Treaty, which froze territorial claims and reserved the continent for “peaceful purposes” and “scientific investigation.” But the momentum behind the US’ push might be difficult to overcome. Last month, the agency announced it would pay companies to excavate small amounts of regolith on the moon. Boley and Byers admit that if this went ahead and was not protested by other nations, it could set a precedent in international law that would be hard to overcome. For better or worse, it seems that US dominance in space exploration means it’s in the driver’s seat when it comes to setting the rules. As they say, to the victor go the spoils.

#### Turn - Dangerous mining greatly increases space debris.

Sarah **Scoles 15**, “Dust from asteroid mining spells danger for satellites,” New Scientist, 5-27-2015, https://www.newscientist.com/article/mg22630235-100-dust-from-asteroid-mining-spells-danger-for-satellites/

NASA chose the second option for its Asteroid Redirect Mission, which aims to pluck a boulder from an asteroid’s surface and relocate it to a stable orbit around the moon. But an asteroid’s gravity is so weak that it’s not hard for surface particles to escape into space. Now a new model warns that debris shed by such transplanted rocks could intrude where many defence and communication satellites live – in geosynchronous orbit. According to Casey Handmer of the California Institute of Technology in Pasadena and Javier Roa of the Technical University of Madrid in Spain, 5 per cent of the escaped debris will end up in regions traversed by satellites. Over 10 years, it would cross geosynchronous orbit 63 times on average. A satellite in the wrong spot at the wrong time will suffer a damaging high-speed collision with that dust. The study also looks at the “catastrophic disruption” of an asteroid 5 metres across or bigger. Its total break-up into a pile of rubble would increase the risk to satellites by more than 30 per cent (arxiv.org/abs/1505.03800). That may not have immediate consequences. But as Earth orbits get more crowded with spent rocket stages and satellites, we will have to worry about cascades of collisions like the one depicted in the movie Gravity. Handmer and Roa want to point out the problem now so that we can find a solution before any satellites get dinged. “It is possible to quantify and manage the risk,” says Handmer. “A few basic precautions will prevent harm due to stray asteroid material.”

#### 2.Lack of US multilateralism dangerous

Mike **Wall 20**, Senior Space Writer, “US policy could thwart sustainable space development, researchers say,” Space, 10-8-2020, https://www.space.com/us-space-policy-mining-artemis-accords

The United States' space policy threatens the safe and sustainable development of the final frontier, two researchers argue. The U.S. is pushing national rather than multilateral regulation of space mining, an approach that could have serious negative consequences, astronomer Aaron Boley and political scientist Michael Byers, both of the University of British Columbia in Vancouver, write in a "Policy Forum" piece that was published online today (Oct. 8) in the journal Science. Boley and Byers cite the 2015 passage of the Commercial Space Launch Competitiveness Act, which explicitly granted American companies and citizens the right to mine and sell space resources. That right was affirmed this past April in an executive order signed by President Donald Trump, they note. The researchers also point to NASA's announcement last month that it intends to buy moon dirt and soil collected by private companies, and its plan to sign bilateral agreements with international partners that want to participate in the agency's Artemis program of crewed lunar exploration. Artemis, one of NASA's highest-profile projects, aims to return astronauts to the moon in 2024 and establish a long-term, sustainable human presence on and around Earth's nearest neighbor by the end of the decade. Making all of this happen will require the extensive use of lunar resources, such as the water ice that lurks on the permanently shadowed floors of polar craters, NASA officials have said. Boley and Byers take special aim at the planned bilateral agreements, known as the Artemis Accords. In promoting them, the U.S. "is overlooking best practice with regard to the sustainable development of space," the researchers write. "Instead of pressing ahead unilaterally and bilaterally, the United States should support negotiations on space mining within the UN [United Nations] Committee on the Peaceful Uses of Outer Space, the same multilateral body that drafted the five major space treaties of the 1960s and '70s," they write in the Science piece. (The most important of the five is the 1967 Outer Space Treaty, which forms the basis of international space law.) "Meanwhile, NASA’s actions must be seen for what they are — a concerted, strategic effort to redirect international space cooperation in favor of short-term U.S. commercial interests, with little regard for the risks involved," Boley and Byers add. The researchers worry that the U.S. is setting an unfortunate precedent for other countries to follow, and that space mining and other exploration activities may therefore proceed in a somewhat careless and chaotic fashion in the not-too-distant future. "That's kind of our worst-case scenario — that you have all of these different national regulations, and they can vary greatly, they allow for 'flag of convenience,' they cause disregard of the environment, large-scale pollution of orbital environments, of the surface of the moon in terms of waste materials and so forth," Boley told Space.com. "That's what we're worried about." He cited the growing space-junk problem as a cautionary tale. For decades, spacefaring nations have been licensing launches internally, without much international coordination, cooperation or long-term planning. In recent years, low-Earth orbit has become crowded enough with satellites and hunks of debris that collisions are a real concern. For example, the International Space Station has had to maneuver itself away from potential impacts three times so far in 2020 alone.

