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#### **Ambiguities in the OST that allow private appropriation have kicked off a race to develop space, setting the stage for a debris crisis and the domination of space by unaccountable billionaires. Current laws fail due to lax rules and forum shopping.**

Dovey 21 [Ceridwen Dovey, “Space Exploration At What Price?,” Readers Digest Asia Pacific, 5/1/21. <https://www.pressreader.com/australia/readers-digest-asia-pacific/20210501/281487869174485>] CT

One environmental risk all stakeholders agree on is that posed by space debris. There’s already about 5000 satellites in orbit around Earth, of which roughly 2000 are operational, plus hundreds of millions of tiny pieces of debris. Ninety-five per cent of the stuff in low-Earth orbit is classified as ‘space junk’. More space debris makes accessing space costlier in terms of loss of equipment (and possibly of human life). There’s also the risk of the Kessler effect: a cascade of collisions, to the point where the most useful orbital slots become permanently clogged. “We are in the process of messing up space, and most people don’t realise it because we can’t see it the way we can see fish kills, algal blooms or acid rain,” Michael Krepon, an expert on nuclear and space issues, said in 2015. Maybe we’ll understand only when it’s too late, “when we can’t get our satellite television and our telecommunications ... when we get knocked back to the 1950s”. The current clashes over space are rooted in the nitty-gritty of international space law. There are five multilateral UN treaties governing space, most importantly the 1967 Outer Space Treaty (OST), which has been ratified by 109 states, including all major spacefaring nations. It defines outer space as a global commons, the province of all humanity, free to be used and explored “for the benefit and in the interests of all countries”, “on a basis of equality” and only for “peaceful purposes”. Article II of the OST has become the major sticking point in the new space race. It forbids “national appropriation by claim of sovereignty, by means of use or occupation, or by any other means”. No nation can make a territorial claim on the Moon or on any other celestial bodies, such as asteroids. While the OST contains no explicit ban of appropriation by private enterprise, Steven Freeland, a professor specialising in space law at Western Sydney University and Australia’s representative to the UN Committee on the Peaceful Uses of Outer Space (COPUOS), says discussions at the time of the OST negotiations clearly show the states parties, including the US, were “of the opinion that Article II prohibited both public and private appropriation”. Yet this perceived legal uncertainty is the loophole that commercial companies are now exploiting. They’ve actively lobbied for an interpretation of OST Article II in the domestic space law of certain countries, to allow for private ownership of resources extracted from the Moon or other celestial bodies. They argue that, because the OST declares all humans are free to “use” space, companies can exercise this right by mining anywhere they like. They won’t claim ownership of the land itself, but will claim ownership of the resources they mine there. They’ve already had a major win in this regard. The space industry lobby in the US put pressure on members of Congress to reinterpret the US’s obligations under international space law, to become more ‘business friendly’. The outcome was the 2015 Commercial Space Launch Competitiveness Act, signed into law by President Obama. Since then, companies owned by US citizens have been given the right to claim ownership of – and sell – any resources they mine off-Earth. Further emboldened by the Trump administration, the “commercial [space] industry is becoming far more aggressive in how it lobbies for its own interests” in the US, Freeland says. There have been Acts proposed in recent years to enable a corporate space culture of “permissionless innovation”, with little regulatory oversight. In a 2017 speech, President Trump’s space law adviser Scott Pace said, “It bears repeating: outer space is not a ‘global commons’, not the ‘common heritage of mankind’, not ‘ res communis’ [area of territory that is not subject to legal title of any state], nor is it a public good.” Even if you accept the US government’s interpretation of Article II – that space resources, but not the territory on which they’re located, can be owned – what happens if someone mines an asteroid out of existence, which is an act of outright appropriation? Should the public trust that companies mining in space will do the right thing? We’re still uncovering the full extent of terrestrial mining companies’ cover-ups. For instance, inhouse scientists at Exxon – now Exxon-Mobil, one of the biggest oil and gas companies in the world – knew long ago that burning fossil fuels was responsible for global warming, but they actively buried those findings and discredited climate change science for decades. We live in a world where ‘meta-national’ companies can accrue and exercise more wealth and power than traditional nation-states. Silicon Valley is believed to be becoming more powerful than not only Wall Street but also the US government. Branson and other space billionaires like to reassure the masses they’re “democratising” space: just as plane travel started out for the wealthy and gradually became cheaper, so too will space travel. Yet this conveniently overlooks the fact that railroads, airlines and now space industries have all been heavily subsidised by taxpayers. “When we take a step back and notice that private corporations are often even less accountable than governments, then it seems mistaken to say these decisions have been democratised,” Ryan Jenkins, an emerging sciences ethicist at California Polytechnic State University, says. “They’ve merely been privatised.” Lenient supervision. In 2017, Luxembourg – already a corporate tax haven, complicit in international investor tax avoidance and evasion – followed the US’s lead and passed a space-resources law that allows companies to claim resources they extract from space as private property. Guardian journalist Atossa Araxia Abrahamian recounted a chilling comment from an American space executive: “We just want to work with a government who won’t get in the way.” Companies anywhere in the world can stake resource claims in space under this new law; their only requirement is an office in Luxembourg. This sets a murky precedent of ‘regulatory forum-shopping’, where companies choose to incorporate in states where they’ll be most leniently supervised. In 2018, a Silicon Valley start-up called Swarm Technologies illegally launched four miniature satellites known as CubeSats into space from India. They’d been refused launch permission in the US due to safety concerns over whether the satellites could be tracked once in orbit. Fined US$900,000 by the US Federal Communications Commission, the company was subsequently given permission to start communicating with its satellites, and launched more CubeSats as part of a payload on a SpaceX rocket that November. In January 2019, the company raised $25 million in venture capital. Space start-ups that are prepared – unlike Swarm Technologies – to play by the rules are nonetheless still proposing to launch their own swarms of hundreds or thousands of satellites into very low orbits around Earth. SpaceX has already launched over 1000 internet-beaming Starlink satellites, aiming to have a constellation of at least 30,000 in orbit eventually. The UK’s Royal Astronomical Society said these satellites will “compromise astronomical research” due to light pollution, and questioned why there’d been no proper consultation with the scientific community before launch.

### Advantage 1: Space Debris

#### Increasing space debris levels inevitably set off a chain of collisions.

Chelsea Muñoz-Patchen, 19 - (J.D. Candidate at The University of Chicago Law School., "Regulating the Space Commons: Treating Space Debris as Abandoned Property in Violation of the Outer Space Treaty," University of Chicago, 2019, 12-6-2021, https://cjil.uchicago.edu/publication/regulating-space-commons-treating-space-debris-abandoned-property-violation-outer-space)//AW

Debris poses a threat to functioning space objects and astronauts in space, and may cause damage to the earth’s surface upon re-entry.29 Much of the small debris cannot be tracked due to its size and the velocity at which it travels, making it impossible to anticipate and maneuver to avoid collisions.30 To remain in orbit, debris must travel at speeds of up to 17,500 miles per hour.31 At this speed even very small pieces of debris can cause serious damage, threatening a spacecraft and causing expensive damage.32 There are millions of these very small pieces, and thousands of larger ones.33 The small-to-medium pieces of debris “continuously shed fragments like lens caps, booster upper stages, nuts, bolts, paint chips, motor sprays of aluminum particles, glass splinters, waste water, and bits of foil,” and may stay in orbit for decades or even centuries, posing an ongoing risk.34 Debris ten centimeters or larger in diameter creates the likelihood of complete destruction for any functioning satellite with which it collides.35 Large nonfunctional objects remaining in orbit are a collision threat, capable of creating huge amounts of space debris and taking up otherwise useful orbit space.36 This issue is of growing importance as more nations and companies gain the ability to launch satellites and other objects into space.37 From February 2009 through the end of 2010, more than thirty-two collision-avoidance maneuvers were reportedly used to avoid debris by various space agencies and satellite companies, and as of March 2012, the crew of the International Space Station (ISS) had to take shelter three times due to close calls with passing debris.38 These maneuvers require costly fuel usage and place a strain on astronauts.39 Furthermore, the launches of some spacecraft have “been delayed because of the presence of space debris in the planned flight paths.”40 In 2011, Euroconsult, a satellite consultant, projected that there would be “a 51% increase in satellites launched in the next decade over the number launched in the past decade.”41 In addition to satellites, the rise of commercial space tourism will also increase the number of objects launched into space and thus the amount of debris.42 The more objects are sent into space, and the more collisions create cascades of debris, the greater the risk of damage to vital satellites and other devices relied on for “weather forecasting, telecommunications, commerce, and national security.”43 The Space Debris Mitigation Guidelines44 were created by UNCOPUOS with input from the IADC and adopted in 2007.45 The guidelines were developed to address the problem of space debris and were intended to “increase mutual understanding on acceptable activities in space.”46 These guidelines are nonbinding but suggest best practices to implement at the national level when planning for a launch. Many nations have adopted the guidelines to some degree, and some have gone beyond what the guidelines suggest.47 While the guidelines do not address existing debris, they do much to prevent the creation of new debris. The Kessler Syndrome is the biggest concern with space debris. The Kessler Syndrome is a cascade created when debris hits a space object, creating new debris and setting off a chain reaction of collisions that eventually closes off entire orbits.48 The concern is that this cascade will occur when a tipping point is reached at which the natural removal rate cannot keep up with the amount of new debris added.49 At this point a collision could set off a cascade destroying all space objects within the orbit.50 In 2011, The National Research Council predicted that the Kessler Syndrome could happen within ten to twenty years.51 Donald J. Kessler, the astrophysicist and NASA scientist who theorized the Kessler Syndrome in 1978, believes this cascade may be a century away, meaning that there is still time to develop a solution.52

#### Collisions make orbit unusable, causing nuclear war, mass starvation, and economic destruction. Jonson 13

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

Whatever the initial cause, the result may be the same. A satellite 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 begins. 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, destroying every satellite in low Earth orbit. 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 ~~crippling~~ of the US military who now depend upon 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 agriculture 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 satellites 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 information 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.

### Advantage 2: Corporate Colonialism

#### Tech-billionaires advance a vision of private space colonization as a source of infinite resources to cure society’s ills. This rationalizes unrestrained consumption and replicates the logic of imperialism.

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It was a time of political uncertainty, cultural conflict and social change. Private ventures exploited technological advances and natural resources, generating unprecedented fortunes while wreaking havoc on local communities and environments. The working poor crowded cities, spurring property-holders to develop increased surveillance and incarceration regimes. Rural areas lay desolate, buildings vacant, churches empty — the stuff of moralistic elegies. ¶Epidemics raged, forcing quarantines in the ports and lockdowns in the streets. [Mortality data](https://wellcomecollection.org/works?query=%22bills+of+mortality%22&production.dates.from=1600&production.dates.to=1699&sortOrder=asc&sort=production.dates) was the stuff of weekly news and [commentary](https://doi.org/10.7227/TSC.27.3.2). ¶Depending on the perspective, mobility — chosen or compelled — was either the cause or the consequence of general disorder. Uncontrolled mobility was associated with political instability, moral degeneracy and social breakdown. However, one form of planned mobility promised to solve these problems: colonization. ¶Europe and its former empires have changed a lot since the 17th century. But the persistence of colonialism as a supposed panacea suggests we are not as far from the early modern period as we think. ¶Colonial promise of limitless growth ¶Seventeenth-century colonial schemes involved plantations around the Atlantic, and motivations that now sound archaic. Advocates of expansion such as the English writer Richard Hakluyt, whose [Discourse of Western Planting (1584)](http://nationalhumanitiescenter.org/pds/amerbegin/exploration/text5/hakluyt.pdf) outlined the benefits of empire for Queen Elizabeth: the colonization of the New World would prevent Spanish Catholic hegemony and provide a chance to claim Indigenous souls for Protestantism. ¶But a key promise was the economic and social renewal of the mother country through new commodities, trades and territory. Above all, planned mobility would cure the ills of apparent overpopulation. Sending the poor overseas to cut timber, mine gold or farm cane would, [according to Hakluyt](https://www.digitalhistory.uh.edu/disp_textbook.cfm?smtID=3&psid=70), turn the “multitudes of loiterers and idle vagabonds” that “swarm(ed)” England’s streets and “pestered and stuffed” its prisons into industrious workers, providing raw materials and a reason to multiply. Colonization would fuel limitless growth. ¶As English plantations took shape in Ulster, Virginia, New England and the Caribbean, “[projectors](https://doi.org/10.1163/15733823-00215p01)” — individuals (nearly always men) who promised to use new kinds of knowledge to radically and profitably transform society — tied mobility to new sciences and technologies. They were inspired as much by English philosopher Francis Bacon’s vision of a tech-centred state in [The New Atlantis](https://www.gutenberg.org/files/2434/2434-h/2434-h.htm) as by his advocacy of observation and experiment. ¶Discovery and invention ¶The English agriculturalist Gabriel Plattes cautioned in 1639 that “[the finding of new worlds is not like to be a perpetual trade](https://quod.lib.umich.edu/cgi/t/text/pageviewer-idx?cc=eebo2;c=eebo2;idno=a68588.0001.001;node=A68588.0001.001:5;seq=29;vid=15242;page=root;view=text).” But many more saw a supposedly vacant America as an invitation to transplant people, plants and machinery. ¶The inventor Cressy Dymock (from Lincolnshire, where fen-drainage schemes were turning wetlands dry) sought support for a “[perpetual motion engine](https://www.dhi.ac.uk/hartlib/view?docset=main&docname=62A_08)” that would plough fields in England, clear forest in Virginia and drive sugar mills in Barbados. Dymock identified private profit and the public good by speeding plantation and replacing costly draught animals with cheaper enslaved labour. Projects across the empire would employ the idle, create “elbow-room,” heal “unnatural divisions” and make England “[the garden of the world](https://www.dhi.ac.uk/hartlib/view?docset=main&docname=64_18).” ¶Extraterrestrial exploration ¶Today, the moon and Mars are in projectors’ sights. And the promises billionaires Elon Musk and Jeff Bezos make for colonization are similar in ambition to those of four centuries ago. ¶As Bezos told an audience at the [International Space Development Conference](https://www.geekwire.com/2018/jeff-bezos-isdc-space-vision/) in 2018: “We will have to leave this planet, and we’re going to leave it, and it’s going to make this planet better.” Bezos traces his thinking to Princeton physicist Gerald O’Neill, whose 1974 article “[The Colonization of Space](https://space.nss.org/the-colonization-of-space-gerard-k-o-neill-physics-today-1974/)” (and 1977 book, The High Frontier) presented orbiting settlements as solutions to nearly every major problem facing the Earth. Bezos echoes O’Neill’s proposal to move heavy industry — and industrial labour — off the planet, rezoning Earth as a mostly residential, green space. A garden, as it were. ¶Musk’s plans for Mars are at once more cynical and more grandiose, in timeline and technical requirements if not in ultimate extent. They center on the dubious possibility of “[terraforming](https://www.businessinsider.com/nasa-just-quashed-elon-musks-plans-to-make-mars-habitable-for-humans-2018-7)” Mars using resources and technologies that don’t yet exist. ¶Musk planned to [send the first humans to Mars in 2024](https://www.businessinsider.com/elon-musk-spacex-mars-plan-timeline-2018-10), and by 2030, he envisioned breaking ground on a city, [launching as many as 100,000 voyages from Earth to Mars](https://www.businessinsider.com/elon-musk-says-we-could-put-a-million-people-on-mars-within-a-century-2015-6) within a century. ¶As of 2020, the timeline had been pushed back slightly, in part because terraforming may require bombarding Mars with 10,000 nuclear missiles to start. But the vision – a Mars of thriving crops, pizza joints and “entrepreneurial opportunities,” preserving life and paying dividends while Earth becomes increasingly uninhabitable — remains. Like the colonial [company-states](https://doi.org/10.1177/1354066120928127) of the 17th and 18th centuries, [Musk’s SpaceX leans heavily on government backing but will make its own laws on its newly settled planet](http://bostonreview.net/science-nature/alina-utrata-lost-space). ¶A failure of the imagination ¶The techno-utopian visions of Musk and Bezos betray some of the same assumptions as their early modern forebears. They offer colonialism as a panacea for complex social, political and economic ills, rather than attempting to work towards a better world within the constraints of our environment. ¶And rather than facing the palpably devastating consequences of an ideology of limitless growth on our planet, they seek to export it, unaltered, into space. They imagine themselves capable of creating liveable environments where none exist. ¶But for all their futuristic imagery, they have failed to imagine a different world. And they have ignored the history of colonialism on this one. Empire never recreated Eden, but it did fuel centuries of growth based on expropriation, enslavement and environmental transformation in defiance of all limits. We are struggling with these consequences today.

