## 1

### Mining DA

#### Noble materials such as platinum are necessary for future survival, yet they are of limited abundance on earth, while are abundant on asteroids.

Sun et al. 20 (Sun, Daoyuan, Dong, Longjun., Shu, W., & Li, Xibing (School of Resources and Safety Engineering, Central South University, Changsha, China), 3-2-2020, “Exploration: safe and clean mining on Earth and asteroids. Journal of Cleaner Production,” <https://www.sciencedirect.com/science/article/abs/pii/S095965262030946X> Accessed 7-13-21)

Some types of mineral resources are obligatory for an evolving future society, which have great differences in their abundances on Earth and asteroids (e.g., Elvis, 2014). For example, platinum, a noble metal with its total reserve of only about 14,000 tons on Earth, has been widely used in the fields of medicine (e.g., Barefoot, 2001), materials engineering and chemical engineering (e.g., Dong et al., 2015), while most of the platinum has been contained in the ultra-deep deposits as it has large density in the early stage of Earth formation (e.g., Holzheid et al., 2000). With the exhaustion of the limited platinum contained in the surface of Earth, we have to consume more energy and resources to extract the ultra-deep platinum. Hence, there is no doubt that the safe and clean extraction of the deep platinum will be an extremely difficult issue by utilizing current mining techniques and equipment. Meanwhile, it can be expected that the output of platinum on Earth will be scarce as its total reserve is short (Dong et al., 2015). However, the platinum is abundant in other asteroids such as the asteroid 2011 UW158, which was worth 5.4 trillion USD for the platinum that it contained (Gary, 2016). According to the surveys funded by NASA’s Near Earth Object (NEO) Observations Program, the total number of discovered near-Earth asteroids (NEAs) reached to 15,000 up to 13 October 2016 (NASA, 2016). As of January 2018, there were over 18,000 known NEOs, with an average discovery rate about 40 per week (NASA, 2018). Many of NEAs contain high concentrations of platinum group metals (PGMs) such as platinum, rhodium, iridium, and palladium, which are similar to the asteroid 2011 UW158 and can be classified as Metallic Asteroids (Blair, 2000). It can be inferred that the deposits of PGMs on the identified NEAs may exceed the total amount of that found on Earth. Evidently, offmining on asteroids provides new ways for the future society to access the rare and noble metals on Earth.

#### Asteroid mining enables solar power satellites – which limit the effects climate change

**Taylor 19** Chris Taylor is a veteran journalist. Previously senior news writer for Time.com a year later. In 2000, he was named San Francisco bureau chief for Time magazine. He has served as senior editor for Business 2.0, West Coast editor for Fortune Small Business and West Coast web editor for Fast Company. Chris is a graduate of Merton College, Oxford and the Columbia University Graduate School of Journalism. "How asteroid mining will save the Earth — and mint trillionaires." Mashable, 2019, mashable.com/feature/asteroid-mining-space-economy. [Quality Control]

The mission is essential, Joyce declares, to save Earth from its **major problems**. First of all, the fictional billionaire wheels in a fictional Nobel economist to demonstrate the actual truth that the entire global economy is sitting on a **mountain of debt**. It has to keep growing or it will **implode**, so we might as well take the majority of the **industrial growth off-world where it can’t do any more harm to the biosphere.**

Secondly, there’s the **climate change fix**. Suarez sees asteroid mining as the only way we’re going to build **solar power satellites.** Which, as you probably know, is a form of uninterrupted solar power collection that is theoretically more effective, inch for inch, than any solar panels on Earth at high noon, but operating 24/7. (In space, basically, **it’s always double high noon).**

The power collected is beamed back to large receptors on Earth with large, low-power microwaves, which researchers think will be harmless enough to let humans and animals pass through the beam. A space solar power array like the one China is said to be working on could reliably supply 2,000 gigawatts — or **over 1,000 times more power than the largest solar farm currently in existence.**

“We're looking at a 20-year window to **completely replace** human civilization's **power infrastructure,**” Suarez told me, citing the report of the Intergovernmental Panel on Climate Change on the coming catastrophe. Solar satellite technology “has existed since the 1970s. What we were missing is **millions of tons of construction materials** in orbit. **Asteroid mining can place it there.”**

The Earth-centric early 21st century can’t really wrap its brain around this, but the idea is not to bring all that building material and precious metals down into our gravity well. Far better to create a whole new commodities exchange in space. You mine the useful stuff of asteroids both near to Earth and far, thousands of them taking less energy to reach than the moon. That’s something else we’re still grasping, how relatively easy it is to ship stuff in zero-G environments.