#### No impact to US leadership decline – multilat would stabilize the transition

**Faulk ‘18** [Richard Falk is an international law and international relations scholar who taught at Princeton University for forty years, taught at the local campus of the University of California in Global and International Studies and since 2005 chaired the Board of the Nuclear Age Peace Foundation, “Toward Benign Global Leadership in a Post-Trumpist World Order,” 6-7-18, https://richardfalk.wordpress.com/2018/06/07/toward-benign-global-leadership-in-a-post-trumpist-world-order/]

What might multilateralism with benevolent leadership mean? China has demonstrated an extraordinary capacity for soft power extension of influence together with the greatest surge of economic growth in all of history. China seems to have a mature and realistic appreciation of the need for global problem solving and management of global warming, nuclear policy, and the world economy. Whether it can deliver the kind of globally oriented leadership needed at this stage of history is an unanswered question. As the most promising nextglobal leader China will need to overcome several obstacles: the fact that Chinese is not spoken outside its borders; China lacks a globally traded currency; China has little experience in global, as distinct from regional, diplomacy; China has a poor human rights record at home; and Chinese ideology, itself now rather obscure, is without many foreign adherents even if its own practice seems pragmatically motivated. Maybe it is premature to count the United States as out of the leadership game. It seems possible, maybe likely, that the Trump presidency will, in one way or another, be rejected by means other than global catastrophe, that is, by electoral rejection, impeachment, resignation. It also seems that a progressive backlash to Trumpism will occur in the United States and perhaps elsewhere, as well as a rejection of the recent global wave of exclusivist nationalism. **A new global mood might be receptive to a revival of creative multilateralism**, vitality for the UN and other international institutions, and display support for more compassionate global public policy processes that are not narrowly focused on national interests, and more attuned to the promotion of global and human interests. A variant of this kind of more hopeful world order scenario would result from a new global political atmosphere induced by a shared recognition of urgent challenges. Such an atmosphere could lead to what might be called benevolent bipolarity in which the United States and China collaborate much as wartime alliances have produced strong cooperative relations temporarily bonding heretofore antagonistic political actors. This was the case with the anti-fascist coalition. Such bipolarity would complement multilateralism by concentrating policymaking in these two governmental centers of authority, status, influence, and capabilities. It would extend their current reach to encompass common and human security systems that gradually rendered the war system obsolete and discredited reliance on coercive geopolitics. During this process security would increasingly be assessed from the perspectives of human rights, global justice, civilizational equality, and ecological sustainability.

### Extra Cards

#### US leadership isn’t special – fundamental aversion to war outweighs

**Mueller ’20** [John Mueller is a senior research scientist at the Mershon Center for International Security Studies and a member of the Department of Political Science at Ohio State University, senior fellow at the Cato Institute, ““Pax Americana” Is a Myth: Aversion to War Drives Peace and Order,” Fall 2020, https://www.cato.org/sites/cato.org/files/2020-09/xWQfin.pdf]

Not only have developed countries, including the Cold War superpowers, managed to stay out of war with each other since 1945, but there have been remarkably few international wars of any sort, as conventionally defined, during that period, particularly in recent decades. Indeed, the only international wars in the present century are the two instituted after 9/11 by the United States that succeeded in pushing out offending regimes in Afghanistan and Iraq. Although states may have largely abstained from conducting wars directly between themselves, the development has not necessarily led to the demise of war or of warlike behavior in total. Indeed, states may well feel freer to engage in behavior that might once have been taken to be a potential casus belli such as tinkering in other countries’ civil wars, firing shots across bows, poaching fish from another’s domestic waters, lobbing cyber balloons, exacting punishing economic sanctions, or seizing tiny bits of territory.5 And civil war continues, though perhaps declining somewhat in number since the 1980s.6 This article examines possible explanations for the decline of international war. Although the argument can only be sketched in the space available, it disputes those that attribute the decline to US security activities or to a US-led “world order.” Rather, the rise of an aversion to international war is the most likely primary reason. Changes in ideas can often have substantial results. In this case, it will be argued that much of the positive development of the post-World War II era would likely mostly have happened even without much American security participation. And the establishment of norms and institutions, economic advance, and the progress of democratization are not so much the cause of international peace and aversion to international war as their consequence. This perspective also suggests that **world order can survive, or work around, challenges that might be thrown at it by the U**nited **S**tates from Donald Trump **or anyone else**; that fears that a rising China or an assertive Russia will upset the order are overdrawn; that there is scarcely any need for the maintenance of a large military force in being; and that, under the right conditions, international anarchy could well prove to be an entirely tolerable condition. “Pax Americana” and the Rise of Aversion to War Analysts have advanced a number of explanations to explain the remarkable decline of international war.7 Two, often but not always related, claim that the decline can be greatly attributed to the activities of the United States. The first holds that the United States has provided worldwide security and thus order, perhaps aided by the attention-arresting fear of nuclear weapons. This is often grandly labeled “the American Global Order” or “Pax Americana,” and it relates to hegemonic stability theory in many of its forms. The second explanation contends that the United States was vital to construct international institutions, conventions, and norms; to advance economic development; and to expand democracy—and that these processes have ordered the world and crucially helped to establish and maintain international peace. Along these lines, neoconservative writers Lawrence Kaplan and William Kristol argue that “in many instances, all that stands between civility and genocide, order and mayhem, is American power,” while former US national security advisor Zbigniew Brzezinski contended that “if America falters,” the likely outcome would be “outright chaos” and “a dangerous slide into global turmoil.” 8 Three prominent political scientists speculate that, absent the pacifying effect of the US presence, Europe might become incapable of securing itself from various threats materializing from somewhere or other, and that this could be destabilizing within the region and beyond while making Europeans potentially vulnerable to the influence of outside rising powers. They also worry that Israel, Egypt, and/or Saudi Arabia might do something dangerous in the Middle East, and that Japan and South Korea might obtain nuclear weapons.9 The United States, as Princeton’s John Ikenberry writes, is the “guarantor of the world order.” 10 These two explanations essentially rest on a counterfactual that is rarely carefully assessed by its advocates: if the United States had withdrawn from the world after 1945, things would have turned out much differently and, most likely, far worse. Thus, Jake Sullivan, a foreign policy advisor in the Obama White House, simply declares that “the fact that the major powers have not returned to war with one another since 1945 is a remarkable achievement of American statecraft.” 11 And analyst Bradley Thayer contends that US leadership “reduced friction among many states that were historical antagonists—most notably France and West Germany,” while political scientists Bruce Russett and John Oneal conclude that it was a US-supported European security community that made armed conflict between France and Germany “unthinkable.” 12 Others might look at the condition differently. The French and the Germans had once been extremely good at getting into wars with each other, but since 1945 there seems to have been no one in either country who has advocated resuming the venerable tradition. This difference reflects the fact that **over** the course of **the 20th century, a significant shift in attitudes toward international war took place**—a change **that scarcely needed the U**nited **S**tates to provide a militarized security environment built around nuclear fears or norms, institutions, economic exchange, and democracy. This change can perhaps be quantified in a rough sort of content analysis. Before World War I, it was common, even routine, for serious writers, analysts, and politicians in Europe and North America to exalt war between states as beautiful, honorable, holy, sublime, heroic, ennobling, natural, virtuous, glorious, cleansing, manly, necessary, and progressive. At the same time, they declared peace to be debasing, trivial, rotten, and characterized by crass materialism, artistic decline, repellant effeminacy, rampant selfishness, base immorality, petrifying stagnation, sordid frivolity, degrading cowardice, corrupting boredom, bovine content, and utter emptiness.13 After the war, in stark contrast, such claims and vivid contentions are almost never heard.