#### If only wealthy elites can tap the vast resources of outer space, we lock in a permanent and unconscionable inequality. Private space colonization amounts to authoritarian corporate control of future settlements. Spencer ‘17

Spencer, Keith A. [senior editor at Salon]“Against Mars-a-Lago: Why SpaceX's Mars Colonization Plan Should Terrify You.” Salon, Salon.com, Oct. 8 2017, https://www.salon.com/2017/10/08/against-mars-a-lago-why-spacexs-mars-colonization-plan-should-terrify-you/.

When CEO Elon Musk announced last month that his aerospace company SpaceX would be [sending cargo missions](https://www.washingtonpost.com/news/the-switch/wp/2017/09/29/elon-musk-says-his-next-spaceship-could-not-only-take-to-you-the-moon-and-mars-but-from-n-y-to-london-in-29-minutes/?utm_term=.85279aa2076a) to Mars by 2022 — the first step in his tourism-driven colonization plan — a small cheer went up among space and science enthusiasts. Writing in the New York Post, Stephen Carter [called](http://nypost.com/2017/10/07/elon-musks-inspiring-vision-for-reaching-mars-and-the-stars/) Musk’s vision “inspiring,” a salve for politically contentious times. “Our species has turned its vision inward; our image of human possibility has grown cramped and pessimistic,” Carter wrote: "We dream less of reaching the stars than of winning the next election; less of maturing as a species than of shunning those who are different; less of the blessings of an advanced technological tomorrow than of an apocalyptic future marked by a desperate struggle to survive. Maybe a focus on the possibility of reaching our nearest planetary neighbor will help change all that." The Post editorial reflected a growing media consensus that humankind’s ultimate destiny is the colonization of the solar system — yet on a private basis. American government leaders generally agree with this vision. Obama egged on the [privatization of NASA](http://blogs.discovermagazine.com/80beats/2010/02/01/obamas-nasa-budget-so-long-moon-missions-hello-private-spaceflight/) by legislating a policy shift to private commercial spaceflight, awarding government contracts to private companies like SpaceX to shuttle supplies to the International Space Station. “Governments can develop new technology and do some of the exciting early exploration but in the long run it's the private sector that finds ways to make profit, finds ways to expand humanity,” [said](http://www.theregister.co.uk/2012/03/08/nasa_private_space_nasa/) Dr. S. Pete Worden, the director of the NASA Ames Research lab, in 2012. And in a Wall Street Journal [op-ed](https://www.wsj.com/articles/america-will-return-to-the-moonand-go-beyond-1507158341?mod=e2fb) this week, Vice President Mike Pence wrote of his ambitions to bring [American-style capitalism to the stars](https://www.salon.com/2017/08/06/tacoma-the-next-video-game-from-gone-home-creators-imagines-the-gig-economy-in-space/): “In the years to come, American industry must be the first to maintain a constant commercial human presence in low-Earth orbit, to expand the sphere of the economy beyond this blue marble,” Pence wrote. One wonders if these luminaries know their history. There has be no instance in which a private corporation became a colonizing power that did not end badly for everyone besides the shareholders. The East India Company is perhaps the finest portent of Musk’s Martian ambitions. In 1765, the East India Company forced the Mughal emperor to sign a legal agreement that would essentially permit their company to become the de facto rulers of Bengal. The East India Company then collected taxes and used its private army, which was over 200,000 strong by the early 19th century, to repress those who got in the way of its profit margins. “It was not the British government that seized India at the end of the 18th century, but a dangerously unregulated private company headquartered in one small office, five windows wide, in London, and managed in India by an unstable sociopath,” [writes](https://www.theguardian.com/world/2015/mar/04/east-india-company-original-corporate-raiders) William Dalrymple in the Guardian. “It almost certainly remains the supreme act of corporate violence in world history.” The East India Company came to colonize much of the Indian subcontinent. In the modern era, an era in which the right of corporations to do what they want, unencumbered, has become a [sacrosanct](https://www.salon.com/2017/09/19/trumps-interior-secretary-on-national-monuments-sell-em-and-strip-em/) [right](https://www.salon.com/2016/12/15/exxonmobil-ceo-and-trump-pick-rex-tillerson-my-philosophy-is-to-make-money_partner/) in the eyes of many politicians, the lessons of the East India Company seem to have been all but forgotten. As Dalrymple writes: Democracy as we know it was considered an advance over feudalism because of the power that it gave the commoners to share in collective governance. To privately colonize a nation, much less a planet, means ceding governance and control back to corporations whose interest is not ours, and indeed, is always at odds with workers and residents — particularly in a resource-limited environment like a spaceship or the red planet. Even if, as Musk suggests, a private foundation is [put in charge](https://www.jacobinmag.com/2017/02/mars-elon-musk-space-exploration-nasa-colonization) of running the show on Mars, their interests will inherently be at [odds with the workers](http://www.dailykos.com/story/2015/5/5/1372730/-Skylab-and-the-Sit-Down-Strike-in-Space) and employees involved. After all, a private foundation [is not a democracy](https://www.jacobinmag.com/2015/11/philanthropy-charity-banga-carnegie-gates-foundation-development); and as major philanthropic organizations like the Bill and Melinda Gates Foundation [illustrate](https://www.jacobinmag.com/2015/11/philanthropy-charity-banga-carnegie-gates-foundation-development), often [do the bidding](http://www.peterfrase.com/2011/08/the-decay-of-the-capitalist-class/) of their rich donors, and take an [important role in ripening industries](https://www.salon.com/2016/02/21/corporate_reformers_wreck_public_schools_billionaire_foundations_and_wall_street_financiers_are_not_out_to_help_your_kids_learn/) and regions for exploitation by Western corporations. Yet Mars’ colonization is a bit different than Bengal, namely in that it is not merely underdeveloped; it is undeveloped. How do you start an entirely new economy on a virgin world with no industry? After all, Martian resource extraction and trade with Earth is not feasible; the cost of transporting material across the solar system is astronomical, and there are no obvious minerals on Mars that we don’t already have in abundance on Earth. The only basis for colonization of Mars that Musk can conceive of is one based on tourism: the rich pay an amount — Musk quotes the ticket price at [$200,000 if he can get 1 million tourists](https://www.recode.net/2016/9/27/13081488/elon-musk-spacex-mars-colony-space-travel-funding-rocket-nasa) to pay that — that entitles them to a round-trip ticket. And while they’re on Mars and traveling to it, they luxuriate: Musk has [assured](http://www.telegraph.co.uk/science/2017/06/21/elon-musk-create-city-mars-million-inhabitants/) that the trip would be “fun.” This is what makes Musk’s Mars vision so different than, say, the Apollo missions or the International Space Station. This isn’t really exploration for humanity’s sake — there’s not that much science assumed here, as there was in the Moon missions. Musk wants to build the ultimate luxury package, exclusively for the richest among us. Musk isn’t trying to build something akin to Matt Damon’s spartan research base in "The Martian." He wants to build Mars-a-Lago. And an economy based on tourism, particularly high-end tourism, needs employees — even if a high degree of automation is assumed. And as I’ve written about [before](https://www.jacobinmag.com/2017/02/mars-elon-musk-space-exploration-nasa-colonization), that means a lot of labor at the lowest cost possible. Imagine signing away years of your life to be a housekeeper in the Mars-a-Lago hotel, with your communications, water, food, energy usage, even oxygen tightly managed by your employer, and no government to file a grievance to if your employer cuts your wages, harasses you, cuts off your oxygen. Where would Mars-a-Lago's employees turn if their rights were impinged upon? Oh wait, this planet is run privately? You have no rights. Musk's vision for Mars colonization is inherently authoritarian. The potential for the existence of the employees of the Martian tourism industry to slip into something resembling indentured servitude, even slavery, cannot be underestimated. We have government regulations for a reason on Earth — to protect us from the fresh horror Musk hopes to export to Mars. If he's considered these questions, he doesn't seem to care; for Musk, the devil's in the technological and financial details. The social and political are pretty uninteresting to him. This is unsurprising; accounts from those who have worked closely with him hint that he, like many CEOs, [may be a sociopath](http://www.businessinsider.com/working-with-elon-musk-tesla-2015-5). Even as a space enthusiast, I cannot get excited about the private colonization of Mars. You shouldn’t be either. This is not a giant leap for mankind; this is the next great leap in plutocracy. The mere notion that global wealth is so unevenly distributed that a small but sufficient sum of rich people could afford this trip is unsettling, indicative of the era of astonishing economic inequality in which we suffer. Thomas Frank, writing in Harpers, once [wrote of](https://harpers.org/archive/2011/11/the-bleakness-stakes/) a popular t-shirt he sighted while picnicking in a small West Virginia coal town: “Mine it union or keep it in the ground.” The idea, of course, is that the corporations interested in resource extraction do not care whatsoever about their workers’ health, safety, or well-being; the union had their interests at heart, and was able to negotiate for safety, job security, and so on. I’d like to see a similar t-shirt or bumper sticker emerge among scientists and space enthusiasts: “Explore Mars democratically, or keep it in the sky.”

**Neoliberalism destroys ethics, locks in poverty and exploitation, decimates the environment, and causes war.**

**Werlhof 15** – Claudia, Professor of Political Science/Women's Studies, University Innsbruck (Austria), 2015 (“Neoliberal Globalization: Is There an Alternative to Plundering the Earth?” Global Research, May 25th, Available Online at http://www.globalresearch.ca/neoliberal-globalization-is-there-an-alternative-to-plundering-the-earth/24403)

