

# Multilateral Agreements for Real Property Rights in the Solar System

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## **Abstract**

A set of principles are proposed for multilateral agreements to allow real property rights on celestial bodies within the confines of the Outer Space Treaty (OST). They are:

- Clear affirmation that the “province of all mankind” language of the OST is fundamentally incompatible with the “common heritage of all mankind” language of the Moon Agreement. Although many parties to the latter are also parties to the OST, it should be affirmed as logically impossible for states to be parties to both treaties.
- Formal recognition of the utter impracticality of the view that whoever mines resources in space must “share any benefit with all states,” a prevailing false interpretation of the “province of all mankind” language in Article II. The notion that the sale of liquid oxygen from the Moon to Elon Musk for a trip to Mars should somehow benefit Botswana is absurd. But for imports of space resources to Earth, one way of dealing with the issue could be a tariff that would fund a development bank, from which nations could borrow to fund their own space projects.
- A requirement that all parties to the agreements will recognize property claims on celestial bodies of individuals from any nation, including non-party nations, subject to certain conditions. The U.S. Homestead Act of 1862 could be used as a model, requiring an individual to inhabit a prospective piece of real estate for some designated period of time, and improve it in some sense, in order to gain title. The General Mining Act of 1872 might also be used as a model, regulating mining claims and requiring their purchase for a fee from a governing body, if they are considered to be found on publicly owned land.
- A distinction between resources extracted in space for personal use, such as harvesting lunar water for life support; resources extracted in space for space commerce, such as harvesting lunar water to create propellant to sell; and resources brought back to Earth from space and for sale in the terrestrial economy.

- A permissive interpretation of Article IX of the OST, which requires avoiding “harmful contamination” of celestial bodies. There is need for a clear interpretation of this clause that would not preclude, say, humans landing on Mars, yet would also ensure the preservation of heritage sites, such as the Apollo landing sites on the Moon or Viking landing sites on Mars.

## 1. Introduction

The Outer Space Treaty (OST) is now over half a century old.<sup>1</sup> At the time it was being debated, less than a decade after the first artificial satellite, only governments were sending objects, or humans, into space, at high cost. Outside of defense, civil space was viewed as a venue purely for research and science, as the Antarctic was; in fact, the OST was modeled on the Antarctic Treaty. Few, other than readers of that era’s science fiction, could imagine large numbers of people actually living and working in space, raising children, building a space economy, and creating new human societies. So while the treaty was not negotiated and written specifically to preclude such things, neither was it written to clearly anticipate and enable them.

Fast forward fifty-two years: At the end of September, 2019, in southernmost Texas, standing alongside a real rocket that looked like the cover of a 1950s science-fiction pulp magazine, a man publicly laid out his plans for sending thousands of people to Mars, and elsewhere in the solar system, in the next decade. The claim is bold, but Elon Musk is no stranger to both making, and fulfilling bold claims. He has already massively disrupted the global launch industry with his low-priced partially reusable rockets. Other industry professionals have bet against him, and lost, and they continue to do so at their peril. It is possible that he will not succeed but, given his track record, that seems unlikely, even if it takes longer than he hopes.

Meanwhile, at Cape Canaveral in Florida, the location from which men first left planet Earth to go to another celestial body half a century ago, Jeff Bezos, the richest man in the world, is developing his own rockets with the same goal of allowing thousands or millions of people to leave the home planet, many permanently, to seek new lives and dreams.

But can their visions of large number of humans developing and settling the solar system be achieved within the confines of a treaty that was written at a time in which such things would have been considered by most and, particularly, by those negotiating the treaty, to be science fiction? Many, including many space lawyers, and the author, believe they can. This paper will describe how.

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1 Formally titled “Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies”.

## 2. “Province Of” Versus “Commons”

Robust, secure, freely transferable property rights are the *sine qua non* of a wealthy, equitable society. As understood under centuries of English common law, they, along with contract law and free markets, lie at the heart of the economic success of the West in general and the Anglosphere in particular, creating the wealthiest societies in human history. In order to understand how it can be possible for humanity to expand into the solar system under the current treaty structure, in the same way that has created such wealth, it is important to understand the arguments of those who claim it is not.