#### Regional actors are restraining China – no escalation

**Koga ‘20** [Kei Koga is Assistant Professor at the Public Policy and Global Affairs Programme, School of Social Sciences, Nanyang Technological University, “Japan goes to sea,” 8-13-20, https://www.limesonline.com/en/japans-seas-connections]

Respecting the international law in the maritime domain also has become one of the core diplomatic agendas for Japan. The South China Sea, particularly the Spratly Islands, is one of Asia’s flashpoints as its territoriality is contested among China, Taiwan, Brunei, Malaysia, the Philippines, and Vietnam. Regional states thus attempt to nurture political atmosphere, where the claimant states can follow the international norms and rules to facilitate peaceful resolution. ASEAN and Southeast Asian states, such as Indonesia, for instance, have taken a step to diffuse tensions and resolve the disputes peacefully though dialogues since the 1990s, producing the 2002 Declaration on the Conduct of Parties in the South China Sea (DOC) (21); however, these efforts have neither completely prevented the tension from rising nor led them to resolve the disputes. Since the 2010s, the territorial disputes over the South China Sea has become revitalized mainly because of China’s rising assertive behavior, including its unilateral land reclamation, oil rigs, and maritime stand-off with other claimant states, inviting “tit-for-tat” reactions from other claimant states. In this context, ASEAN and many regional and non-regional states emphasized the importance of UNCLOS, and in 2016, the South China Sea Arbitration Tribunal issued ruling over the disputes between China and the Philippines defies China’s “9-dash-line.” (22) China immediately rejected this ruling, but largely because of fears of diplomatic and economic retaliation, there was little push-back against China from Asian states except for the United States, Australia, Japan, and Vietnam. Although this ruling arguably led China and ASEAN to initiate negotiation over a South China Sea code of conduct, its process remains slow, and the situation still has a risk of disrupting the vital SLOCs in the sea that affects Japan’s economic and security interests. For its part, Japan faces a strategic dilemma. Given that Japan does not have any territorial dispute in the South China Sea, its commitment is unlikely to be as strong as that of the East China Sea. Also, Japan’s military involvement is quite limited because of its constitutional and political constraints, largely deriving from Article 9 of the Japanese constitution, which limits Japan’s Self-Defense Force oversea deployment. Of course, the Abe administration has strived for relaxing such constraints, as shown in the 2014 reinterpretation of the constitution that allows Japan to exercise a right to collective self-defense. Its defense budget also gradually increased from 2012. In addition, Japan dispatched its maritime SDF to the South China Sea in 2018 and 2019, namely the Indo-Southeast Asia Deployment 2018 (ISEAD 2018) and the Indo-Pacific Deployment 2019 (IPD19) to show its military presence whenever possible. (23) Nevertheless, the activation of collective self-defense is possible only when Japan faces an existential crisis, has no other appropriate means to overcome the crisis and/or to protect its citizens, and limits the use of force to the minimum extent necessary. (24) In this sense, dispatching the Maritime SDF to the South China Sea to defend status quo would become highly contentious for Japan. Even if the SLOCs in the South China Sea is disrupted, Japan’s involvement would be difficult due to the existence of a counter-argument that there are other alternative routes, such as the use of the Lombok Strait, the Celebes Sea, and the Philippine Sea, that it may be able to use despite its high economic cost. (25) To solve this dilemma, Japan has conducted quasi-off-shore balancing against China. Diplomatically, Japan continuously emphasizes the importance of international laws, including UNCLOS. For instance, Prime Minister Shinzo Abe stated at the 2014 Shangri-La Dialogue that states should “clarify their claims based on international law”; they should not “use force or coercion in trying to drive their claims”; and they should “seek to settle disputes by peaceful means.” (26) Also, Japan emphasizes one of the core principles of Japan’s “Free and Open Indo-Pacific” concept is to secure SLOCs in the Indo-Pacific region. (27) In so doing, Japan has attempted to internationalize the South China Sea issue, keeping the international community aware of the maritime situation. Militarily, Japan conducts naval and maritime law enforcement capacity-building programs to Southeast Asia, particularly Vietnam and the Philippines. This includes the provision of coast-guard patrol vessels, education, and training, which help building naval and coast-guard capabilities to defend the status quo. The Future of Japan’s Posture to the East and South China Seas—Policy Implications Sino-Japanese relations have many aspects of bilateral relationship, depending on different domains. While the bilateral relations in each domain influences the characteristics of the overall relationship. The current Sino-Japanese relations in the political and maritime domains are case in point. In the context of rising US-China rivalry, **Japan’s** political **relation with China has become better**. In the 2018 and 2019 bilateral summits, **both** states **agreed to seek** for **cooperation**, such as planning joint infrastructure projects in third countries. President Xi also plans to make a state visit to Japan in April 2020, by which Japan and China would issue a landmark statement, the so-called “5th document.” (28) **These** political maneuvers **would** likely **prevent China from** taking **further assertive behavior in the East China Sea**, at least in the short term. However, a possibility of naval provocation, coast-guard stand-off, diplomatic protests, and public demonstrations between Japan and China, still exists. Particularly, China’s presence in the East and South China Seas is highly likely to remain. As such, Japan’s maritime posture towards China also remains the same despite a better bilateral political climate, which illustrates more continuity than change. While Japan’s commitment to the East China Sea will unlikely be weakened, the South China Sea appears to be more vulnerable to China’s encroachment. This is because it is ultimately Southeast Asian claimant states’ policy choice that determines how they deal with China’s assertive behavior. Certainly, Japan’s quasi off-shore balancing has contributed to expanding their choices; however, they are not sufficient to maintain the status quo. Given Japan’s limited resources and constitutional constraints, it is difficult to dramatically enhance its capacity-building programs to Southeast Asian states or to substantially increase its defense presence in Southeast Asia. Therefore, there should be a different approach. One idea is furthering maritime operational coordination and coordinated capacity-building programs. Given the increasing diplomatic and defense commitment to the Indo-Pacific region from regional and non-regional states, such as Australia, India, France, the United Kingdom, and the United States, they could coordinate their presence in the South China Sea to monitor the situation as well as their capacity-building programs to increase the MDA capabilities of the Southeast Asian states. (29) These efforts can boost the Southeast Asian claimant states confidence to defend the status quo, which in turn increases deterrence effect. This is likely to continue in the near future. Nevertheless, in order to maintain stability, creative efforts in both domains should be continuously pursued.