At the center of both old and new economic liberalism lies: Self-interest and individualism; segregation of ethical principles and economic affairs, in other words: a process of ‘de-bedding’ economy from society; economic rationality as a mere cost-benefit calculation and profit maximization; competition as the essential driving force for growth and progress; specialization and the replacement of a subsistence economy with profit-oriented foreign trade (‘comparative cost advantage’); and the proscription of public (state) interference with market forces.[3] Where the new economic liberalism outdoes the old is in its global claim. Today’s economic liberalism functions as a model for each and everyone: all parts of the economy, all sectors of society, of life/nature itself. As a consequence, the once “de-bedded” economy now claims to “im-bed” everything, including political power. Furthermore, a new twisted “economic ethics” (and with it a certain idea of “human nature”) emerges that mocks everything from so-called do-gooders to altruism to selfless help to care for others to a notion of responsibility.[4] This goes as far as claiming that the common good depends entirely on the uncontrolled egoism of the individual and, especially, on the prosperity of transnational corporations. The allegedly necessary “freedom” of the economy – which, paradoxically, only means the freedom of corporations – hence consists of a freedom from responsibility and commitment to society. The maximization of profit itself must occur within the shortest possible time; this means, preferably, through speculation and “shareholder value”. It must meet as few obstacles as possible. Today, global economic interests outweigh not only extra-economic concerns but also national economic considerations since corporations today see themselves beyond both community and nation.[5] A “level playing field” is created that offers the global players the best possible conditions. This playing field knows of no legal, social, ecological, cultural or national “barriers”.[6] As a result, economic competition plays out on a market that is free of all non-market, extra-economic or protectionist influences – unless they serve the interests of the big players (the corporations), of course. The corporations’ interests – their maximal growth and progress – take on complete priority. This is rationalized by alleging that their well-being means the well-being of small enterprises and workshops as well. The difference between the new and the old economic liberalism can first be articulated in quantitative terms: after capitalism went through a series of ruptures and challenges – caused by the “competing economic system”, the crisis of capitalism, post-war “Keynesianism” with its social and welfare state tendencies, internal mass consumer demand (so-called Fordism), and the objective of full employment in the North. The liberal economic goals of the past are now not only euphorically resurrected but they are also “globalized”. The main reason is indeed that the competition between alternative economic systems is gone. However, to conclude that this confirms the victory of capitalism and the “golden West” over “dark socialism” is only one possible interpretation. Another – opposing – interpretation is to see the “modern world system” (which contains both capitalism and socialism) as having hit a general crisis which causes total and merciless competition over global resources while leveling the way for investment opportunities, i.e. the valorization of capital.[7] The ongoing globalization of neoliberalism demonstrates which interpretation is right. Not least, because the differences between the old and the new economic liberalism can not only be articulated in quantitative terms but in qualitative ones too. What we are witnessing are completely new phenomena: instead of a democratic “complete competition” between many small enterprises enjoying the freedom of the market, only the big corporations win. In turn, they create new market oligopolies and monopolies of previously unknown dimensions. The market hence only remains free for them, while it is rendered unfree for all others who are condemned to an existence of dependency (as enforced producers, workers and consumers) or excluded from the market altogether (if they have neither anything to sell or buy). About fifty percent of the world’s population fall into this group today, and the percentage is rising.[8] Anti-trust laws have lost all power since the transnational corporations set the norms. It is the corporations – not “the market” as an anonymous mechanism or “invisible hand” – that determine today’s rules of trade, for example prices and legal regulations. This happens outside any political control. Speculation with an average twenty percent profit margin edges out honest producers who become “unprofitable”.[9] Money becomes too precious for comparatively non-profitable, long-term projects, or projects that only – how audacious! – serve a good life. Money instead “travels upwards” and disappears. Financial capital determines more and more what the markets are and do.[10] By delinking the dollar from the price of gold, money creation no longer bears a direct relationship to production”.[11] Moreover, these days most of us are – exactly like all governments – in debt. It is financial capital that has all the money – we have none.[12] Small, medium, even some bigger enterprises are pushed out of the market, forced to fold or swallowed by transnational corporations because their performances are below average in comparison to speculation – rather: spookulation – wins. The public sector, which has historically been defined as a sector of not-for-profit economy and administration, is “slimmed” and its “profitable” parts (“gems”) handed to corporations (privatized). As a consequence, social services that are necessary for our existence disappear. Small and medium private businesses – which, until recently, employed eighty percent of the workforce and provided normal working conditions – are affected by these developments as well. The alleged correlation between economic growth and secure employment is false. When economic growth is accompanied by the mergers of businesses, jobs are lost.[13] If there are any new jobs, most are precarious, meaning that they are only available temporarily and badly paid. One job is usually not enough to make a living.[14] This means that the working conditions in the North become akin to those in the South, and the working conditions of men akin to those of women – a trend diametrically opposed to what we have always been told. Corporations now leave for the South (or East) to use cheap – and particularly female – labor without union affiliation. This has already been happening since the 1970s in the “Export Processing Zones” (EPZs, “world market factories” or “maquiladoras”), where most of the world’s computer chips, sneakers, clothes and electronic goods are produced.[15] The EPZs lie in areas where century-old colonial-capitalist and authoritarian-patriarchal conditions guarantee the availability of cheap labor.[16] The recent shift of business opportunities from consumer goods to armaments is a particularly troubling development.[17] It is not only commodity production that is “outsourced” and located in the EPZs, but service industries as well. This is a result of the so-called Third Industrial Revolution, meaning the development of new information and communication technologies. Many jobs have disappeared entirely due to computerization, also in administrative fields.[18] The combination of the principles of “high tech” and “low wage”/”no wage” (always denied by “progress” enthusiasts) guarantees a “comparative cost advantage” in foreign trade. This will eventually lead to “Chinese wages” in the West. A potential loss of Western consumers is not seen as a threat. A corporate economy does not care whether consumers are European, Chinese or Indian. The means of production become concentrated in fewer and fewer hands, especially since finance capital – rendered precarious itself – controls asset values ever more aggressively. New forms of private property are created, not least through the “clearance” of public property and the transformation of formerly public and small-scale private services and industries to a corporate business sector. This concerns primarily fields that have long been (at least partly) excluded from the logic of profit – e.g. education, health, energy or water supply/disposal. New forms of so-called enclosures emerge from today’s total commercialization of formerly small-scale private or public industries and services, of the “commons”, and of natural resources like oceans, rain forests, regions of genetic diversity or geopolitical interest (e.g. potential pipeline routes), etc.[19] As far as the new virtual spaces and communication networks go, we are witnessing frantic efforts to bring these under private control as well.[20] All these new forms of private property are essentially created by (more or less) predatory forms of appropriation. In this sense, they are a continuation of the history of so-called original accumulation which has expanded globally, in accordance with to the motto: “Growth through expropriation!”[21] Most people have less and less access to the means of production, and so the dependence on scarce and underpaid work increases. The destruction of the welfare state also destroys the notion that individuals can rely on the community to provide for them in times of need. Our existence relies exclusively on private, i.e. expensive, services that are often of much worse quality and much less reliable than public services. (It is a myth that the private always outdoes the public.) What we are experiencing is undersupply formerly only known by the colonial South. The old claim that the South will eventually develop into the North is proven wrong. It is the North that increasingly develops into the South. We are witnessing the latest form of “development”, namely, a world system of underdevelopment.[22] Development and underdevelopment go hand in hand.[23] This might even dawn on “development aid” workers soon. It is usually women who are called upon to counterbalance underdevelopment through increased work (“service provisions”) in the household. As a result, the workload and underpay of women takes on horrendous dimensions: they do unpaid work inside their homes and poorly paid “housewifized” work outside.[24] Yet, commercialization does not stop in front of the home’s doors either. Even housework becomes commercially co-opted (“new maid question”), with hardly any financial benefits for the women who do the work.[25] Not least because of this, women are increasingly coerced into prostitution, one of today’s biggest global industries.[26] This illustrates two things: a) how little the “emancipation” of women actually leads to “equal terms” with men; and b) that “capitalist development” does not imply increased “freedom” in wage labor relations, as the Left has claimed for a long time.[27] If the latter were the case, then neoliberalism would mean the voluntary end of capitalism once it reaches its furthest extension. This, however, does not appear likely. Today, hundreds of millions of quasi-slaves, more than ever before, exist in the “world system.”[28] The authoritarian model of the “Export Processing Zones” is conquering the East and threatening the North. The redistribution of wealth runs ever more – and with ever accelerated speed – from the bottom to the top. The gap between the rich and the poor has never been wider. The middle classes disappear. This is the situation we are facing. It becomes obvious that neoliberalism marks not the end of colonialism but, to the contrary, the colonization of the North. This new “colonization of the world”[29] points back to the beginnings of the “modern world system” in the “long 16th century”, when the conquering of the Americas, their exploitation and colonial transformation allowed for the rise and “development” of Europe.[30] The so-called “children’s diseases” of modernity keep on haunting it, even in old age. They are, in fact, the main feature of modernity’s latest stage. They are expanding instead of disappearing. Where there is no South, there is no North; where there is no periphery, there is no center; where there is no colony, there is no – in any case no “Western” – civilization.[31] Austria is part of the world system too. It is increasingly becoming a corporate colony (particularly of German corporations). This, however, does not keep it from being an active colonizer itself, especially in the East.[32] Social, cultural, traditional and ecological considerations are abandoned and give way to a mentality of plundering. All global resources that we still have – natural resources, forests, water, genetic pools – have turned into objects of utilization. Rapid ecological destruction through depletion is the consequence.If one makes more profit by cutting down trees than by planting them, then there is no reason not to cut them.[33] Neither the public nor the state interferes, despite global warming and the obvious fact that the clearing of the few remaining rain forests will irreversibly destroy the earth’s climate – not to mention the many other negative effects of such actions.[34] Climate, animal, plants, human and general ecological rights are worth nothing compared to the interests of the corporations – no matter that the rain forest is not a renewable resource and that the entire earth’s ecosystem depends on it. If greed, and the rationalism with which it is economically enforced, really was an inherent anthropological trait, we would have never even reached this day. The commander of the Space Shuttle that circled the earth in 2005 remarked that “the center of Africa was burning”. She meant the Congo, in which the last great rain forest of the continent is located. Without it there will be no more rain clouds above the sources of the Nile. However, it needs to disappear in order for corporations to gain free access to the Congo’s natural resources that are the reason for the wars that plague the region today. After all, one needs diamonds and coltan for mobile phones. Today, everything on earth is turned into commodities, i.e. everything becomes an object of “trade” and commercialization (which truly means liquidation, the transformation of all into liquid money). In its neoliberal stage it is not enough for capitalism to globally pursue less cost-intensive and preferably “wageless” commodity production. The objective is to transform everyone and everything into commodities, including life itself.[35] We are racing blindly towards the violent and absolute conclusion of this “mode of production”, namely total capitalization/liquidation by “monetarization”.[36] We are not only witnessing perpetual praise of the market – we are witnessing what can be described as “market fundamentalism”. People believe in the market as if it was a god. There seems to be a sense that nothing could ever happen without it. Total global maximized accumulation of money/capital as abstract wealth becomes the sole purpose of economic activity. A “free” world market for everything has to be established – a world market that functions according to the interests of the corporations and capitalist money. The installment of such a market proceeds with dazzling speed. It creates new profit possibilities where they have not existed before, e.g. in Iraq, Eastern Europe or China. One thing remains generally overlooked: the abstract wealth created for accumulation implies the destruction of nature as concrete wealth. The result is a “hole in the ground” and next to it a garbage dump with used commodities, outdated machinery and money without value.[37] However, once all concrete wealth (which today consists mainly of the last natural resources) will be gone, abstract wealth will disappear as well. It will, in Marx’s words, “evaporate”. The fact that abstract wealth is not real wealth will become obvious, and so will the answer to the question of which wealth modern economic activity has really created. In the end it is nothing but monetary wealth (and even this mainly exists virtually or on accounts) that constitutes a monoculture controlled by a tiny minority. Diversity is suffocated and millions of people are left wondering how to survive. And really: how do you survive with neither resources nor means of production nor money? The nihilism of our economic system is evident. The whole world will be transformed into money – and then it will disappear. After all, money cannot be eaten. What no one seems to consider is the fact that it is impossible to re-transform commodities, money, capital and machinery into nature or concrete wealth. It seems that underlying all “economic development” is the assumption that “resources”, the “sources of wealth”,[38] are renewable and everlasting – just like the “growth” they create.[39] The notion that capitalism and democracy are one is proven a myth by neoliberalism and its “monetary totalitarianism”.[40] The primacy of politics over economy has been lost. Politicians of all parties have abandoned it. It is the corporations that dictate politics. Where corporate interests are concerned, there is no place for democratic convention or community control. Public space disappears. The res publica turns into a res privata, or – as we could say today – a res privata transnationale (in its original Latin meaning, privare means “to deprive”). Only those in power still have rights. They give themselves the licenses they need, from the “license to plunder” to the “license to kill”.[41] Those who get in their way or challenge their “rights” are vilified, criminalized and to an increasing degree defined as “terrorists” or, in the case of defiant governments, as “rogue states” – a label that usually implies threatened or actual military attack, as we can see in the cases of Yugoslavia, Afghanistan and Iraq, and maybe Syria and Iran in the near future. U.S. President Bush had even spoken of the possibility of “preemptive” nuclear strikes should the U.S. feel endangered by weapons of mass destruction.[42] The European Union did not object.[43] Neoliberalism and war are two sides of the same coin.[44] Free trade, piracy and war are still “an inseparable three” – today maybe more so than ever. War is not only “good for the economy” but is indeed its driving force and can be understood as the “continuation of economy with other means”.[45] War and economy have become almost indistinguishable.[46] Wars about resources – especially oil and water – have already begun.[47] The Gulf Wars are the most obvious examples. Militarism once again appears as the “executor of capital accumulation” – potentially everywhere and enduringly.[48] Human rights and rights of sovereignty have been transferred from people, communities and governments to corporations.[49] The notion of the people as a sovereign body has practically been abolished. We have witnessed a coup of sorts. The political systems of the West and the nation state as guarantees for and expression of the international division of labor in the modern world system are increasingly dissolving.[50] Nation states are developing into “periphery states” according to the inferior role they play in the proto-despotic “New World Order”.[51] Democracy appears outdated. After all, it “hinders business”.[52] The “New World Order” implies a new division of labor that does no longer distinguish between North and South, East and West – today, everywhere is South. An according International Law is established which effectively functions from top to bottom (“top-down”) and eliminates all local and regional communal rights. And not only that: many such rights are rendered invalid both retroactively and for the future.[53] The logic of neoliberalism as a sort of totalitarian neo-mercantilism is that all resources, all markets, all money, all profits, all means of production, all “investment opportunities”, all rights and all power belong to the corporations only. To paraphrase Richard Sennett: “Everything to the Corporations!”[54] One might add: “Now!” The corporations are free to do whatever they please with what they get. Nobody is allowed to interfere. Ironically, we are expected to rely on them to find a way out of the crisis we are in. This puts the entire globe at risk since responsibility is something the corporations do not have or know. The times of social contracts are gone.[55] In fact, pointing out the crisis alone has become a crime and all critique will soon be defined as “terror” and persecuted as such.[56] IMF Economic Medicine Since the 1980s, it is mainly the Structural Adjustment Programs (SAPs) of the World Bank and the IMF that act as the enforcers of neoliberalism. These programs are levied against the countries of the South which can be extorted due to their debts. Meanwhile, numerous military interventions and wars help to take possession of the assets that still remain, secure resources, install neoliberalism as the global economic politics, crush resistance movements (which are cynically labeled as “IMF uprisings”), and facilitate the lucrative business of reconstruction.[57] In the 1980s, Ronald Reagan and Margaret Thatcher introduced neoliberalism in Anglo-America. In 1989, the so-called “Washington Consensus” was formulated. It claimed to lead to global freedom, prosperity and economic growth through “deregulation, liberalization and privatization”. This has become the credo and promise of all neoliberals. Today we know that the promise has come true for the corporations only – not for anybody else. In the Middle East, the Western support for Saddam Hussein in the war between Iraq and Iran in the 1980s, and the Gulf War of the early 1990s, announced the permanent U.S. presence in the world’s most contested oil region. In continental Europe, neoliberalism began with the crisis in Yugoslavia caused by the Structural Adjustment Programs (SAPs) of the World Bank and the IMF. The country was heavily exploited, fell apart and finally beset by a civil war over its last remaining resources.[58] Since the NATO war in 1999, the Balkans are fragmented, occupied and geopolitically under neoliberal control.[59] The region is of main strategic interest for future oil and gas transport from the Caucasus to the West (for example the “Nabucco” gas pipeline that is supposed to start operating from the Caspian Sea through Turkey and the Balkans by 2011.[60] The reconstruction of the Balkans is exclusively in the hands of Western corporations. All governments, whether left, right, liberal or green, accept this. There is no analysis of the connection between the politics of neoliberalism, its history, its background and its effects on Europe and other parts of the world. Likewise, there is no analysis of its connection to the new militarism.

### Plan/Solvency

Since, in a just world, outer space would be treated as a global commons, and a global commons model precludes appropriation by private entries, then the appropriation of outer space by private entries is unjust.

Thus, the plan: States ought to adopt a binding international agreement that bans the appropriation of outer space by private entities by establishing outer space as a global commons subject to regulatory delimiting and global liability.

#### The aff:

#### solves debris and space colonialism by ensuring the sustainable and equitable use of outer space resources.

* prevents circumvention by aligning the interests of state parties.
* is normal means since it models numerous successful agreements governing all other global commons.