Many who believe the OST to be inadequate for the development of space believe that the solution is a new agreement, and in fact one was proposed in the 1970s, and acceded to by some nations subsequently (though no space-faring ones at the time), known in the space legal community as the Moon Agreement.<sup>2</sup> It proposes the establishment of an international “regime” to ensure the “equitable” allocation of space resources. The regime established for seabed mining under the Law of the Sea Treaty is used as a model. In that light, it is worth noting that there has been very little seabed mining since that treaty went into force decades ago.

With the exception of Guatemala, which is a signatory to the Moon Agreement, all States Parties to the Moon Agreement are also States Parties to the OST. It has been argued, however, that the two treaties are fundamentally, philosophically incompatible, a position with which the author agrees.

Article I of the OST declares that the *exploration and use* of space shall be “the province of all mankind.” Emphasis is added because many, in citing that article, leave out those words, claiming instead that space *itself* is the province of all mankind. This is despite the fact that the phrase “exploration and use” appears no fewer than *nineteen times* in the document, including in the title itself. It is those *activities* that are the “province of all mankind,” not space. In other words, any person is allowed to participate in them.

In contrast, in Article 11, the Moon Agreement declares the moon (and by extension other celestial bodies) to be the “common heritage of mankind.” That is, it is describing not the activities of exploration and use, but space itself, or at least the bodies within it. This is one of the several reasons that it has never been acceded to by any space-faring nation, and it is the current position of the United States government, as explicitly publicly reiterated several times in the past couple years by Dr. Scott Pace, Executive Director of the National Space Council, that space is *not* a commons, and that describing it as such is unhelpful in discussions about its commercial use. Nonetheless, many in the space legal community, and particularly at the

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2 Formally titled “Agreement Governing the Activities of States on the Moon and Other Celestial Bodies”.

Committee on the Peaceful Uses of Outer Space (COPUOS), use the two phrases interchangeably, ingenuously or otherwise.

The author would argue that if it is required to get permission from some undefined international authority in order to carry out space activities, space cannot be said to be “the province of all mankind,” but rather only the province of those members of humanity who can get such permission. Thus, in its declaration that space is a commons, the Moon Agreement is in fact philosophically incompatible with the OST, and a States Party to one should not be States Party to the other. It is also to doom it to the “tragedy of the commons” that Garret Hardin described decades ago, in which that which is owned by all is owned by none, and there is nothing to prevent overutilization of a resource, fisheries being a notable example.

Beyond that, while both treaties ban national appropriations by claims of national sovereignty of celestial bodies in part or whole – the OST does so in Article II – the Moon Agreement goes far beyond this. In Article 11, Section 3, it declares that not only may a state not claim sovereignty, but that no one, including international entities can own private property in space, and that occupation and use shall explicitly *not* confer ownership. This declaration is fundamentally inimical to the traditional English common law that has created so much wealth, which has long recognized that, in English philosopher John Locke’s terms, property has its basis in the mixing of soil with toil to create value. To forbid the reward of property for the improvement of the land would be to eliminate the incentive to engage in such activities. In fact, the author would argue that banning the ownership of property is a violation of a *fundamental human right*. There is an extensive literature on this subject, but without getting into that level of detail, the United Nations itself, in Article 17 of the Universal Declaration of Human Rights, declares that “Everyone has the right to own property alone as well as in association with others.” That the property happens to be in space is insufficient reason for such a violation. The UN declaration is literally *universal*, not to be confined to a single planet. Ignoring other issues, the Moon Agreement should be summarily rejected for this reason alone.

The new treaty was clearly written with the mindset that the OST was too ambiguous in respect to these issues, which is why it is reasonable to think that it is, in the words of the current U.S. administration, “permissive” in that regard. It could in fact be possible to recognize property rights without the need for a claim of national sovereignty. That is, the ban on such claims is not necessarily a ban on private extraterrestrial property *per se*.