## Overpopulation DA

### 1AR Opop DA

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#### 4. No overpopulation now, and squo solves their internal links

**Deonandan, 17**—Epidemiologist & Professor, University of Ottawa (Raywat, “The World Isn't Facing An Overpopulation Problem,” <http://www.huffingtonpost.ca/dr-raywat-deonandan/overpopulation_b_16216754.html>, dml)

Many people believe that overpopulation is the **greatest threat** to the world's security and prosperity. It was probably Malthus who first pointed out that population growth is **exponential**, while agricultural growth is **arithmetic**. He reasoned that every population must inevitably outgrow its food source. Political instability and border insecurity naturally follow, when growing populations seek to nervously protect their shrinking resource base. Critics of Malthus pointed out that human populations, unlike bacteria, **do not grow exponentially**; fertility rates **vary geographically** and **over time**. **New economic models**, including those that factor labour as capital, valued large populations as **assets rather than detriments**, allowing industrializing nations to **convert population to production** and therefore to wealth, allowing them to **purchase needed resources**. The predicted Malthusian collapse **did not occur**, due **largely** to **improvements in agricultural sciences** and something called the **Demographic Transition**. It's this latter thing that gives many demographers **hope** that the world's population growth might be **slowing**, soon to be **plateauing**, and **eventually reversing**. The Demographic Transition was first proposed by Warren Thompson in the 1920s and is well described on BBC's educational site. From observing changes in Europe over the centuries, Thompson and his intellectual heirs suggested that societies evolve through five stages of demographic development. In Stage 1, we live pre-industrial lives, dependent on the land and at the mercy of the elements. Diseases are plenty, lifespan is short. Infant mortality rates are very high, such that we don't even name our children until we are sure they will live beyond infancy. The cost of a child is simply the price of feeding that child, whereas its value as a labourer is high. Both death rates and birth rates are high, and the population is neither growing nor shrinking. In Stage 2, with the arrival of public health and hygiene measures, infectious diseases recede, and mortality declines, particularly among children. But the cost of children is still low, while their utility is high. Thus, reproduction behaviours remain unchanged. But overall population size increases dramatically. Many so-called developing countries would have been in Stage 2 in the late 19th and early 20th centuries, accounting for their explosive growth. In Stage 3, social factors intervene to lower the birth rate. When infants survive and women are socially empowered, fertility rates drop. As economies shift from agrarian to industrial bases, more people move to cities. In fact, so many countries have entered Stage 3 that the human race is now a majority urban species. The widespread introduction of contraception methods, and the use of new wealth to invest in public education (especially for women), leads to smaller families. The cost of children increases with housing and educational demands, while their utility diminishes, as they are no longer needed as labourers. Thus, in Stage 3 population size is still increasing, but more slowly. Western Europe began emerging from Stage 3 in the 19th century. India and China, with their expanding middle class, are in the latter half of Stage 3 or beyond. In Stage 4, we transition to a services and information economy, with few economic incentives for reproduction. Birth and death rates are balanced, and there is minimal population growth. Canada is likely a Stage 4 nation. Rapidly modernizing Stage 3 nations may be progressing to Stage 4 quickly. China is approaching a sort of demographic cliff, since a majority of its people are over the age of 30 and are having fewer children than their recent ancestors. Some recognize a fifth stage in which birth rate drops below death rate, and the population shrinks. Japan is a Stage 5 country. Subsequent generations are too small to provide an adequate tax base for maintaining social programs. Immigration policies must be re-thought, and governments begin to experiment with strategies for encouraging larger families. The Demographic Transition is a theoretical construct with some vulnerabilities. It is unclear whether deep religiosity can compel modernized generations to reproduce at rates against their economic self-interest, leading to what some call a "demographic trap." Also, it is possible that globalization is a disincentive for modernization, compelling some populations to remain agrarian or manufacturing-based, never to progress to an information-based economy. Climate change, antibiotic resistance, and the unpredictability of international affairs can confound a nation's linear progression through the stages. However, given that the basic tenets of the Demographic Transition are being **observed in real time** in such **living social laboratories** as **India**, **China**, and parts of **Africa**, it is reasonable that the world is in the **process of transitioning**. With **investments in public health**, **reproductive rights**, and **wealth-building programs**, we have seen **dramatic recent reductions** in the global fertility rate. Most of humanity is transitioning to Stage 4, which means that while total population size is **still growing**, growth is **slowing down**. Human population growth is expected to **drop to one per cent** by 2020, though we are still on schedule to reach the 9 billion mark by 2050. Total world population should plateau at about 13 billion by 2100, and **actually decline thereafter**. Some projections, like that of the International Institute for Applied Systems Analysis in Austria, are **more optimistic**, suggesting that total fertility rate will drop below replacement rate in the 2070s, **plateauing around the 9 billion mark**.