Vollmer 20 [Sarah Louise Vollmer (St. Mary's University School of Law), “The Right Stuff in Geospace: Using Mutual Coercion to Avoid an Inevitable Prison for Humanity,” 51 ST. MARY'S L.J. 777 (2020). <https://commons.stmarytx.edu/thestmaryslawjournal/vol51/iss3/6?utm\_source=commons.stmarytx.edu%2Fthestmaryslawjournal%2Fvol51%2Fiss3%2F6&utm\_medium=PDF&utm\_campaign=PDFCoverPages> ]CT

IV. NECESSITY FOR REGULATION TO PRESERVE THE HERITAGE OF MANKIND—A PROPOSAL ¶ Conceptually, all persons hold an implied property right in the space commons.111 As such, spacefaring entities and developing nations possess an equitable right to access and use orbital resources.112 But the sui generis nature of geospace presents a paradox requiring a unique regime for the sustainable usage of its resources.113 The international community cannot realize the advantages of the common heritage principle under a property regime because any conceivable assignment would violate the non-appropriation clause or unjustly enrich a particular interest.114 This means that only regulatory solutions can protect the interests inherent in a commons protected for the common heritage of mankind. ¶ A. The Motivations for International Compliance¶ The crux of a workable treaty lies in the consent of the parties to the agreement.115 Thereafter, signatories internalize the agreement’s object and purpose into their domestic law, or in the case of international organizations, into an institutional framework.116 To implement a binding international instrument, we must therefore ask the question: Why do nations follow international law,117 and how can we use those behavioral realities to construct a workable framework to ensure geospace survives?118¶ At the dawn of civilized society, depending on a particular jurisdiction’s values, the laws of nature and morality compelled obedience and social order.119 When nation-states concluded international agreements, it represented the coalescence of the various values-based systems, the overlap of which formed a universal understanding of the law of mankind.120 “[The] fundamental conceptual boundary between municipal and international law . . . view[s] international law largely in terms of contractual relations, therefore assigning to the ‘sovereign’ a central place in the construction of the two orders.”121 In other words, transnational cooperation operated through balancing the competing autonomy and values of the parties involved. Despite centuries of debate, values systems remain the principal motivating factor of compliance with international law.122 Effective regulatory regimes must, therefore, strike at the heart of what nation-states value the most, which is often related to national security.123¶ When entering an international agreement, whether or not a nation-state will ratify it informs us of the value a nation-state places on the instrument’s subject matter. That value equates to the utility a nation-state places on certain allowances or prohibitions.124 Incorporating these motivating factors with Hardin’s regulatory solution, any freedoms infringed upon must manifest a higher utility than currently realized. If COPUOS proposes a protocol for sustainable uses of space, the provisions must either have a negligible effect on the global community’s perceived utility of space access or substantially increase that utility. Assuming the propositioned regulatory scheme aligns with the values system of each nation-state, the probability of internalizing such regulations through domestic codification is high. ¶ To ascertain the interests of nation-states, we must look to the factors motivating current space utilization. Routine access to space undeniably aids our technological advancement. The ISS’s antigravity environment provides unique conditions to study medicine.125 Satellites provide real-time tracking of environmental conditions and transmit crucial information for disaster recovery planning.126 Space telescopes track objects with the potential to cause the extinction of life of Earth.127 Free from the veil of our hazy atmosphere, satellites can produce better imagery and ascertain the composition of potential resource deposits on celestial bodies.128 And simply receiving satellite imagery of our planet forces us to confront the realities of our fragile existence. These benefits signify the tangible realization of the OST’s object and purpose, which flow to all members of the global community.129 If we do not begin active decontamination and mitigation of space debris, the utility of geospace will cease to exist. Imagining our existence without these advances is a potent method to stress the criticality of unabated pollution in geospace.¶ B. Existing Proposals¶ Legal scholars have formulated several frameworks to mitigate space debris. Some recommend implementing a market-share liability regime, which assigns liability according to the volume of each nation-states’ exploits.130 Opponents of this construction rightfully highlight the inequities inherent in such a scheme. Considering the United States, Russia, and China make up the bulk of spacefaring activity, market-share liability would unduly burden these nations, and coerce a categorical exit from the space industry or a repeat of the Moon Treaty.131 Another scholar advocates for an environmental law approach, asserting that the space commons would benefit from a protocol closely mirroring the Madrid Protocol.132 While prospective applications of such a model could prevent additional accumulations, it would not feasibly abate the current collection of debris.133 The strengths of Mary Button’s mitigation proposal lie in the binding nature of the Madrid Protocol and compulsory environmental impact requirements. And though it advocates for a more collaborative conference mechanism, rather than the strict unanimous consent required of UNCOPUOS’s resolutions, it still shies away from compulsory requirements for active debris removal. Along with the Antarctic Treaty (ATS), the Law of the Sea (UNCLOS) also served as a model for the Corpus Juris Spatialis. But oddly, the law of salvage was omitted from the treaties. Unlike abandoned objects at sea, once a nation-state places an object into space, ownership exists in perpetuity. Sandra Drago addressed removing the OST’s property-in-perpetuity mechanism134 so as to permit the active salvage of inoperable satellites.135 Drago’s proposal is vital to any mitigation framework. But while this removes a substantial bar currently restricting debris removal, it does not address free-riding, and spacefaring enterprises are free to choose more lucrative space activities other than salvage operations.136 ¶ C. A Coercive Proposal¶ Mutual coercion lies at the core of Hardin’s solution.137 To summarize, law-abiding citizens make concessions to regulatory social constructs in the interest of conserving some utility otherwise lost.138 The coercive element lies in relinquishing one’s ability to exploit some freedom, the detriment of which cannot be realized at that moment in time.139 Conceding to a regime that tempers free exploitation of the commons allows everyone to benefit from the positive externalities of individual usage. Equated to space, nation-states currently concede to non-appropriation in the interest of maintaining equitable access. But because of the sui generis nature of geospace, even non-participants receive a benefit from the use of the commons. In effect, beneficiaries are free-riding from the capital investment of spacefaring nations and entities. This informs the structure of the ensuing two-part framework: geospace delimitation and global liability ¶ 1. Geospace Delimitation ¶ The history of regulatory delimitation illustrates its effectiveness at balancing the rights of individuals, sovereigns, and mankind. Each instance explained in Part II infra, arose out of public necessity to ensure and protect the maximum utility of the global commons, without the deleteriousness of inhabitability, sovereign interference, or over-exploitation.140 The regimes governing Antarctica, the High Seas, the Atmosphere, and the radio-frequency spectrum evidence that mutually coercive delimitation can honor the common heritage of mankind, without encroaching on the peaceful enjoyment and benefits attributable to these areas. ¶ a. Antarctica ¶ In the 1950s, there was concern that Antarctica would succumb to Cold War hysteria, becoming a target for international discord and nuclear arms testing.141 In a move to reestablish global scientific exchange, the international scientific community hosted the International Geophysical Year project, and after identifying the potential of Antarctica, sought to protect it from any ruinous power posturing.142 This necessity for regulating permissible activity resulted in the formation of the ATS.143 Subsequent technological advancement revealed mineral deposits, triggering commercial interest in exploiting its natural resources. The threat catalyzed the promulgation of the Madrid Protocol.144 Again, these delimitations did not sever humanity’s utility in Antarctica. Rather, mankind conceded to the prohibition of deleterious usage in the interest of preserving its scientific utility.145¶ b. The High Seas¶ Similar to Antarctica, the High Seas faced threats in the 1960s when nation-states began unilaterally and arbitrarily, extending resource recovery activities further into the depths of international waters.146 In the interest of equity, particularly the interests of landlocked nations, UNCLOS delimited sovereign access to the seas, allowing usage only within the established exclusive economic zones (EEZs).147 An annex to UNCLOS provided a procedural framework in which resource recovery enterprises could operate in international common areas beyond the EEZs, precluding the unilateral capture of global resources by one nation.148 Once more, a mutually coercive framework removed certain freedoms in the interest of mankind without unjustly limiting equitable access to resources. ¶ c. The Atmosphere¶ Divergent from the problems of the ice and sea, atmospheric regulation resolved an issue more analogous to geospace debris proliferation. Atmospheric utility is quite simple: breathable air and protection from deadly cosmic radiation. When satellite imagery revealed the sizable hole in the ozone layer, the Montreal Protocol to the Vienna Convention placed an outright ban on ozone-depleting chemicals in everyday consumables.149 This prohibition directly addressed the source of the negative externality, forcing humanity to internalize the externality through alternate investment in refrigerants. Recent evidence of the reduction of ozone loss validates the mutually coercive delimitation within the Montreal Protocol.150¶ d. Regulating the Telecommunication Spectrum¶ The business model and financial strategy of telecommunications entities influence satellite deployment planning. Typically, orbital placement aims to “maximize [a] potential user base,” and if that base happens to encompass, for instance, the continental United States, market competition drastically narrows the availability of slots for satellite positioning.151 Realizing that satellite acquisition becomes moot without conscientious “use of telemetry and control . . . required for spaceflight,”152 the Space Radiocommunication Conference convened to revise the Radio Regulations in 1963,153 granting the ITU authority to allocate radio frequencies among spacefaring entities.154 Originally, the ITU:¶ [A]llocated orbits and frequencies solely through a first-in-time system. This led to concern that developed countries would secure all of the available slots before developing countries had the technological capacity to use them. Although some orbits and frequencies are still allocated on a first-in-time basis, each state is now guaranteed a certain number of future orbits and frequencies, regardless of its current technological capacity.155¶ The FCC regulates the segment of the electromagnetic spectrum allocated to the United States.156 Arguably, the ITU and agencies like the FCC engage in de facto appropriation of the more highly sought-after orbits.157 Yet to an extent, the ITU’s delimiting of the radio-frequency spectrum remedied the negative externalities of non-appropriation in geospace, such as the overcrowding of active satellites and the resultant interference. Where the ITU’s scheme does not remedy the byproduct of geospace resource use, it succeeds in ensuring communication capabilities remain free from inequitable use.158¶ e. The OST’s Ineffective Delimitations¶ The recurrent theme among the aforementioned regulatory schemes is the preservation of utility within the commons concerned.159 The frameworks each provide a means to enjoy shared resources while removing the potential for destruction. The OST’s nonproliferation provisions properly regulate the usage of the space commons to further the enjoyment of space’s true utility: scientific discovery and telecommunications. Likewise, the Liability Convention reinforces the necessity to maintain heightened situational awareness to guarantee the mutual, uninterrupted enjoyment of activity in space.160 But nation-states exploit the loop-holes within these documents to avoid internalizing some of their externalities. Specifically, the Liability Convention only assigns liability for damage caused to space objects when fault can actually be determined.161 Though it would be simple to assign fault to a collision caused by an intact and inoperative satellite, it is virtually impossible to identify the owner of smaller pieces of debris. Further, while the ITU reserves slots for nations not represented in space,162 it does nothing to stop those capable of reaching geospace from littering the commons and destroying the utility of reserved slots.163 Holistically, none of the delimitations in the Corpus Juris Spatialis negate the cause of the growing belt of debris in geospace.¶ As a sui generis resource, the mere occupation of LEO or GSO equates to the reduction of the overall utility of geospace. When an entity launches a rocket into space, the accompanying payload causes either (1) temporary reduction of the aggregate utility of geospace or (2) permanent reduction of the aggregate utility of geospace.164¶ The first delimitation prong will recommend bifurcating the applicability of the Corpus Juris Spatialis, with separate regimes for outer space and geospace. While the commercialization of outer space is not overly injurious to the international commons or interests of developing nations, the overcrowding of affluent spacefaring entities vying for orbital acquisition puts immense pressure on the finite resources within geospace. Therefore, demarcating the upper limit of geospace will allow entities to continue exploring the universe without imposing the restrictions placed on those seeking geospace positioning.165 This modification will allow continued use of both regions, but coerce more sustainable usage of geospace with the assistance of the secondary prong below. ¶ 2. Global Liability ¶ Operating under the theory that humanity holds an implied property right in the global commons but limited under the non-appropriation clause to protect those interests through traditional property mechanisms, the logical alternative is to impose liability on actions violative of the global interest.166 Further, assuming humanity collectively benefits from utilization of this commons, then humanity likewise must internalize the cost of the negative externalities imposed.167 This means that spacefarers, as members of the global collective, hold both the right and obligation to protect that right for others.168 Therefore, anyone utilizing or benefitting from the utilization of the geospace commons has an equitable duty to ensure its sustainability. Under traditional tort theories, when one has a duty, breach of that duty causally linked to a measurable injury is actionable. In terms of the duty to humanity when utilizing geospace, the culmination of Kessler Syndrome represents the measurable injury.¶ Kessler informed the scientific community in 1970 of the probable cataclysmic chain-reaction and destructive conclusion of unabated geospace debris pollution.169 This theory, reiterated consistently since its dissemination, materialized in 2009.170 Fundamentally, every spacefaring entity and approving launching state knows of this monumental threat to the utility of geospace. Yet to date, mitigation guidelines remain non-binding, and four-figure satellite constellations continue to receive approval.171 To incorporate a time-honored risk calculation method, the Hand Formula is instructive and evidences a trend toward unapologetic endangerment to the utility of geospace in isolation of the associated tort regime.¶ Let us assume the burden to mitigate space debris is $18.5 million172 but the probable magnitude of not mitigating the accumulation of space debris equates to reverting our technological capabilities back to the 1800s. Considering the accumulation of debris from the accidental or intentional breakup of geospace satellites, the probability of Kessler Syndrome fully concluding in the absence of a comprehensive mitigation protocol is one hundred percent.173 While difficult to quantify, the value of our scientific progress attributable to the advent of space travel far outstrips the burden to mitigate space debris. Should Kessler Syndrome become our reality, the measurable injury is the cost of reestablishing global communications without the usage of satellite relays. To add insult to injury, the invaluable utility of geospace will cease to exist.¶ A viable alternative would institute a regime of shared global liability which makes consideration of capital investors as well as nonparticipating beneficiaries in the interest of equity. That is, should the inevitable prison for humanity become a reality, the entire global community will be liable to pay an equitable share of the overall cost of recovery efforts.174 The Liability Convention should undergo a similar trifurcation, adding this new scheme to the current strict and absolute liability mechanisms.175 As such, shared global liability will consider the responsibility of nation-states and private entities in isolation.176 This will coerce cooperation among all agencies, nations, and private entities because the equitable share of responsibility will drive collective resolution. ¶ V. CONCLUSION¶ In light of the emerging global sentiments regarding environmental conservation and sustainability, instituting a regime that clearly defines a legal consequence in the event of environmental ruin boasts greater coercive force than non-binding resolutions. 9 This international agreement aligns with the universal value that the international community places on the utility of geospace.177 In essence, it protects geospace by forcing the signatory to face the reality of their negative externalities. It is unlikely that a nation-state exists that does not value space exploration and the benefits attributable.¶ In April of 2019, in the spirit of the Sustainable Development Goals (SDGs), COPUOS adopted an agenda that focused on the long-term sustainability of the space commons, space traffic management, equitable uses of GSO, and the mitigation of space debris.178 Mindful of space’s critical role in attaining many of the SDGs, the Committee put forth guidelines to facilitate capacity building without prejudice to any one nation-states’ economic capabilities. To be sure, the Guidelines for the Long-Term Sustainability of Outer Space Activities are an important step forward, but many delegates reiterated the importance of developing binding instruments, particularly in light of developments in “space resource exploitation, large constellations, and space debris remediation.”179 ¶ Looking forward, research continues to advance the availability of debris mitigation mechanisms, such as the European Space Agency’s newly-commissioned ClearSpace-1 satellite.180 Mission objectives increasingly include end-of-life procedures to place satellites in appropriate orbits to decrease clutter in areas where active satellites operate.181 In the context of private entities, Planetary Resources—originally positioned to become a principle player in the space mining industry—merged with Consensys Space and quickly launched TruSat, a crowd-sourced situational awareness forum that compiles the reports of private citizens to track objects in geospace.182 These developments instill confidence in the international community’s sentiments toward ameliorating this ever-approaching catastrophe. It is with great hope that this trend continues, and COPUOS promulgates binding regulations to ensure the sustainability of geospace for the common heritage of mankind. “But we can never do nothing. That which we have done for thousands of years is also action. It also produces evils.”183