### **3. “Equitable Sharing” Under The OST**

The words “equitable sharing,” a phrase that many delegates to COPUOS use in the context of the utilization of space resources, does not in fact appear

in the OST; it is a phrase from Article 11, Section 7(d) of the Moon Agreement:

*An equitable sharing* by all States Parties in the benefits derived from those resources, whereby the interests and needs of the developing countries, as well as the efforts of those countries which have contributed either directly or indirectly to the exploration of the moon, shall be given special consideration. [Emphasis added]

This is presumably derived from Article I of the OST, which states that:

The exploration and use of outer space, including the moon and other celestial bodies, shall be carried out for the benefit and *in the interests of all countries, irrespective of their degree of economic or scientific development*, and shall be the province of all mankind.

Outer space, including the moon and other celestial bodies, shall be free for exploration and use by all States without discrimination of any kind, *on a basis of equality* and in accordance with international law..." [Emphasis added in both cases]

In either case, it is easy to describe how the *exploration* of outer space can benefit all countries. For instance, all nations get the data from our planetary probes, or our weather satellites, or remote sensing (though the latter are more exploration of the home planet than outer space).

This argument becomes more problematic as such services become privatized, but they are still available to all at market prices. It also becomes more problematic as space exploration *itself* becomes privatized, as it did (for example) on the American frontier with beaver pelts, to gain preferential knowledge of resources for commercial benefit against competitors. But even given that, it is much harder to explain how the *use* of outer space, at least in terms of resources, can do so. In reality, the notion of "equitable sharing" of the use of space resources can be, at best, aspirational, not literal. And as an aspiration, it is a fine one, but it is essential to recognize that, historically, lofty aspirations seldom survive contact with the realities of physics, economics, or fundamental human nature.

Consider: Someone mines a carbonaceous asteroid for its water and carbon, and manufactures methane and oxygen, and sells it to Mr. Musk for use as propellant for his interplanetary vessels. How can this a) harm any developing nation on Earth, or b) benefit it, at least directly? Answer: It cannot. But that should not prevent it from happening because it is not literally an "equitable sharing."

The same would apply to a homesteader, mining the Martian atmosphere, regolith and recently discovered water reserves, to live off the Martian land.

The only case of space-resource utilization that could conceivably hurt a developing nation would occur when such resources are brought back to Earth and injected into the terrestrial economy. For instance, if a country's

income was partially dependent on exports of titanium sponge, or ore, or platinum-group metals, massive imports of cheap supplies of those commodities from space could depress the prices and damage its economy.

For this case (and only for this case), it might make sense to put a tariff on extraterrestrial imports that could go to a development bank, which could give out loans to developing nations to enable them to participate in the space economy. But the notion of an earthly “regime” that would decide to what use space resources would be put in space, is absurd. It would neither be able to enforce such a thing, or to have any useful knowledge of the best use. Given the distances involved, it would be an extreme example of Friederich Hayek’s “knowledge problem,” in which the market will always be smarter than a technocrat.

So, in the context of the discussion of space resource utilization, which has recently become a hot topic in Vienna at COPUOS, particularly with controversial national laws passed in the United States and Luxembourg in recent years, it is important to make a distinction between these three uses of space resources:

- 1) Personal use (e.g., utilization for life support and personal agriculture, and perhaps personal manufacture via tools such as additive manufacturing, in space settlements);
- 2) Commercial use (utilization to produce products for sale to others in legitimate commerce in space, with other space inhabitants or businesses);
- 3) Terrestrial use (the import of space products into the terrestrial economy).

Note that (1) and (2) are already recognized with such distinctions in terrestrial law; e.g., rules for growing things differ for personal versus commercial use. Only (3) should be of concern to advocates of the Moon Agreement.

#### **4. What Is A “Celestial Body”?**

Though the phrase appears repeatedly in both the OST and the failed Moon Agreement, including within the titles of the treaties themselves, “celestial body” is not defined. Clearly, Earth’s moon is considered one, because the agreements are about it and “other celestial bodies.” But is an asteroid? Presumably Ceres is, and probably anybody that is in hydrostatic equilibrium (that is, large enough for its own gravity to physically enforce its sphericity). But what about smaller bodies that are non-spherical, perhaps even including the Martian moons Phobos and Deimos?