#### 5. Case solves warming sooner – colonizing other planets is going to take too long. We not only have to find planets to colonize, but we have to develop the technology that would allow for humans to survive on other planets permanently. Sustainable development solves warming sooner – and it solves the reasons why we would need to “get of the rock” in the first place.

## Digital Divide/Starlink DA

### 1AR Digital Divide DA

#### 1. No link- it’s not appropriation. The link evidence is about regulations

#### 2. But if it is appropriation, it causes space debris

**O'Callaghan, 19** -- freelance journalist covering commercial spaceflight, space exploration and astrophysics

[Jonathan O'Callaghan, "SpaceX’s Starlink Could Cause Cascades of Space Junk," Scientific American, 5-13-19, https://www.scientificamerican.com/article/spacexs-starlink-could-cause-cascades-of-space-junk/, accessed 1-15-22]

This Wednesday SpaceX will launch its first batch of Starlink satellites—a “mega constellation” of thousands of spacecraft to provide high-speed Internet access to billions of people at any location on the planet. Starlink is only the first of many such projects; there are at least eight more mega constellations in the works from other companies. Although they promise to revolutionize global telecommunications, these efforts are **not free of peril**: as the number of satellites inexorably grows, so, too, does the risk of creating dangerous debris that could **threaten the continued safe use of Earth orbit**. “This is something we need to pay attention to,” says Glenn Peterson, a senior engineering specialist at the Aerospace Corporation, headquartered in El Segundo, Calif. “We have to be proactive.” Today Earth orbit is a busy place. Almost 2,000 active satellites whiz around our planet, along with nearly 3,000 dead satellites and 34,000 pieces of “space junk” larger than 10 centimeters in size. Whenever debris or a defunct spacecraft gets too close for comfort to an active satellite—typically when a collision risk rises to one part in several thousand—the satellite’s operator must perform a collision-avoidance maneuver. The International Space Station, for example, is moved when the chance of a collision is greater than one in 10,000. These close encounters already occur thousands of times each year, but the **sheer vastness** of mega constellations such as Starlink will **change the game**, resulting in an estimated **67,000 annual collision-avoidance maneuvers** if all of them are launched. As Earth orbit becomes **jam-packed** with satellites, **the risk increases**. A worst-case scenario would be the **Kessler syndrome**, a positive feedback loop in which debris-generating collisions create more and more collisions, which in turn create more and more debris, rendering parts of Earth orbit essentially unusable. Nine companies total—including SpaceX, Amazon, Telesat and LeoSat—have been licensed by the U.S. Federal Communications Commission to launch such constellations. SpaceX alone plans to launch nearly 12,000 satellites by the mid-2020s, which will operate either at an altitude about 500 kilometers in low-Earth orbit (LEO) or a higher altitude of roughly 1,200 kilometers in nongeostationary orbit (NGSO). It is the first company of the nine to launch any fully functional satellites of its constellation. OneWeb, the next front-runner, has plans for a 650-strong constellation in NGSO. Six of its test satellites were launched this past February, and its first proper launch of three dozen or so satellites are planned for later this year. Monthly launches of 30 to 36 satellites will follow, with the service coming online in 2021. Every other company has similar plans for incrementally launching hundreds to thousands of satellites of its own. RISK VERSUS REWARD The benefits of mega constellations would be manifold. Blanketing the entire planet with high-bandwidth, low-latency, always-on Internet access means ships out at sea, high-flying planes and people in remote, undeveloped areas (even Antarctica!) will suddenly be connected as never before. “Connectivity is just not [currently] available to everybody,” says Mike Lindsay, a space mission designer at OneWeb. “Half the world lacks an affordable access point to broadband Internet.” Questions remain, however, on how to safely operate so many satellites in orbit. If the satellites fail, they could easily add to the growing problem of space junk. At altitudes of 500 kilometers, failed satellites will not be a huge problem: within several years, atmospheric drag will naturally pull them back toward Earth to burn up on reentry. Indeed, to combat space junk, SpaceX recently modified its license with the FCC to lower the planned altitudes of more than 1,500 of its satellites by half. But at an altitude of 1,200 kilometers, where satellites remain aloft for longer, the dilemma becomes clear: “It’ll be thousands of years at those altitudes,” says Hugh Lewis, a professor of engineering and physical sciences at the University of Southampton in England, who developed a model called DAMAGE to track and monitor space debris. There are no binding rules currently in place for how long a satellite can safely linger in orbit. The United Nations recommends that satellites be deorbited no more than 25 years after the end of their missions, but these guidelines lack strict penalties for noncompliance. “They are voluntary guidelines,” says Brian Weeden, director of program planning at the Secure World Foundation. The longer a satellite is in orbit, the greater the odds of it colliding with another one are. And such collisions are not unprecedented—in 2009 the American Iridium 33 satellite slammed into the defunct Russian Kosmos 2251 satellite, producing thousands of new pieces of debris. Some companies are being proactive in how to approach this problem. OneWeb, for example, will attach a handle to each of its satellites, offering an easy way for future orbital scrappers to haul them back down for disposal. No company has yet proved such technology, but progress is being made by entities such as the Japan-based Astroscale. “It is expected that a very small percentage of satellites will fail in such a way that the satellite operator is unable to deorbit them,” says Harriet Brettle, a business analyst at Astroscale. But “Astroscale and other emerging companies are looking to provide a backup service that will remove such failed satellites and maintain a sustainable space environment.” Other companies licensed by the FCC, however, plan to solely use the onboard propulsion of each of their satellites to ensure a safe deorbit. In principle, doing so seems fine, but in practice, satellite failure rates are not negligible. Even a 99 percent reliability rate for mega constellations would still result in hundreds of dead satellites adrift in orbit. As these numbers stack up, the chance of catastrophe would only grow. “The real problem is that we don’t have a great track record of getting [satellites] back out of orbit,” says Stijn Lemmens, a space debris analyst at the European Space Agency. “Long-term environment simulations indicate that we would need to reduce the orbital lifetime of about 90 percent of all objects that are launched into orbit. And in reality, we see this is happening successfully for about 5 to 15 percent. So we’re way off the target goal.” NOISY SKIES Another issue is the radio-based communications of the satellites themselves. Each satellite constellation will be awarded a chunk of the electromagnetic spectrum in which to communicate, but picking out a satellite amidst the noise of so many can be tricky. With thousands more satellites set to enter orbit, actually communicating with a single one among those flying overhead could be difficult. “The radio frequency interference is a big thing that is overshadowed by the potential collision risk,” Weeden says. These mega constellations could cause problems for astronomy, too. Already, astronomers using optical telescopes have to contend with satellites occasionally crossing their view. Such interference could increase by a factor of several times with the emergence of mega constellations, says Mark Hammergren, a planetary scientist at the Adler Planetarium in Chicago. And for radio astronomers, things could become even more vexing. “Any time a satellite would pass through the observing beam of a radio telescope, there’s a chance that its transmission might be received and interpreted as a celestial signal,” Hammergren says. Wednesday’s Starlink launch will be rightly lauded as a means to bring the Internet to the masses, but the greater plan of more than doubling the number of active satellites in orbit unavoidably comes with huge complications and seemingly scant room for contingencies. Even if launches and operations unfold smoothly for every mega constellation operator, just one of them experiencing financial difficulties could make the risk of space junk **suddenly skyrocket**. “The worst case is: you launch all your satellites, you go bankrupt, and they all stay there,” Lemmens says. “Then you have thousands of new satellites without a plan of getting them out of there. And you would have a Kessler-type of syndrome.”