#### Treating space as a commons solves orbital debris. Current non-binding agreements are not enough.

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The failure to manage Earth orbits as a commons undermines safety and predictability, exposing space operators to growing risks such as collisions with other satellites and debris. The long-standing debris problem has been building for decades and demands an international solution.¶ Competing states need to coalesce behind a commons-based understanding of Earth orbits to set the table for a governance system to organize space traffic and address rampant debris. New leadership in the United States can spur progress on space governance by affirming that Earth orbits are a great commons. So far, President Joe Biden and his administration have focused on major space projects, but a relatively simple policy declaration that frames Earth orbits as a great commons can support efforts to negotiate space governance models for issues like debris mitigation and remediation. The Biden administration can set the stage to pursue broad space policy goals by establishing a consensus among states, particularly those with the most invested in Earth orbits, that space is a great commons.¶ THE PRESSING NEED FOR SPACE GOVERNANCE¶ The Earth orbits that provide the majority of benefits to states and commercial ventures represent only a tiny fraction of outer space as a whole. Competition for the limited volume of these Earth orbits is especially fierce since two satellites cannot be in the same place at the same time and not all orbits are equally useful for all missions. The number of objects residing in Earth orbits is now at an all-time high, with most new objects introduced into orbits at altitudes of between 400 and 700 kilometers above sea level. Millions of pieces of debris in Earth orbits pose a threat to continuing space operations. For instance, the final U.S. space shuttle missions faced 1-in-300 odds of losing a space vehicle or crew member to orbital debris or micrometeoroid impacts.¶ Collisions with fragments of orbital litter as small as a few millimeters across can ruin satellites and end missions. Current technologies cannot track all of these tiny pieces of debris, leaving space assets at the mercy of undetectable, untraceable, and unpredictable pieces of space junk. Some researchers have determined that the debris population in low Earth orbit is already self-sustaining, meaning that collisions between space objects will produce debris more rapidly than natural forces, like atmospheric drag, can remove it from orbit.¶ States—namely the United States, Russia, China, and India—have exacerbated this debris accumulation trend by testing kinetic anti-satellite capabilities or otherwise purposefully fragmenting their satellites in orbit. These states, along with the rest of the multilateral disarmament community, are currently at an impasse on establishing future space governance mechanisms that can address the debris issue. A portion of this impasse may be attributable to disparate views of the nature of outer space in the international context. Establishing a clear view among negotiating parties that Earth orbits should be treated as a great commons would establish a basis for future agreements that reduce debris-related risks.¶ Beyond debris-generating, kinetic anti-satellite weapons tests, revolutionary operating concepts challenge existing space traffic management practices. For instance, commercial ventures are planning networks of thousands of satellites to provide low-latency connectivity on Earth and deploying them by the dozens. States are following this trend. Some are considering transitioning away from using single (or few) exquisite assets in higher orbits and toward using many satellites in low Earth orbits. These new operational concepts could lead to an increase in collision risks.¶ Without new governance agreements, problems related to debris, heavy orbital traffic, and harmful interference will only intensify. Debris in higher orbits can persist for a century or more. The costs of adapting to increasingly polluted orbits would be immense, and the opportunity costs would be even higher. For instance, all else being equal, hardening satellites against collisions increases their mass and volume, in turn raising launch costs per satellite. These costs, rooted in a failure to govern space as a commons, will be borne by all space actors, including emerging states and commercial entities.¶ EXISTING FORMS OF SPACE GOVERNANCE¶ A well-designed governance system, founded on a widespread understanding of Earth orbits as a great commons, could temper these risks. Currently, space is not wholly unregulated, but existing regulations are limited both in scope and implementation. Many operators pledge to follow national regulations and international guidelines, but decentralized accountability mechanisms limit enforcement. These guidelines also do not cover the full range of potentially risky behaviors in space. For example, while some space operators can maneuver satellites to avoid collisions, there are no compulsory rules or standards on who has the right of way.¶ At the interstate level, seminal multilateral agreements provide some more narrow guidance on what is and is not acceptable in space. Most famously, the Outer Space Treaty affirms that outer space “shall be free for exploration and use by all states without discrimination of any kind” and that “there shall be free access to all areas of celestial bodies.” Similar concepts of Earth orbits being a great commons arise in subsequent international texts. Agreements like the Liability Convention impose fault-based liability for debris-related collisions in space, but it is difficult to prove fault in this regime in part because satellite owners and operators have yet to codify a standard of care in space, and thus the regime does not clearly disincentivize debris creation in orbit. Other rules of behavior in Earth orbits have been more successful in reducing harmful interference between satellite operations, but even these efforts are limited in scope.¶ States have acceded to supranational regulations of the most limited (and thus most valuable) Earth orbits. The International Telecommunication Union (ITU) coordinates, but does not authorize, satellite deployments and operations in geosynchronous orbits and manages radiofrequency spectrum assignments in other regions of space to reduce interference between satellites. These coordination activities are underpinned by the ITU’s constitution, which reminds states “that radio frequencies and any associate orbits . . . are limited natural resources,” indicating a commons-based approach to governing the radiofrequency spectrum. However, the union’s processes are still adapting to new operational realities in low Earth orbit, and these rules were never designed to address issues like debris.

#### A global commons regime would require a form of democratic governance that ensures the equitable use of space resources and overcomes the expansion of neoliberal capitalism into outer space.

Dardot 18 [Pierre Dardot, “What democracy for the global commons?,” The Commons and a New Global Governance, ed. Samuel Cogolati and Jan Wouters (2018). <https://d1wqtxts1xzle7.cloudfront.net/58613276/What_Democracy_-_Dardot_Leuwen_2018.pdf?1552469271=&response-content-disposition=inline%3B+filename%3DWhat_democracy_for_the_global_commons.pdf&Expires=1642726034&Signature=YJi8AG6~Y---mP0qsop4i3t~Z5bVLtQYwuDtUdXm6sdKaYwCJFFzQOL-OiY9nIH~JZsophnChwMlUMSGOCDVh7NhHmUonD28k9fU9PrfN2nYTNV2x8XnvoK2KtelSRvRyWN78eA7uC1isTAf1pO5~abPS9XQnORhjp9nPXjpIuBqLrrJhIUCKNjEorJ0u1h63DxkORBKVZfFh-TawG~PS~WdamGNqfljxjaP1G5bG-hUh1aNw0CuXhnqdd8yeH0-uT7iXVNu8cDl2zOtobIiAmD0SBKxjUXP8SYLkvNO0BETnpIzetK7gW8yksHtYjt-WasarhkMQpHeNwvJOY8QeA__&Key-Pair-Id=APKAJLOHF5GGSLRBV4ZA>] CT