Let’s do a thought experiment.

In terms of ownership and transfer of space resources, we already have legal precedent for the ability to take material from a celestial body and exchange it for tokens of value, from both Apollo, and Soviet uncrewed sample-return missions. So, presumably, if one were to land on an asteroid, break off a piece with a rock hammer, it could be brought back to Earth and sold.

Now break off a larger piece and do the same. And yet another even larger piece, perhaps one so large that it's more than half the original mass. Because there is no obvious limit on size in terms of the principle, each removed portion, no matter how large, has thus become the property of the remover. So, by induction, one would in theory be able to simply remove the entire body to a different location, all at once, at which point it would become the property of the person who had done so. That is, if it had been a celestial body before, it would no longer be.

This could provide us with a potentially useful definition. The author proposes that "celestial body" be defined as a space object in a natural orbit. That is, it is in an orbit that has not been deliberately and artificially altered to put it in a more favorable economic location.

Why the latter condition? It is physically impossible to materially interact with any object in space (including Earth itself) without affecting its orbit, however minutely. For instance, we know that, from Newton's laws of motion, each Apollo landing (and ascent from the lunar surface) moved the moon and changed its orbit around both its barycenter with the Earth, and around the sun, however imperceptibly. But it didn't do so in any predictable or intentional way, so despite the fact that its orbit was altered by human activity, by the proposed definition, it would remain a celestial body.

But suppose that a person discovered an interesting (from a resource standpoint) body a few meters, or even a few hundred meters in size, but in an inconvenient heliocentric orbit, from the standpoint of accessing it in terms of time or velocity. Under the proposed definition, by deliberately moving it to an orbit more convenient, it would no longer be a celestial body, and the terms of the treaty(s) would no longer apply to it as such; it would become the property of the human or corporate person who had thus moved it.

Note that this definition would be consistent with the aforementioned Locke's Labor Theory of Property (not to be confused with the nonsensical Marxist Labor Theory of Value). Previously unowned property would become the personal property arising from the labor of the person who had improved it. It is the basis of traditional homestead law (which will be discussed in the next section).

Some might argue that for major bodies, such as Earth's moon, or planets, or even an asteroid such as Ceres, that no one should be able to appropriate them under any circumstances. Assuming that by "major bodies" we mean a spherical one, this issue could be addressed by a slight modification of the definition: "A celestial body is a body in hydrostatic equilibrium, or a smaller

body that is in an orbit that has not been deliberately and artificially altered to put it in a more favorable economic location.” Since the removal of sufficient mass of a body in hydrostatic equilibrium to render it non-spherical would likely be viewed as an act of war, this definition should be sufficient to ensure that no one would attempt to legally seize it by simply deliberately moving it.

Of course, this raises interesting issues of liability. Once someone has taken ownership of such an object, if there were to be an accident with it in so moving it (e.g., an impact with Earth or some other inhabited location), they would be liable, which raises an interesting issue. Both chemical weapons and nuclear weapons, both fission and fusion, are weapons of mass destruction in international law, but the intent at the time the OST was negotiated was likely to forbid nuclear weapons in orbit or on celestial bodies, per Article IV. But arguably, any sufficiently effective gravity tractor (or other means of changing the orbit of a natural object) is potentially a true weapon of mass destruction. An asteroid diverted to hit a terrestrial city (or some other inhabited region of the solar system) could be as devastating in its effects as a nuclear strike. It would also be an extreme violation of the Article IX prohibition of “adverse changes in the environment of the Earth resulting from the introduction of extraterrestrial matter...”

But presumably, given the implied space-faring technology of the ability to reliably move such objects, we would also have monitoring sentinel telescopes in the inner solar system looking out, away from the sun, for such hazards, whether natural or nefarious. Unlike a nuclear strike with a missile, there would be ample warning time for governments, terrestrial or otherwise, to deal with such a situation.