#### 3. Starlink doesn’t solve the digital divide

**Nelius, 20** -- Staff Reporter at Gizmodo

[Joanna, "Satellite Internet Will Not Solve the Digital Divide," Gizmodo, 10-29-20, https://gizmodo.com/satellite-internet-will-not-solve-the-digital-divide-1845415108, accessed 1-16-2022]

Internet service providers will be vying for some of the FCC’s Rural Digital Opportunity Fund today, including Elon Musks’s SpaceX. Its Starlink satellite network allegedly has speeds of up to 100 Mbps now, so the company seems to be in a better position to convince the FCC it’s worth a piece of that $16 billion in grant money. A vast network of satellites that can provide uninterrupted, fast, and low latency internet access anywhere in the world is a cool idea. A dream, even. Musk and many of his fans even think it could solve the digital divide! Unfortunately, **tech**nological **limitations** and the **cost** of maintaining such a large network of satellites as Starlink means it’s **more likely** that those in the most need of internet still **won’t** have equally **affordable** and **reliable** access to it. The digital divide in the U.S. existed long before today, and the covid-19 pandemic has only made it worse, especially for many people working or attending school from home. We need to close it as soon as possible, ideally sooner than the 10 years it will take for all that FCC grant money to be used up. Yet it seems like the best hope for doing it sooner rather than later isn’t investing in Elon Musk’s latest venture, but a big combination of improving geosynchronous satellites like the existing HughesNet network, expanding wired and wireless broadband, and allowing municipal broadband to thrive in every state. The problem with most broadband expansion currently is cost. Cable and fiber broadband providers often cite the immense cost of laying new infrastructure as a reason they do not put much effort into connecting sparsely populated areas. According to Oltelco, a small telecommunications provider in the U.S., the cost of laying fiber is between $18,000 and $22,000 per mile. And that doesn’t take into account the cost of connecting individual homes to the network, which is about $500 and $750 per home. When 24% of people (about 14.4 million) living in rural America say access to high-speed internet is a problem, it’s easy to see how laying fiber throughout rural America could add up quickly. Most of the cost of laying fiber or cable comes from digging trenches to lay the hardware itself, and there’s a lot more hardware involved to get wired broadband to rural areas. Satellites, utilized by ISPs like HughesNet, are currently the most wide-spread way to provide rural America with internet. You launch one, bus-sized satellite into space and it covers tens of thousands of miles. And though it’s incredibly expensive to launch one, it’s more time-efficient and less expensive than laying cable in the ground. The cost of installing it at someone’s house doesn’t change very much whether that person’s in Manhattan or the mountains in Montana. Only there are **inherent limitations** to satellite internet, stark pros and cons compared to cable and fiber. Peter Gulla, Hughes Network Systems Senior Vice President, understands the advantages and challenges all too well, and is brutally honest about satellite internet’s role in closing the digital divide. “Our purpose is to provide satellite internet where people cannot get it,” said Gulla. “Competing directly with fiber or cable is not our mission. We’re here to fill the gap and provide.” Satellite internet providers can go where other ISPs will not, but depending on the type of satellite internet customers will get mixed results in terms of **speed**, **latency**, and **cost**. Until Starlink HughesNet was the largest provider of satellite-based internet in the U.S. and faced a considerable number of complaints from customers. The appeal of Starlink, at least in its marketing, is that SpaceX will provide the new frontier of the internet. It will be internet available everywhere and capable of going toe to toe with giants like Spectrum and Comcast instead of just functioning as the last resort for people with no other options. SpaceX and Starlink’s promise is based around the type of satellite it uses, which is very different from the kind HughesNet relies on. Right now there are two types of satellites that provide internet across the globe: Geosynchronous (GEO) and Low Earth Orbit (LEO). GEOs, like the satellites HughesNet uses for its internet infrastructure, match Earth’s rotation on its axis. They remain in a fixed orbit over one location at an altitude of about 22,200 mi (35,720 km) or higher. Because they are fixed, ISPs like HughesNet can aim them in a specific direction to cover a large area to provide uninterrupted service, as long they are not above or below approximately +/- 70 degrees latitude. That means HughesNet needs fewer satellites to cover rural America in internet. But since they sit so high in orbit, latency is high, which makes HughesNet typically not great for online gaming and other latency dependent internet traffic. Starlink relies on LEOs which constantly rotate around the Earth at a much lower orbit, around 1,200 mi (2,000 km) or lower. They must constantly move or else risk being pulled into Earth’s atmosphere and come crashing down to earth, or being flung out of orbit into space. Because this type of satellite is constantly in motion, it can’t provide uninterrupted service to a single location. Users’ connections will need to bounce from once satellite to the next to maintain uninterrupted service. Many more LEOs are needed to cover a single area compared to GEOs, which means a lot more satellites in orbit. However, since LEOs float much closer to Earth, their latency speeds are a lot lower, which makes them more suitable for gaming and the kind of internet speeds and latency people expect in 2020. Since it takes so many LEOs to create an uninterruptible network there can be problems. SpaceX’s Starlink network