Using ‘commons’ as a noun, thus, implies a methodological break with this reification of common things, as well as with the logic underlying the classification of goods in economic theory. A ‘commons’ is first and foremost an institutional affair and, more specifically, an institutional space defined by collectively developed practical rules. What is most important is the dimension of instituting the activity, and not the technical characteristics of things and goods. Here lies the essential difference between common goods and the common(s). We must specify, therefore, that any commons, insofar as it is instituted as such, is a good in an ethical and political sense. By contrast, any good that is capable of being purchased and sold, is not in itself a commons. This means that a commons is a good only under the condition that it is not a possession or an acquisition. In other words, once it is instituted, a commons is inalienable and inappropriable. It creates a space within which use prevails over ownership. It is, thus, not a resource in itself – even when it is related to one. In this way we understand a commons to be the active link between an object, a place, a natural resource (for example, a waterfall or a forest), or something artificial (for example, a theatre or a square) and the collective activity of those who take charge of it, preserve it, maintain it and take care of it. This activity is not external to the commons, but instead inherent in it. ¶ If we take this to be the definition of every common, then a third implication is that a common, regardless of its specific designation, requires self-government or democratic government. The very act of establishing a common is in and of itself a democratic act. The act of governing a common is nothing more than the continuation of the democratic act; it is thus a sort of continuation of the institution. It consists of reviving this institution by critically assessing its collective rules, whenever the situation demands it. As such, the governance of the common can only proceed from the principle of democracy – the non-democratic governance of a common would threaten, in the short-term, the very existence of this common. I call this the principle of the common, this time in the singular form. For that purpose, I refer to the Latin etymology of this word: the common, or ‘cum-munus’, is the co-obligation that results from co-participation in the same activity. This co-obligation cannot proceed from the simple fact of belonging. Democracy is, in essence, co-participation in public affairs. The Occupy movement (for example, the anti-austerity movement in Spain, also referred to as the 15-M Movement or the Indignados, or the wave of protests in 2013 to contest the urban development plan for Istanbul’s Gezi Park) brought with it a strong anti-oligarchic critique of contemporary political representation, advocating for ‘real democracy’. Most notable is that this democratic requirement is strongly tied to ecological claims based on preserving the ‘commons’ (urban spaces in particular) against any sort of private or state enclosure. It then becomes evident that the commons (in the plural) cannot but be established or governed but by the implementation of the principle of the common (in the singular), which is to say, democracy. To sum up, common use requires self-government.¶ Yet these examples would seem to speak in favour of the establishment of a local democracy, confined within specific geographic limits (for example, a neighbourhood or a city). Aristotle argued for a similar sort of constraint, pointing that beyond a certain number, citizens could no longer know each other. This capacity to mutually engage with one another was, according to him, an important condition for the exercise of democracy. Thus emerges a challenge I will here try to tackle: what sort of democracy is required for commons which are not local, but global in nature – global commons? My thesis is that this democracy can only be global. It remains to be seen what this sort of global democracy should look like.¶ CURRENT PARADIGMS TO DEAL WITH THE UNLIMITED COSMOCAPITALISM¶ With neoliberal capitalism we have come to know a singular historical phenomenon, which I will refer to as ‘cosmocapitalism’. How can this be understood? Cosmocapitalism is not merely a geographical or spatial extension of capitalism, since this extension appeared along with the birth of capitalism. It represents capitalism’s tendency to become universal. By this, I mean that capital tends to submit all aspects of human existence, even those most intimate and subjective, along with the natural world, to the market’s logic, which is nothing more than the logic of competition. The terms ‘world’ and ‘cosmos’ do not describe the planet in a physical sense, or even the global population, but rather the political framework, with its institutional and normative qualities whereby the expansion of the market’s logic becomes possible. Max Weber already described the idea of an immense cosmos which imposes its economic activity on the individual caught within the market’s grasp (Weber, 2002). Today, this cosmos has grown beyond the single economic sphere to include the social sphere. ¶ 3.1 Humanity’s Common Heritage Paradigm and the Appropriation of Space¶ A first example will allow us to highlight this logic of limitlessness by examining the delegation of tasks between the state and private enterprises. On 25 November 2015, just a few days before the opening of the 21st Conference of the Parties (COP) of the Framework Convention on Climate Change in Paris, Barack Obama passed law H.R.2262, which provided authorization for private American companies to use natural resources from outer space (US Congress, 2015). As we know, the 1967 Outer Space Treaty established the legal status of outer space in the following manner (United Nations, 1967). Article 1 acknowledged that the exploration and use of outer space shall be carried out for the benefit and in the interests of all countries, implying free and equal access without discrimination of any kind. Article 2 established that ‘Outer space, including the moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means’. These two conditions, equal access for all and non-ownership, are strictly complementary and both refer to subjects recognized by international law, that is to say, the states: ‘national appropriation’ is state ownership and non-appropriation refers to non-appropriation by states only.¶ It is precisely from this ambiguity that the law (US Congress, 2015) was cleverly enacted on 25 November 2015. Its name is already quite self-evident: US Commercial Space Launch Competitiveness Act. In a nutshell, the Act gives any United States (US) citizen involved in commercial exploration and exploitation of an asteroid or space resource, the right to own, possess, transport, use, and sell this resource provided it is in accordance with the applicable legislation. This amounts to giving American companies a property right over space resources in due form (Calimaq, 2015). Yet, the law passed by Congress seems to pretend the contrary, as it provides a so-called ‘Disclaimer of Extraterritorial Sovereignty’ in Section 3 of the Act (US Congress, 2015)¶ By the enactment of this Act, the United States– Exercises its jurisdiction over United States citizens and vessels, and foreign persons and vessels otherwise subject to its jurisdiction, in the exercise of the high seas freedom to engage in exploration for, and commercial recovery of, hard mineral resources of the deep seabed in accordance with generally accepted principles of international law recognized by the United States; but Does not thereby assert sovereignty or sovereign or exclusive rights or jurisdiction over, or the ownership of, any areas or resources in the deep seabed.¶ We can clearly see how this law circumvents the prohibition of national appropriation articulated by the 1967 Outer Space Treaty: the prohibition forbids states themselves from ‘national appropriation by claim of sovereignty’, but it does not prevent a private company from exploring or exploiting space resources for commercial purposes. It goes without saying that the enactment of this law was very much applauded by private companies planning to embark on asteroid mining. What is remarkable about this law is that it confirms the international commitment of the US not to assert sovereignty over any space resource, while simultaneously conferring private companies the right to appropriate resources therein without any restriction.¶ Under the Outer Space Treaty, the legal status of the ‘common things’ (res communes), under which certain resources are known to be common by nature (as in Roman law), is not formally addressed. Under Article I of the Outer Space Treaty, the outer space is not even declared to be the ‘common heritage of mankind’, but simply the ‘province of all mankind’ (United Nations, 1967). The notion of ‘common heritage’ was only explicitly introduced in 1967 to deal with the legal status of the deep seabed beyond the limits of national jurisdiction (United Nations General Assembly, 1967). Regardless of the ambiguity of this notion, particularly regarding the holder of such heritage, the idea of ‘heritage’ implies a double duty to both preserve and transmit it. However, international law limits the right of use for states only, as they alone are faced with the prohibition of appropriation. We are, therefore, presented with a way of extrapolating the res communes category inherited from Roman law, insofar as non-appropriation and common use are present, but subordinate to the goodwill of the states. Thus, we are faced with a cheap if not unfinished version of a ‘common’, which is entrusted to states, and limits state sovereignty without even calling it into question.¶ With the Competitiveness Act (US Congress, 2015), we are faced with an act of state sovereignty that manages to circumvent the prohibition of appropriation by a sovereign state without formally violating it. This represents a sort of ‘delegation’ under which the state, on the one hand, grants its citizens a legal title that it denies to itself, on the other, it does so in order to better guarantee it to those to whom it has been delegated. The imperium (state sovereignty) gives full licence for all candidates to the dominium, to privately control and appropriate any resources they are able to seize: statutory law enforces beforehand the power that technology provides. Beyond this collusion between the state and private companies, what emerges here is the powerful homology between state and private ownership: imperium and dominium appear to be based on two forms of a similar logic of ownership, which affirm one another. The primary challenge facing the heritage of mankind paradigm is that it does not fundamentally break with interstate logic and, as such, leaves leeway for private appropriation.¶ 3.2 The Global Public Goods Paradigm and the Value of Biodiversity A second example allows us to unveil the same neoliberal capitalist logic at work within the realm of the destruction of the biosphere. At the end of the 1980s, with the momentum of the pollution rights initiated by Reagan, George H. W. Bush encouraged the expansion of the market endorsing the ‘No Net Loss’ goal (Feydel and Bonneuil, 2015: p. 45). The seemingly small adjective ‘net’ carries with it a heavy connotation. It does not mean that we do not have the right to destroy biodiversity but rather, the opposite. Indeed, under the ‘No Net Loss’ principle, we have the right to destroy biodiversity as long as we replace whatever has been destroyed elsewhere. In other words, damages resulting from human activities must be balanced by at least equivalent gains. For example, we have the right to destroy ten acres of forest in one area, as long as we plant ten acres of trees elsewhere, within the next 30 years, because once the new trees have grown, it will not make any difference. In market lingo, this is referred to as ‘biodiversity offsetting’. The neoliberal argument is the same and is now well-established – we have failed to obtain our reduction goals, so we must adapt our strategy by trying new financial mechanisms, which are much more effective than the inefficient laws and regulations. That these so-called ‘laws and regulations’ have failed because they have bet on the market must be hidden. It is always the same explanation – if we failed, it is not because we conceded to the market, but rather the opposite, because we did not sufficiently take advantage of it. What is the relationship between this logic of compensation and actual biodiversity, which is made up of the interaction between complex systems, and not of detachable and interchangeable parts? A good example comes from the Brazilian company Vale, which sought to present eucalyptus plantations as a form of reforestation of the Amazon rainforest whose destruction it has actively contributed to. The logic of this compensation can be understood as equivalency logic in its most literal sense. That is, it assumes that there is a commensurability between the Amazon rainforest and eucalyptus plantations, which would affirm their equal value. This type of reasoning is completely indifferent to the sort of relationship a tree has with the soil: the fact that the eucalyptus, which originated from Australia, actually dries up the Amazonian soil, is not at all taken into consideration (Feydel and Bonneuil, 2015: pp. 94–5). As Marx so aptly described it in the first Volume of his major book Capital (1992), the logic behind market equivalency is at its core a logic of indifference to the qualitative differences that exist between different types of work, and the products that stem from each. What is remarkable here is that we are not referring to the products of human work but instead to living ecosystems. Here we have come to a critical point: the marketing of biodiversity requires that we assign value to something that is not, in fact, a product of work. This argument was reaffirmed by Pavel Sukhdev, a banker who has directed the Economics of Ecosystems and Biodiversity (TEEB) project launched by the United Nations Environment Programme (UNEP) since 2007: ‘We take advantage of nature because it has value. But we lose it because it is free’ (Feydel and Bonneuil, 2015: p. 62). Thus, ‘[t]he economy has become the currency of politics’ (sic), we have to learn to understand ‘[t]he economic value of nature’ and express it in a way that is clear to political decision makers. In essence, we must remedy the ‘[i]nvisible economics of nature’ by assigning to it a monetary value or a price. In order to carry out this task we must employ a calculation: in this way, the pollination of trees and flowers by bees constitutes an economically invisible service whose value is estimated at 200 billion dollars, which is almost 8 per cent of the global agricultural production on earth according to Pavel Sukhdev (ibid.: p. 9). The same principle can be applied to pure air or drinking water – the services they render become more and more valuable as they become increasingly rare. Scarcity has always determined value, except that now scarcity represents the services provided by nature. But what exactly does the notion of an economically assessable ‘service’ mean? What vision of nature does it propose and is this conceptualization really new? For a long time, biodiversity was conceived of as a group of resources comprised of several distinct elements (genes, species, habitats and so on), which were capable of being owned, purchased and sold. This conception prevailed in Rio during the Convention on Biological Diversity (United Nations, 1992). But, at the end of the twentieth century, a more dynamic representation emerged which posited that ecosystems should be recognized as the ‘third level of biodiversity’, situated above genes and species (Feydel and Bonneuil, 2015: pp. 164–166). Now processes and flows take precedence over individual entities and elements. Although we can measure the intrinsic value of the latter, we can only appreciate the value of process and flow in terms of ‘services’. It is, thus, not biodiversity in and of itself which is valuable, but more so the services rendered by the ecosystems that possess value. Hence the notion of ‘ecosystem services’, consisting of streams of natural capital stock which, when combined with human industrial activities, gives way to human welfare (ibid.: pp. 59 and 165). ‘Provisioning services’ (related to ‘resources’: food, wood, grains and so on), ‘regulating services’ (the climate, rainfall, water quality), and ‘cultural services’ (spiritual or recreational value of nature) can be counted among such services. Biobanks sell shares to protect species threatened by deforestation to the very companies who carry out such acts (ibid.: p. 154). Many are unwavering in their belief that the biosphere as a whole should be treated as natural capital. In keeping with this line of thought, the following shift occurs: the biosphere should not enter the commercial sphere merely as a commodity (the logic underlying the sale of timber and industrial capitalism, marketing ‘biological resources’ and patented genes, and so on), but also and most importantly as an asset (that is, within the context of securities eligible for future revenue based on the logic of annuities) (ibid.: p. 166). Thus, we move from the simple commodification of nature, typical of industrial capitalism, which emphasizes producing goods, to neoliberal capitalist financialization and, simultaneously, from the portrayal of nature as a ‘resource’ to its representation as capital generating a ‘flow of services’. How does the theory of GPGs (Kaul et al., 1999) allow us to fight against this trend to financialization? Is GPGs theory not designed, on the contrary, to promote governance of private and state actors? As we know, beyond the criteria relative to the beneficiaries of such goods (the publicum which turns these goods into global goods), this theory distinguishes between three classes of GPGs: (i) global natural goods (for example, ozone layer, climate stability); (ii) goods that constitute man-made heritage (for example, knowledge, cultural heritage, the Internet); and (iii) goods that result from global politics (for example, peace, health, financial stability). While the first class represents natural goods, the other two result from human activity. However, the distinction between these three distinct classes becomes blurred in the case of the negative consequences flowing from poorly managed non-renewable energy. As a result of global policies, global natural goods slide into the third category of GPGs. Moreover, an economistic approach in terms of supply requires that these natural goods are reduced to ‘stock variables’ like the goods of the second category, whereas the goods of the third category are conceived as ‘flow variables’ since a continued effort is required to ensure their potential. But if natural assets are now part of the third category, should we conclude that they have become ‘flow variables’? In any case, the evolution from ‘stock’ to ‘flow’ corresponds precisely with the sort of change that accompanies and legitimizes nature’s financialization. Finally, and most worryingly, the value attributed to biological diversity is estimated by reference to the costs of protecting it. Thus, biological diversity enters the category of public goods that have an ‘intrinsic existence value’ ‘in an effort to grapple with and ultimately define the intrinsic worth of protecting the [good]’ (ibid.: p. 253). We would be better off articulating that this is not intrinsic at all: biodiversity has no value of its own and is not a good in and of itself; instead, its value is derived from the fact that it is the result of subjective appreciation, which amounts to recognizing that this is a good. We see what can result from the ambiguity surrounding the term ‘good’. But overall this confirms the rejection of the notion of biodiversity’s intrinsic value in favour of the idea that value is assigned by an external party, which expresses in its own way the notion of ‘ecosystem services’.¶ 4. COSMODEMOCRACY ¶ Given the logic underlying cosmocapitalism, we must find out a new type of global democracy if we wish to have any chance of halting and reversing it. Such a democracy will be referred to below as cosmodemocracy. It is indeed linked to cosmopolitanism; that is, to the idea of global politics and global citizenship.¶ 4.1 Different Types of Cosmopolitanism 4.1.1 Cosmopolitanism as a project¶ Cosmopolitanism can be defined as the feeling and consciousness of belonging to the same world. It can be expressed in many different ways. It can represent the awareness of living in the same world or sharing the same human condition, the feeling of sharing a common, confined space, and the feeling of being affected by everything that affects another part of humanity. According to Kant’s well-known dictum, ‘a violation of rights in one place is felt throughout the world’ (Kant, 1977). The awareness of belonging to a shared world has been expressed in noteworthy works of philosophy. This is particularly true of stoicism, within which man is seen as belonging to part of a ‘Universal’ or ‘Upper City’ and whose political city is just a small image. Individuals are then viewed as a citizens of the world, but this citizenship is not at all political. By virtue of its universalism, Christianity was able to modify and extend its tradition through the ‘catholicity’ of the Church. The idea that human rights are not limited to any specific country, but are universal in nature, arose from Christian universalism and found support from various scholars and lawyers, including Anacharsis Cloots, author of Bases constitutionnelles de la République du genre humain (1793). Yet the framework remains one in which the world is assimilated to the nation: the human race becomes the only ruler so that the Universal Republic must identify with the Republic of Mankind and there is only one nation that corresponds with humanity itself. With Kant’s Perpetual Peace: A Philosophical Essay (1795), cosmopolitanism begins to take a new meaning. Kant distinguishes between three overlapping components of public law: (i) municipal or civil law (ius civitatis), which should be a republican constitution; (ii) international law or the law of nations (ius gentium), which provides for the right of states to engage in mutual relations or international law via a federation of free states; and (iii) cosmopolitan law (ius cosmopoliticum). However, cosmopolitan law is intended to guarantee the right of ‘hospitality’ to all individuals – which is a right of access merely to promote trade. In this way, cosmopolitanism restricts the cosmos to the commercial sphere without establishing a genuine political citizenship.¶ 4.1.2 Factual cosmopolitanization¶ What was once only an idea or ideal has become part of how we now live. Cosmopolitanism has become the new reality, both in an objective and subjective sense, and what Ulrich Beck has called ‘banal cosmopolitanism’ (2006: p. 26). This factual cosmopolitanization, borne out of the growth of interdependence and transnationalization of ways of life and cultures, should not be confused with transnational political activities and institutional creations, even if the link between these phenomena seems quite obvious. Factual cosmopolitanization is essential to the world’s inhabitants, albeit to varying degrees. It became extremely important at the turn of the century. With the rise of global risks, it began to haunt our minds, penetrating the banality of everyday life, for example, with respect to food, altering our aesthetic tastes, and changing our approach to interstate relations by giving preference to human rights over sovereignty. It is no longer a matter of assigning positive value to the world’s political organization by imagining what the future might hold. It is rather about establishing and characterizing the multitude of processes that transform everyday life up to the point where they lead to the relativization of national borders. According to Beck, ‘reality itself has become cosmopolitan’ (ibid.: p. 10). With globalization and resistance to the latter, a new era has emerged – that of ‘reflexive modernity’. In order to see, understand, and analyse it, one must abandon the ‘national perspective’ and ‘methodological nationalism’, ¶ 4.1.3 Normative and institutional cosmopolitanism¶ What Beck also failed to see is that normative and institutional cosmopolitanism do not flow freely and naturally from factual cosmopolitanization. This is so, firstly, because of the opposition of forces that have no interest in seeing their powers being eroded. Second, and most importantly, because a strictly empirical conceptualization of factual cosmopolitanization runs the risk of overlooking immediately what is generated from internal relations of domination in national and local settings, and what is beyond local level democratic control. Now, because the local and national spheres are losing their ‘naturalness’, for those who live in those areas, the effects of globalization imply that the normative and institutional issues arise with urgency in a political form that is antagonistic. Factual cosmopolitanization is no longer a ‘happy globalization’, but for many the dispossession of their destiny. We must give credit to Karl Renner, Austrian Social Democrat and Austro-Marxist, for encouraging the reflection on the switch between a de facto internationalism to an institutionalized internationalism (Renner, 1998). This de facto internationalism, comprised of economic, social and cultural forms of internationalization, demonstrates how the world’s legal fabric extends beyond the mere sum of nations. In the same way that the nation is the product of a historical development which culminates in its legal capacity at the end of the eighteenth century, the ‘internation’, to use Mauss’ term, will inevitably find its legal form from a substrate of facts that is poorly or not at all seen, but as such, represents a legal duty. The term ‘international’ should not be taken at face value, as it represents much more than international relations between states. Indeed, it involves the way in which the world is constructed, legally and politically, in its post-Westphalian organization. According to Mauss, the enemy is state sovereignty, as it represents an obstacle to real human interests. We are moving towards a world order that will no longer be limited by the coexistence of sovereign nation states, what Renner calls the ‘institutional Oecumene’. The creation of the League of Nations in 1920 gave way to a new era, as the ‘community of nations’ was granted legal standing above the states. Renner claims that, as a result of the establishment of the League, a ‘supra-State international law’ appeared in order to guarantee an infra-state national law, which itself protects minorities. However, as Renner argues, this step remained constrained by the desire to freeze the acquired positions after the First World War. We know that this is also exactly what happened in 1945 with the creation of the United Nations: as demonstrated recently during the COP 21, the most glaring contradiction still exists between the interstate logic of a group of sovereign states, and the need for a global community which undermines the sovereignty of each state in order to respect higher principles which cater to the interests of humanity. Hence Renner’s proposal in 1937: delegates representing ‘partial international interests’ (capital, labour, culture and so on) should be members of the League of Nations Council. It is under this condition that international interests would be taken into account, since the representatives in question would not be able to mandate all issues nationally. The question, then, is how to make this global human community exist as such. We can envision this as Renner did when describing a global parliament or, more specifically, a second chamber of representatives in which the people themselves articulate and make decisions about their economic structure and social values, along with their present grievances and hopes for the future (Renner, 1998: p. 74). Yet it is evident that the creation of a supranational chamber does not respond to the needs of those who represent ‘partial international interests’. Indeed, the parliamentary system of representation, with all its inherent vices, is simply replicated on a global scale. In order to overcome the interstate’s limitations, we must decide to make the leap from internationalism and cosmopolitanism to cosmopolitics; that is, to a political organization of humanity¶ 4.2 Cosmopolitics¶ The two paradigms discussed above suffer from a crippling limitation – that of humanity’s common heritage which subjects the ‘common things’ to the interstate logic, and that of GPGs, which leave the latter to the governance of private and state actors. Still, progress has been made in the establishment of humankind law. But, even assuming a legal status was assigned to humanity, this would not suffice, and neither would a cosmopolitan consciousness, in reaching cosmopolitan institutions. How do we overcome the double impasse imposed by the interstate and global private law, while paving the way for humanity’s common form of political activity; which is to say, a real democracy for humanity? I would like to highlight two points which I feel are complementary. The first relates to the institutional architecture of a global democracy and the second concerns the political activity of world citizens. The first requires, above all, a political imagination, and the second assumes that we extend the observation of collective practices and experimentations already underway.¶ 4.2.1 The dual federation of the commons¶ In order to introduce the first point, we must return to our discussion of the commons. Early on in this chapter, we established that the commons are institutional matters to the extent that they determine the rules of common use. In this sense, the commons emerge from what we might legally refer to as the ‘public’, not only in the orthodox economics sense of the collective nature of ‘public goods’, but also in terms of the public in opposition to the private. It is important to note that this public sui generis is non-state public. What exactly does this mean? The state’s public aims to ensure universal access to services but it does so by allowing state administration to monopolize the management of these services, thereby excluding users reduced to mere consumer status. The non-state public of the commons guarantees universal access via user participation in this management. Note that non-state does not mean anti-state, but rather, autonomous from the state. But what are we to make of the state itself? Under what conditions can it itself become a common? And how can we conceptualize its articulation to what belongs to the infra- and supra-state levels? Moreover, how can the different types of commons be organized among themselves? ¶ The magnitude of these questions led us to imagine a political system, that of non-centred federalism, which was inspired by Proudhon (1863). Indeed, he designed a dual federation of social and economic organizations, representing the municipalities as well as the production units and working companies, both of which should be governed by the principle of democracy. In a similar way, we can distinguish, on the one hand, the social-economic commons (common of river, common of forest, seed bank, production unit and so on) independently constituted of territoriality and administrative borders and, on the other hand, political commons formed through the process of increasingly integrating territories (municipalities, regions, states, international groupings of states). Yet, in all of this we are neither statists nor anarchists. We are even reluctant to consider a single global government or a single world state, which would imply a centralized form of authority that is incompatible with the democracy required by the institution of the commons. We are supporters of a polyarchic system, which should not be understood as ‘government of the many’ but instead as ‘many governments’ democratically coordinated across the world, which naturally implies a systematic intersection of different types of government, state and non-state, politics, and socio-economics.¶ 4.2.2 Global citizenship¶ These ‘demo-cosmopolitan’ systems will not come from above and they will not emerge from interstate decisions or contractual agreements between private actors. Historically, the exercise of constructive activist citizenship has been an important precursor to the creation of new political institutions. Today, we observe the elements of an authentic political citizenship, which is diverse, decentred and transnational at the same time. This is exemplified by anti-globalization and social movements, in the missions of non-governmental organizations like Amnesty International, in the commitment of certain ecological associations to the COP 21, and via initiatives supporting public aid for migrants, and so on. This is not a citizenship that is expected to gain legal recognition, status, rights or duties as part of a state, but instead one that is called to act, engaging in transnational actions by those Beck calls ‘global public interest entrepreneurs’ (2006). We could also refer to them as global commons actors. This non-state and non-statutory citizenship must be thought of in terms of practices aimed at maintaining or acquiring rights rather than formally granting them. Only such transnational citizenship-in-action can give full meaning to the idea of cosmopolitics: politics for the world, as long as the ‘world’ implies what resonates in the Latin term mundus, namely, not the Earth as a planet and not the totality of individuals living on Earth but instead, the living connection between the individuals inhabiting in and the Earth itself. In this sense, the anti-globalization slogan ‘the world is not for sale’ is more meaningful than it might seem at first sight: the world, in itself, is not a ‘thing’ that we can own; it must be recognized as inappropriable and instituted as a common.¶ 5. Conclusion¶ To conclude, instituting the world as a common cannot be understood as an extension of the nation-state or city-state models at the global level. The democracy of the global commons is irreducible to a mere change of scale. Instead, it requires a genuine collective political invention, which is based on the multiplication of self-government at all levels. What is at stake here is the confrontation between two diametrically opposed logics: whereas the logic of the commons is fundamentally plural, polymorphic, non-centred in nature, the logic of state sovereignty as it was constructed in the West is intrinsically linked to an indivisible and absolute centre of power. The solution is not for several sovereignties to overlap on the same territory, as this would be incompatible with the very notion of sovereignty, but for several types of self-governments to limit each other’s power reciprocally.