## **5. Homesteading The High Frontier?**

It is often argued that the OST Article II ban on national appropriation by claims of national sovereignty of celestial bodies (such as the Earth’s moon or Mars) effectively outlaws private claims as well, because the property isn’t the sovereign’s to grant. But suppose that a group of States Parties to a new agreement choose to recognize property claims without any single national claim?

Consider a multilateral agreement between several like-minded nations to recognize the property claim of a miner or homesteader, even of a corporate or individual person not of any of those nations, assuming that they meet certain conditions. Those conditions should of course, at the least, meet the Lockean standard: To occupy the land for a minimum specified period of time, and to improve it (e.g., build a habitable structure), and if possible, cultivate it (probably in a greenhouse, absent effective terraforming). Relevant models of such a recognition are (from U.S. jurisprudence) the



Homestead Act of 1862, and the 1872 Mining Act. That is, one couldn't make a claim simply by planting a flag, or landing a rover.<sup>3</sup> A registry for such claims could be created in some neutral, non-threatening country (Luxembourg would be a good candidate).

Given the multilateral nature of such an agreement, and the willingness to grant the claim to all comers, it would be difficult to argue that it was a "national" appropriation under Article II. And the devil, of course, would lurk in the details of such an agreement, in terms of allowable size of claim, definitions of what would constitute an "improvement," and required duration. But it would seem to be a useful model that was quite successful in developing the American West, and it is worthy of consideration for the economic development of the solar system.

## 6. Planetary "Protection"

The words "planetary protection" do not appear in the OST, but it is currently a U.S. national policy derived from Article IX, in its prohibition of "harmful contamination" of celestial bodies. The notion was recently in the news with the revelation that freeze-dried tardigrades had been smuggled into a lunar lander. While it is hard to argue that the "contamination" was "harmful" (it is in fact possible that tardigrades have been hitch hiking to the lunar surface from ejecta from Earth for eons), there were concerns about the process (or lack thereof) of how such a thing was approved.

The general notion, though, is problematic for settling and developing the solar system, at least on celestial bodies. In it lies the tension between science (which was the primary purpose of space activities originally envisioned at the time of treaty negotiation) and economic development. Neither "harmful" or "contamination" are defined, but until they are, a high degree of uncertainty of the legal ability to send humans to (for example) Mars at all, let alone establish settlements there, will remain.

What is more clear is that we should preserve the human heritage already existing on both Earth's moon and Mars. The landing sites of the early space age are historically priceless, and the COPUOS member *For All Moonkind* has been leading a salutary effort to preserve them. Implicit in such preservation, however, is that if these sites are declared off limits, then other non-historical sites would not be, providing an additional basis for traditional property rights in the exploration and *use* of space.

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3 It is interesting to note in this regard that game developer and private astronaut Richard Garriott does own a Lunokhod rover on the moon, which he purchased from the Russians. If it were to become a tourist attraction, its tracks in the regolith could be considered an "improvement" to the locality, and also protected as his property.

## **7. Conclusion**

The Outer Space Treaty is more permissive than many seem to believe in allowing the settlement not just of space itself, but of celestial bodies. Article II is not in fact prohibitive of traditional property rights under English common law, and the Moon Agreement is in fact in violation of both human rights and human nature.

A new definition of “celestial body” could be useful in terms of defining property rights under the OST that repeatedly refers to the phrase. Transferable property rights and free markets are at the heart of how billions have been brought out of poverty over the past two centuries, and they can continue to do so in the rest of the solar system. That region is simply a new domain for human activity, not a special location that somehow suspends human nature, human rights, or economics by dint of its lack of earthly environment. It should, and will allow the same broad scope of social design as the home planet itself.

In light of the vast improvement in our technical capabilities over the half century since it went into force, it is time to reinterpret the OST for the 21<sup>st</sup> century, to allow the continued human flourishing, not just on Earth, but to bring earthly life out into the solar system, and perhaps with further improvements in space technology, into the cosmos beyond.