is one of the biggest LEO networks being built at the moment and its many satellites recently obscured views of Comet NEOWISE. The light pollution SpaceX is creating with its Starlink network is likely only going to get worse. The company has 835 satellites in orbit as of October 18, 2020 with plans to launch 11,165 more over time for a total of 12,000. That’s thousands of satellites all needed to provide a constant and stable internet connection—all at the cost of astronomy. That’s on top of the 5,000 other satellites from the U.S. other countries inhabiting Earth’s orbit as of January 2019, according to the United Nations Register of Objects Launched into Outer Space. HughesNet uses just a handful of bus-sized satellites to deliver internet to rural areas, and the company plans to roll out a 100 Mbps service next year which could hopefully rival Starlink while keeping the number of satellites in orbit down. The other problem with SpaceX’s network is the **life span** of a SpaceX satellite, according to Tim Farrar, President of TMF Associates. “SpaceX has rushed to launch hundreds and hundreds of satellites very quickly. The first ones that they launched are **already deorbiting** because they were not useable for commercial service,” said Farrar, who has been a consultant in the satellite industry for about 25 years. Starlink’s first prototype test-flight satellites launched in February 2018 and they’re already basically **space junk**. “People are getting increasingly nervous with so many [Starlink] satellites going into orbit so quickly, not really knowing how well they’ll work and how reliable they’ll be, and how much SpaceX has its act together,” said Farrar. According to Farrar, a small percentage of those satellites have already stopped working, the clock ticking away until they fall out of orbit. Others SpaceX has been deorbiting on purpose because they don’t have the customer base to justify using them. Yet. The goal of Starlink is similar to HughesNet, but any satellite-based ISP is going to face an **uphill battle** in trying to convince potential customers to subscribe. Satellite signals are easily distorted compared to wired internet. A bad storm or heavily wooded area can turn stable connections spotty or grind service to a halt. Even a misaligned dish or getting new carpeting in your home can cause problems. Satellite internet is also generally slower and more expensive than wired broadband or DSL for the consumer. “I would dare compare it to dial-up,” said Nicole, a rural Michigan resident and former HughesNet customer, about how slow her service was after using up her allotted data for the month. Nicole and her family live in a very rural town. Cash-crop county, as she describes it. Big fields full of sugar beets, wheat, and corn. Some windmills, too. With a total population of around 360 people, it’s the kind of town you can only see on Google Maps if you zoom in all the way. Before they moved to where they live now, internet service was so bad they relied on their cell phones for access. And up until April 2020, Nicole and her family were paying $150 a month for 50 GB of data, and download speeds of 25 Mbps and upload speeds of 3 Mbps, through HughesNet. SpaceX’s beta service costs $100 a month with a $500 upfront cost to order the Starlink kit. By comparison, many metropolitan areas can get 100 Mbps cable broadband for $40-$50 a month. That 50 GB data limit might sound like a lot, but it’s not: Streaming an HD (1080p) video on Netflix can use up to 3 GB per hour per device. Streaming in SD (480p) uses 0.7 GB per hour per device. Customers on cable or fiber plans are usually allotted 1 TB of data per month, or unlimited for Spectrum customers, but streaming in SD via satellite means Nicole and her family are only able to watch two hours of SD videos a day on a single device, which puts them at 42 GB for the month—but doesn’t take into account video conferencing, emails, or anything else work or school related. For a while, HughesNet was the only ISP Nicole could get. If she needed to download large files or print something, Nicole would head to the town library or the family business so they wouldn’t run out of data before the end of the month. They even got a second internet plan at one point, DSL through the now beleaguered Frontier, just in case a storm completely took out their internet or they ran out of data. But when virtual learning started in March, neither was enough. “[Teachers] would say go in the woods, find these objects, talk about it, and send us a video of what you found. But that video alone would take up a chunk of our data,” said Nicole. “And things you don’t even think about, like signing your child up for sports, stuff like that would take me hours.” Nicole now has internet service through Agri-Valley Service (AVS), a local ISP that offers fixed 4G LTE wireless broadband, DSL broadband, and fiber. Some of its plans come with unlimited data, which she says has been leaps and bounds better than HughesNet—although not every plan offered has the FCC defined minimum of 25 Mbps like HughesNet. The heavily wooded area where she and her family live blocks out much of the satellite signals, but with AVS she doesn’t have to worry about disruptions to her internet service, especially while her kids continue distance learning during the pandemic. “We just stumbled upon a pot of gold and got good internet [with AVS]. I had heard that some people had good luck with them, so we were waitlisted at first,” said Nicole. AVS was only available to a certain number of households in her area, but luckily enough a spot opened up not too long after remote learning started for her school-aged children. “Now we can stream, and we can be like normal people.” Nicole also says kids who do not have Internet in her area have no choice but to return to in-person learning in the middle of the pandemic. In Michigan, it was left up to the districts on when they wanted to go back in person last month. But because so many kids don’t have reliable or affordable