#### Since the national appropriation is banned by the OST, banning private appropriation would ipso facto result in space being a global commons, so the plan is not extra T and is normal means.

Neto 21 [Bittencourt Neto, Olava de O. “Chapter 1: Outer Space as a Global Commons and the Role of Space Law,” A Research Agenda for Space Policy, Edward Elgar Publishing, Cheltenham, UK, 2021. https://www.elgaronline.com/view/edcoll/9781800374737/9781800374737.00009.xml] CT

Over the past years, the proliferation of space activities and the diversification of space actors have offered plenty of opportunities but also posed challenges to outer space’s long-term sustainability. The rapidly transforming space sector and growing global space economy have enabled many satellite applications and services, while outer space and orbital slots have become more congested with an increasing space debris population. The commercialization of space activities has denounced a growing interest in private, non-governmental uses of outer space, including space resources. As such, outer space continues to prove itself as a strategic domain from scientific, economic, and security standpoints. As far as international law is concerned, novel debates have emerged about the ontological nature of outer space. Incredibly vast, magnificent, and complex by nature, it constitutes a unique domain, unlike anywhere else on Earth. Throughout the years, outer space has been subject to a specific international framework based on legal principles established at the dawn of the Space Age, notably open access to and non-appropriation of outer space. Space law treaties and international instruments govern space activities and provide relevant input concerning the legal status of outer space. The 1967 Outer Space Treaty (OST), in its first article, solemnly declares that the exploration and use of outer space “shall be the province of mankind”. Therefore, a common interest and shared fate await humankind as we advance through the cosmos. Collective action, based on international cooperation and mutual assistance, is of the essence. Nevertheless, a universal definition and delimitation of outer space, as a distinct domain on Planet Earth, remains to be multilaterally accorded (Bittencourt, 2015). Given the evolving nature of space activities and economy, the legal status of outer space has led to intensive debates in various fora. By constituting a resource domain to which all nations have access, but to which none has the right to claim sovereignty, outer space may be understood as an example of global commons – similarly to the high seas, deep seabed, and Antarctica (Buck, 1998, p. 6). Therefore, outer space and its natural resources, including those located at the Moon and other celestial bodies, are not subject to national appropriation by any means. The legal status of outer space as a global commons is of extraordinary importance and relevance for space law and space policy. Indeed, it influences the application and interpretation of the legal framework developed for the governance of outer space activities, vis-à-vis the domain and its resource units. To accurately assess this scenario, a comparative approach is followed. The specific features of global commons and legal ramifications justify further appraisal to comprehend definitions and correlated concepts well.¶ 2. Key problems and conflicts¶ In space law as in space policy, words matter. By legally classifying outer space as a global commons, relevant political consequences, both national and international, naturally ensue. In order to properly understand the nuances and avoid misconceptions, one should revisit principles of international law. Centuries of customs, often based on Roman law concepts, have led to important regulations and definitions. The proper evaluation of those concepts may illuminate the path forwards.¶ Global Commons Concept¶ Legally defining “global commons” has proved to be a challenge, leading to incompatible views. Global commons are socially constructed, as explained by John Vogler, being determined by “shifts in human knowledge, capability and perceptions of scarcity” (Vogler, 2012, p. 61). As a legal concept, its roots may be traced back to Roman law. More specifically, reference should be made to the notions of res nullius and res communis, applicable to domains not subjected to rights of a specific subject. Res nullius is understood as encompassing things belonging to no one or areas free to be acquired by occupatio.1 Terrae nullius, a derivative international law concept, is applicable to unclaimed areas that may be occupied by states (Rose, 2003; Shaw, 2017, p. 372). Not subjected to exclusive sovereignty, global commons may either be unowned resource domains, or deemed as belonging to the international community in totum. Soroos explains that unowned domains can be regarded as commons if generally understood that they cannot be claimed by any individual actor, neither partially nor as a whole. A regulatory scheme may eventually be accorded by users, to reflect shared interests. On the other hand, domains considered as belonging to the international community presume that all states are their partial owners, therefore legitimized to take part in the decision-making processes related to its uses (Soroos, 2001, p. 45).

# 1ar cards

## Asteroid mining

#### Resource extraction should not be considered appropriation – treaties and legal doctrines prove. Wrench 19

Wrench ’19 - John G. Wrench [attorney at the Institute for Justice], “Non-Appropriation, No Problem: The Outer Space Treaty Is Ready for Asteroid Mining,” 51 Case W. Res. J. Int'l L. 437 (2019)Available at: <https://scholarlycommons.law.case.edu/jil/vol51/iss1/11> AT

II. Legal Regimes Distinguishing Resource Extraction from Appropriation¶ Although the OST does not provide a comprehensive guideline for resource extraction in outer space, its foundational logic provides a workable distinction between ownership and use. This part explores three property regimes developed under the same fundamental constraints as the non-appropriation principle: the United Nations Convention on the Law of the Sea (“UNCLOS”), the Antarctica Treaty System, and the prior appropriation doctrine as applied in United States water law.63 Under each regime, parties may establish some form of ownership in extracted resources despite being restricted from claiming sovereignty over the underlying land. ¶ Each section includes a brief discussion of the property regime’s history, its major traits and their relationship to the overarching characteristics of the non-appropriation principle. This part further describes how each property regime fits within the non-appropriation principle’s prohibition on claims to land, while prohibiting waste, separating land ownership from rights to extracted resources, enforcing liability for destruction or damage, and establishing a simple regulatory system to manage claims. ¶ A. The Law(s) of the Sea: UNCLOS and the Seabed Act ¶ International and national maritime laws addressing resource extraction deal with many of the same obstacles present in outer space. Like outer space, “[t]he seabed is rich in minerals…[c]ollecting and mining these minerals is expensive and requires sophisticated technology capable of reaching the great depths.”64 Additionally, the international regulatory regime created to address seabed mining contemplates widely applicable issues including the “protection and preservation of the marine environment,” “promot[ing] the peaceful uses of the seas and oceans,” and the “efficient utilization” of the resources therein.65 Although international law forms the backbone of seabed mining regulations, individual nations have concurrently developed their own regulations. ¶ The foremost international maritime law is the United Nations Convention on the Law of the Sea (“UNCLOS”).66 The current iteration of UNCLOS came into force in 1982, replacing decades of international treaties that had not addressed seabed mining.67 The 1982 UNCLOS established the International Seabed Authority (“ISA”), a body responsible for managing seabed mining through regulations and licensing.68 UNCLOS further established a dispute resolution system through the Seabed Disputes Chamber of the International Tribunal.69 ¶ The United States found some features of the 1982 UNCLOS objectionable. Originally, the ISA was empowered to create an entity called the “Enterprise”, which would conduct mining operations for the benefit of developing countries alongside private mining operations.70 Under this agreement, private businesses were compelled to provide the Enterprise with the location of discovered minerals and the technology necessary to extract them, all in addition to the funding from member states.71 Some of these requirements proved controversial. ¶ Several developed nations subsequently rejected UNCLOS and signed the “Provisional Understanding Regarding Deep Seabed Matters” (“The Provisional Understanding”) in 1984.72 The Provisional Understanding established “…procedures to follow in order to avoid overlapping claims to seabed sites,” while encouraging reciprocal recognition of other party’s claims.73 The Group of 77—a coalition of developing countries—and the ISA, criticized the Provisional Understanding on the grounds that it established an illegal regime.74 As one critic concedes, however, the Provisional Understanding is probably legal because it “…neither claims sovereignty or ownership…nor grants exclusive rights…” to seabed areas.75 ¶ UNCLOS was renegotiated in 1994, in part due to the changes brought about by the end of the Cold War and decreased focus on deep-seabed mining.76 Among the changes, it secured permanent seats on the ISA Council for the United States and Russia,77 created a Finance Committee consisting of the five parties with the largest financial contributions,78 removed mandatory funding of the Enterprise,79 made technology-sharing optional,80 and made development plans a prerequisite for granting permits for resource mining.81 Despite these changes, the United States “remains the only major seafaring nation” that has not ratified 1994 Agreement.82 ¶ The United States’ disagreements with the 1982 UNCLOS led to the creation of an interim national law called the Deep Seabed Hard Mineral Resources Act (“Seabed Act”).83 While the Seabed Act is intended as a temporary regime, it acknowledges that a functional international regime may take some time to develop.84 Under the Seabed Act, companies are required to obtain licenses and permits to explore and extract, both of which expire after a period of years.85 ¶ The United States has not entirely abandoned UNCLOS. Addressing recent conflicts in the South China Sea, President Trump called for “…claimants to clarify and comport their maritime claims in accordance with the international law of the sea as reflected in the 1982 United Nations Convention on the Law of the Sea…”86 Additionally, several United States presidents have supported ratification of UNCLOS since the 1994 Agreement.87 And, although President Reagan was dissatisfied with the 1982 UNCLOS, changes incorporated into the 1994 Agreement have addressed those complaints.88 ¶ The laws regulating resource extraction in the sea share major traits with the non-appropriation principle, as UNCLOS and the Seabed Act allow parties to establish property rights in extracted resources without violating the non-appropriation principle. First, under both regimes, parties extract minerals without laying claim to underlying land.89 Secondly, UNCLOS’s requirement for development plans and the Seabed Act’s licensing-system place some pressure on parties to extract resources or forfeit their rights.90 This feature prevents parties from sleeping on a license, thereby encouraging productive use of land. In other words, the licensing system reduces waste and protects against de facto ownership of land resulting from inordinately long periods of occupation. The United States, by adopting both traits from UNCLOS, and voicing its willingness to enter into a robust international regime for resource extraction, indicates support for an international regime reflecting those features. ¶ Even if the United States’ framework under the Seabed Act were adopted as a model for resource extraction in space, it comports with the non-appropriation principle. The United States’ conceptual distinction between land ownership and resource extraction is a gauge for whether it would accept a similar arrangement for space law.91 And, while the United States is only one of many members of the international community, it is difficult to conceive of a successful international agreement without the involvement of the major spacefaring nations. ¶ B. The Antarctic Treaty System ¶ The Antarctic Treaty92 and the subsequent agreements collectively regulating the peaceful use of Antarctica form the “Antarctic Treaty System.”93 The first of these treaties was created in 1959 to preserve environmental integrity and prohibit violence in the region.94 Antarctica’s size, impenetrableness, and vast resource stores have made it a reoccurring model for outer space law.95 While the Antarctic Treaty System shares key features with the law of outer space, its development and subsequent legal regime is distinctive. Several nations made property claims to Antarctica before the first Antarctic Treaty.96 Parties suspended those claims, however, in effort to moderate claims and prevent Antarctica from becoming a site of violent competition.97 Although the 1959 Antarctic Treaty does not directly address resource-mining, parties “…understood that the question of how Antarctic mineral activity was to be regulated…would not go away.”98 ¶ The international community originally attempted to establish a legal regime for Antarctica that distinguished between sovereign claims and resource extraction. The Convention on the Regulation of Antarctic Mineral Resource Act (“CRAMRA”) was the first venture to provide a foundation for an international property regime in Antarctica.99 CRAMRA defined, as a means to regulate resource mining, three categories of resource-related activity: “prospecting”, “exploration”, and “development.”100 The Regulatory Committee, one of several institutions established under CRAMRA, was responsible for considering permit applications for the “exploration and development” of mineral resources.101 Unlike exploration and development, prospecting does not require the authorization of any of the institutions.102 ¶ CRAMRA’s definition of “prospecting” is crucial for understanding the role of property rights under the regime. Prospecting includes the investigation of areas for potential exploration or development using a variety of sensing technologies.103 Dredging, excavation, or drilling, however, are defined as “prospecting” only if used for the purpose of obtaining small-scale samples or drilling less than 25 metres.104 Furthermore, activities defined as “prospecting” do not confer property rights to mineral resources.105 As a result, an operator gains property rights to mineral resources “…at the exact point where prospecting activities cease to be prospecting activities and become exploration or development activities.”106 ¶ The six years of negotiation that culminated in CRAMRA107 were not ultimately fruitful. Under its terms, CRAMRA could not enter into force unless all states with territorial claims to Antarctica were parties to it.108 Australia and France, while supportive of CRAMRA during negotiations, stated in 1989 that they would not ratify the Convention.109 Consequently, no nations have ratified CRAMRA.110 ¶ Antarctic resource extraction is currently regulated under the Protocol on Environmental Protection to the Antarctic Treaty, also known as the “Madrid Protocol”.111 Concluded in 1991, the Madrid Protocol prohibits “…[a]ny activity relating to mineral resources, other than scientific research…”112 Parties to the Madrid Protocol are able to reconsider the ban on commercial resource mining in 2048 and have reaffirmed the moratorium as recently as 2016.113 ¶ Although it was not ultimately adopted, CRAMRA’s negotiation provides insight into the international community’s willingness to create a resource extraction regime starting from a premise that ownership and use are distinct. Although CRAMRA permitted nations to extract resources, extraction explicitly could not amount to ownership of the underlying land.114 From that premise, CRAMRA does not grant property rights to parties who have merely used sensing technologies on the land, requiring more significant labor through activities like drilling or dredging.115 ¶ While the Madrid Protocol removes commercial resource extraction as an option, it allows nations to extract scientific samples without requiring—or permitting—claims of sovereignty.116 Because the Madrid Protocol “neither modif[ies] nor amends” the framework laid out by the Antarctic Treaty,117 extraction—whether scientific or commercial—remains separate from the ownership of underlying land. While the international community chose to restrict commercial extraction in Antarctica, that arrangement is a result of environmental concerns and not the failure to develop a property regime.118 CRAMRA’s successful illustration of a property regime remains instructive for the international community as it develops finer points of space law. ¶ C. The Prior Appropriation Doctrine ¶ The prior appropriation doctrine is a system developed in the American West to simplify miners’ water claims, granting rights to use the water to whoever made beneficial use of it first.119 The prior appropriation doctrine is useful for analyzing the law of outer space in both functional and abstract ways. First, scientists expect that water will be necessary for creating fuel and breathable air in outer space.120 ¶ Secondly, the prior appropriation doctrine evolved to resolve various claims in the water-scarce American West.121 The prior appropriation doctrine developed against the backdrop of commercial/private tension, embodies deeply-rooted American ethical assumptions, and contemplates the “public ownership” of underlying land.122 The prior appropriation doctrine is also “a rule of scarcity, not plenty,” and is therefore concerned with managing limited resources.123 These features of the doctrine make it a useful comparison to the demands of outer space resource extraction. Most importantly, the prior appropriation doctrine has resulted in an intuitive set of rules distinguishing between ownership and productive use. ¶ The prior appropriation doctrine grew out of the chaos and grit that embodied the mining rush to the Western United States.124 The unpredictable availability of water, combined with the need for a simple adjudicative system, led early miners and farmers to adopt an “intuitive common sense” system of rules to resolve water claims.125 Essentially, the first claimant to make actual beneficial use of the water has senior rights to later users.126 Claimants do not own the land, however, but rather the right to use the water.127 Consequently, claimants may transfer their rights to the use but the public ultimately owns the water.128 Each of these features is explored below. ¶ Central to the prior appropriation doctrine, and exemplified in Colorado’s constitution, is that water is a publicly owned resource.129 This concept stands in contrast to the idea that ownership of land is tied to ownership of the land’s water.130 The prior appropriation doctrine severs those concepts from one another, justifying citizens’ right to appropriate water while nullifying riparian claims.131 This feature is a doctrinal cornerstone of the prior appropriation system, as it distributes ultimate decision-making authority to the public while protecting valid claims. ¶ Not all claimants establish or retain valid claims to use diverted water. Prior appropriation requires a claimant to make actual beneficial use of the water to obtain and retain their right to continue that use.132 In the context of the doctrine’s development, this stipulation prevented vast, speculative hoarding of property for the purpose of a later sale.133 This emphasis on “antispeculation” is derived from the era’s intensely anti-monopoly sentiment, favoring the distribution of water rights to those who could make actual use of the land.134 Therefore, claimants must define the location and expected scope of their use to establish or transfer rights.135 ¶ Parties who establish valid claims are protected against other future users who seek to use the same water at the earlier claimant’s detriment. Parties who make actual beneficial use of water have “seniority” over later claimants who use the water for similar purposes.136 In this system of senior and junior claimants, the latter must yield their use to senior claimants in times of water scarcity.137 Although this arrangement protects senior claimants from losing their use in times of scarcity, one scholar notes that claims often avoid their seniority.138 Furthermore, some states simply prohibit senior claimants from enforcing their priority over junior claimants when doing so would be futile.139 Claimants may actually benefit from avoiding enforcement, especially when enforcement is sought solely to prove seniority at the expense of junior claimants.140 Because prior appropriation separates the ownership of land from rights to beneficial use of water, claimants can freely transfer their validly established water rights.141 The technology claimants use to divert water for “out-of-stream” uses, like mining and agriculture, helps make the use “measurable and enforceable,” and therefore identifiable for transfer.142 Although transfers require new users to satisfy the actual beneficial-use requirement, the arrangement is flexible enough to facilitate the temporary transfer of use rights.143 ¶ The prior appropriation’s system of senior and junior claimants is enforced and regulated by a centralized authority. Acting in a “trusteeship role,” the government is responsible for enforcing validly established water rights.144 Although enforcement is sometimes avoided, as noted above, the value of a senior claim is necessarily dependent on the enforcement of those rights, especially when water is in short supply.145 In addition to adjudicating claims, the government is responsible for the “conservation of the public’s water resources.”146 Here, the implications of the “public ownership” concept is significant: ¶ …[T]he state assumed a trusteeship role to administer the waters of the state for the benefit of the public. As such, it became responsible not only for minimal administrative functions but also for administration of the kind a trustee owes to the beneficiary of the trust. Its responsibilities include, first and foremost, the conservation of the estate and avoidance of waste; second, the promotion of beneficial use by assisting the appropriator in achieving use objectives to the maximum extent feasible; third, the representation of beneficiaries in a parens patriae capacity and maintaining the use regimen on the river system; and fourth, the promotion of efficiency and prudence of the kind expected of a trustee.147 ¶ The prior appropriation doctrine serves as a unique example for space law because of how it conceptualizes land ownership. Underlying land is available for use not because it is “unowned,” but because it is owned by a community who has the right to make productive use of it.148 Because the community owns the land, claimants have an obligation to use the land properly and the government is responsible for stewardship.149 This framing fits neatly with proponents of the idea that outer space is collectively “owned” by the international community. Regardless, stewardship and government ownership do not necessarily displace the potential for productive use. ¶ Parties do not violate the non-appropriation principle simply by extracting—or as here, diverting—resources from the land. At no point does extraction equate to a sovereign claim over the land. In instances where non-productive use or the like violates those principles, property rights disappear. Furthermore, the OST encourages the idea that outer space is to be used to benefit the broader international community.150 The prior appropriation doctrine illustrates that parties can establish and transfer robust property rights in resources independent from land-ownership, while promoting beneficial use.¶ Conclusion ¶ The non-appropriation doctrine restricts parties from making sovereign claims over underlying land—the same restriction embedded in each of previous section’s legal regimes. Without violating the nonappropriation principle, those regimes grant parties the right to extract resources from land they do not own, transfer that right, and limit wasteful use. Each system similarly vests an entity with the authority to regulate and enforce those rules. With some tailoring, those rules could graft onto the uniqueness of outer space resource extraction.

## Space based solar

#### Space based solar is a fantasy.

Handmer ’19 - Casey Handmer [Founder, Terraform Industries; Former Software System Architect at NASA Jet Propulsion Laboratories, former NASA Frontier Development Lab Space Scientist; Post-doc and graduate researcher at the Cal Tech], “Space-based solar power is not a thing,” *Casey Handmer’s Blog* (Web). Aug. 20, 2019. Accessed Feb. 6, 2022. <https://caseyhandmer.wordpress.com/2019/08/20/space-based-solar-power-is-not-a-thing/> AT

Transmission losses: The process of converting sunlight to electricity is about 20% efficient, depending on the type of panel – and this is a loss common to both systems. In addition, the space-based system has to convert the electrical power back into EM radiation, which is converted back into power on Earth. Proponents think that it should be possible to perform each conversion with 90% efficiency, but even beam-forming that well is not possible without a much larger antenna. My personal opinion is that the end-to-end microwave link efficiency would be lucky to exceed 40% efficiency, which erodes the competitive advantage substantially.¶ Thermal losses: The conversion efficiency of the high-power microwave transmitter has a nasty side-effect, namely that what isn’t transmitted is wasted as heat, and that heat has to go somewhere. If the transmitter is 80% efficient (which is being very generous), then it will have to radiate 200MW of thermal power. This is a different problem to the thermal losses in the solar panels, which are more like 4GW but spread over a huge area that is in radiative thermal equilibrium with its environment. Instead, the microwave power electronics will need a huge cooling system. If the electronics can operate at 350K, then the radiator power will be 850W/m^2, so the radiator will need a total area of 23ha, comparable to the total size of the solar array and the microwave transmission antenna. In contrast to the usual claims of perfect scaling efficiency with solar arrays in microgravity, a large space-based solar power system will also need a huge antenna and cooling system, which don’t scale quite as nicely.¶ Logistics costs: Consider transportation cost. Today, SpaceX has crushed the orbital transport market with a price of around $2000/kg. Compare this to the worldwide network of intermodal containers, which can transport anything in 20T units almost anywhere on Earth for about $0.05/kg. Even if all of Elon Musk’s wildest Starship dreams come true, transport costs will dominate the total capex of any space-based solar system, by many orders of magnitude. A factor of 10x improvement in resource does not make up for transport costs which are more than 10,000x higher. If logistics costs are more than 0.1% of current solar farm costs (they’re more like 20%), then increased transport costs completely negate the improved solar resource. It’s not even close.¶ One further aspect of logistics bears closer examination. In our baseline case, we considered an array of panels strung up on posts, compared to a mesh of wire strung up on posts. It turns out that (as of 2019) a substantial fraction of the overall cost of a solar PV station is the mounting hardware, which is also required by the microwave receiver. So if the mounting hardware costs 20% of the overall deployment cost for terrestrial solar, that places a strong upper bound on total system cost allowable for space-based. In other words, does anyone seriously believe that the microwave receiving antenna could cost 20% of the overall system capex, the other 80% to be used to launch thousands of tonnes of high performance gear into space? Put another way, the most cost-effective way to get a GW of power out of a microwave receiving antenna is obviously to tear down the wire mesh and sling up a bunch of solar panels, which can be ordered with a lead time of weeks from any of dozens of suppliers worldwide with widely available financing.¶ Finally, the space technology penalty. On Earth, we are living in an extremely exciting time for energy. Hundreds of major companies are competing on development cycles measuring only months to provide solar panels in an industry that’s growing at 20% a year. As a result, costs have fallen by 10% a year, and in the last few years, solar and batteries have neared, equaled, then utterly crushed all other forms of electricity generation. Initially, this process occurred on remote islands with high fuel import costs. Then the sunnier parts of the US. The rampage continues northwards at about 200 miles a year. The industry can sustain 30% deployment growth rate worldwide for another decade at least, before saturation occurs.¶ Today, I can pick up the phone and any of dozens of contractors in the LA market can fill hundreds of acres with panels, each built to survive 30 years under the harsh sun and sized perfectly for deployment using the latest tech, which is men in orange vests with forklifts.¶ In contrast, space technology has not benefited from such breakneck levels of growth, demand, and investment. Prohibitive maintenance costs demand perfect performance, and low rates of deployment ensure a slow innovation feedback loop. The result is that none of the current incredibly cheap solar panels could work in space, where thermal and vacuum, not to mention stresses of launch, would destroy their operation in days.¶ Instead, space operators rely on more traditional supply chains, with the result that building anything for space takes years and costs billions. Right now, a billion dollars invested will buy about 100MW of solar panels on the Earth, or 100kW of solar panels in space. This is a factor of 1000, and it also erases the advantages of more sunlight in space.¶ These four elements, transmission, thermal, logistics, and space technology, inflate the relative cost of space-based solar power to the point where it simply cannot compete with terrestrial solar. It’s not a matter of 5% here or there. It’s literally thousands of times more expensive. It’s not a thing.¶ I can relax assumptions all day. I can grant 100% transmission efficiency, $10/kg orbital launch costs, complete development and procurement cost parity, and a crippling land s

hortage on Earth. Even then, space-based solar power still won’t be able to compete, because the antenna receiver alone is basically a solar plant in disguise¶ I can grant a post-scarcity fully automated luxury communist space economy with self-replicating robots processing asteroids into solar panels, and even then people will still prefer to have solar panels on their roof, to avoid supply interruptions and utility bills. Or maybe they’ll all be post-humans living in some data center orbiting Jupiter. Let’s reel it back in a bit.¶ There is one additional reason why space-based solar power won’t be built, and that is investment risk. It is the same reason why nuclear power won’t solve climate change. Power plants traditionally front load much of their costs, and space-based solar is no exception. So what, advocates say, all infrastructure costs a huge amount up front, and that investment is paid off gradually over decades of use by everyone. Let’s say that despite all the above issues, a business plan emerges which can justify borrowing the necessary capital to build and deploy a bunch of space-based power stations, backed by a “purchase power agreement”, where a utility agrees to buy all the power at a currently acceptable price for some number of decades. Like nuclear power, which requires 50 or more years of operations to pay off construction and decommissioning costs, signing such an agreement in 2019 is an enormously risky thing for a utility to do, because of future price uncertainty.¶ Indeed, just last month a major solar farm was announced in Nevada with a power price of $35/MWh, including storage. This price would have seemed impossibly low even last year, and yet I am certain that we will not have to wait long to see solar projects built for less than $10/MWh. For the first time in nearly 50 years, energy is rapidly getting cheaper and there’s no limit in sight. Against a backdrop of supply costs dropping by 10%/year, it will not be possible to find financial backers for projects that have a ROI time measured in decades. It is simply not possible to predict whether they will be able to make any money.