access to the internet, Nicole’s district decided to open the schools back up because it was the only option. Families who could do remote learning still had the option too. “So far things are going well, because we’re pretty isolated. But it’s a safety issue, so we’re not gonna do that with our kids. Luckily we can do it this way, but it’s just one more inequality for the other kids.” A few states away in a rural Upstate New York town—so remote that cell phone service is virtually non-existent—Nikki Wasielewski and her husband are also preparing to make the switch from HughesNet to a local broadband provider, which she says will solve all their problems. Solid internet is crucial for the two of them; Nikki manages online education for five nearby hospitals and her husband is an elementary school teacher, and they both have been working from home since the beginning of the pandemic. Without reliable internet, they can’t do their jobs properly. “We’ve been with Hughes for about 10 years. We supposedly got upgraded to Gen5 a couple years ago but in the spring found out we never did, and was told we aren’t able to have where we live. I don’t think Hughes could support how many people were home at once when the pandemic started and that caused our Internet service from Hughes to be even slower and stop at times,” said Wasielewski. “When the weather is really bad—heavy snow storm, rain storm—it does interfere with the signal.” On average, it takes 10-11 hours to do seven hours of work on their home internet, according to Wasielewski, and that’s when the weather is good. The hills on either side of their home can sometimes cause interference on those good days. And even at 50 GB of data a month, Nikki and her husband run out constantly due to the amount of downloads and uploads they have to do from home for work. They also have to think outside the box when it comes to helping students who are in the same or worse predicament than they are when it comes to internet access. Some of Nikki’s husband’s students can’t afford the lowest $60 a month plan HughesNet offers, and even the ones that can only get a maximum of 10 GB of data a month run out of that data so quickly. To help students who otherwise wouldn’t be able to attend class, Nikki’s husband makes homework assignments available both in digital and physical formats. “Not having high speed Internet really affects the local teachers. There are a lot of rural school districts where we live. Teachers are uploading lessons on the Internet, loading lessons on flash drives with students without Internet, or making physical copies for students who don’t have a computer.” Nikki, unfortunately, doesn’t have that option when it comes to the students she prepares materials for. As part of her area’s response to the covid-19 pandemic, nearby hospitals have been re-training nurses who have been working desk jobs for years, yet still have valid nursing licenses. Nikki isn’t allowed to be on campus for as long as the pandemic rages on, so she relies immensely on being able to communicate with students using the education portal who need help finding or accessing materials. “There’s a lot of people depending on me with my job as system administrator for online learning for local hospitals. We’re trying to train extra nurses to help during covid. Some nurses with desk jobs are being given refresher courses online that I’m responsible for uploading. And if they can’t get in to complete their courses, I have to troubleshoot, so it is critical for me to have good internet speed and connectivity,” said Wasielewski. “There are nurses waiting to help with patient care because they’ve got to get complete online education in order to go out to give bedside patient care. There’s already a shortage of nurses across the country, and if staff end up in quarantine, it makes even a bigger shortage. If my internet service was faster, I could resolve their online issues sooner and help get staff out to do patient care.” How many ISPs will get a piece of that FCC money? We don’t know yet. Studies have shown municipal broadband would make reliable, fast internet accessible and affordable to rural communities, yet many states continue to roadblock those efforts in favor of keeping tiny monopolies across city and state lines between a handful of providers. Satellite, whether from a bright new upstart like Starlink or an established player like HughesNet, is a stop-gap. It’s a Band-Aid on a wound that needs sutures instead. Regardless of what kind of satellite is providing internet, or who is providing it, it’s still **prohibitively expensive** for the speeds and the amount of data you get a month. Its signals are easily obscured by trees, storms, hills, buildings, and the more people connecting to a single satellite, the less bandwidth there is to go around. There are all areas where wired broadband is miles ahead of satellite internet. The way to completely close the digital divide is to dump that money into fiber broadband, says the Electronic Frontier Foundation, especially since there is no 5G network without fiber. “Fiber-to-the-home helps with the build out of 5G networks,” according to the EFF. “The fundamental challenge facing nationwide coverage of 5G is the lack of ubiquitous dense fiber infrastructure, which 5G relies on. Dense fiber barely exists for anyone in America, according to the government’s own data measuring network access deployment.” It’s ironic that the ISP’s own reluctance, even with federal dollars, to roll out broadband across the U.S. is hampering their own efforts to roll out 5G, true 5G. It’s painfully clear that residents in rural communities need the internet as much as urban and suburban residents do, especially where education and health care are concerned. But an emphasis on short-term investments have made cable and fiber ISPs hyper focused on areas that would give them a quick return to please shareholders. This profits-over-people mentality created the digital divide and it needs to stop if we ever hope to close it.