#### Off- Earth mining reduces emissions.

Dallas, et al. 19 (Dallas, J.A. (Australian Centre for Space Engineering Research, School of Minerals and Energy Resources Engineering, Sydney, Australia) et al. November 2, 2019, "Mining beyond earth for sustainable development: Will humanity benefit from resource extraction in outer space?," *Acta Astronautica*, <https://www.sciencedirect.com/science/article/abs/pii/S0094576519313839>. Accessed 7-12-21)

Off-Earth mining has been hailed by some as the answer to many of the environmental issues associated with mining on Earth (e.g., MacWhorter, 2015), based on the idea that much of the mining that is carried out on Earth 2 could instead be done in space in a bid to reduce pressure on Earth’s environment. In a preliminary study comparing the greenhouse gas emissions resulting from mining platinum (Pt) on Earth compared to asteroids, Hein et al. (2018) found that mining Pt in space produced considerably less greenhouse gas emissions relative to Earth-based mining. However, this study compared greenhouse gas emissions resulting from 1 kg of mined Pt, and did not compare the impact on other areas of the environment. If asteroids were to supply Earth with all, or even most of the demand for Pt, the assumption can be made that this would require a number of space vehicles carrying materials required for mining infrastructure. While the greenhouse gas emissions associated with space launches may be relatively less than Pt mining on Earth, the cumulative impact of frequent space launches on other areas of the environment is likely to be considerable. Numerous studies have documented the environmental impact of space launches (e.g., Madsen, 1981; Malkin, 1978; Murray et al., 2013; NASA, 1983; Nauryzbaev et al., 2005; Ross et al., 2010), and of particular concern when discussing cumulative launches is depletion of the stratospheric ozone layer. Space rocket launches are the only source of ozone depleting substances deposited directly into Earth’s ozone layer, causing concern that an increase in the frequency of launches could have dire consequences for the ozone layer (Ross et al., 2009). Aside from global environmental concerns, both Earth-based mining and space launches impact the local environment, with both being associated with emissions to soil, air, and water. However, the scale of emissions from mining is much greater than those associated with space launches, and this would likely remain the case even with a large increase in the frequency of space launches. While more work is needed to quantify the local environmental impact of the Earth-based mining as well as the space launches associated with off-Earth mining, preliminary evidence suggests that space launches result in environmental impacts of a much smaller magnitude (e.g., Hein et al., 2018). MacWhorter (2015) suggests that the environmental benefits to Earth of moving mining for resources used on Earth to other celestial bodies will be so large that off-Earth mining should be incentivized through a legal framework that grants property rights in extracted minerals on a “first-in-time, first-in-right” basis

#### If we don’t make a change, emissions can lead to extinction.

Spratt and Dunlop 19, David Spratt [Research Director for Breakthrough National Centre for Climate Restoration, Melbourne, and co-author of Climate Code Red: The case for emergency action] & Ian Dunlop [member of the Club of Rome. Formerly an international oil, gas and coal industry executive, chairman of the Australian Coal Association, chief executive of the Australian Institute of Company Directors, and chair of the Australian Greenhouse Office Experts Group on Emissions Trading 1998-2000], “Existential climate-related security risk: A scenario approach,” Breakthrough - National Centre for Climate Restoration, May 2019, pg. 8-10, beckert. Brackets in original text

2020–2030: Policy-makers fail to act on evidence that the current ​Paris Agreement path — in which global human-caused greenhouse emissions do not peak until 2030 — will lock in at least 3°C of warming. The case for a global, climate-emergency mobilisation of labour and resources to build a zero-emission economy and carbon drawdown in order to have a realistic chance of keeping warming well below 2°C is politely ignored. As projected by Xu and Ramanathan, by 2030 carbon dioxide levels have reached 437 parts per million — which is unprecedented in the last 20 million years — and warming reaches 1.6°C.18 2030–2050: Emissions peak in 2030, and start to fall consistent with an 80 percent reduction in fossil-fuel energy intensity by 2100 compared to 2010 energy intensity. This leads to warming of 2.4°C by 2050, consistent with the Xu and Ramanathan “baseline-fast” scenario.19 However, another 0.6°C of warming occurs — taking the total to 3°C by 2050 — due to the activation of a number of carbon-cycle feedbacks and higher levels of ice albedo and cloud feedbacks than current models assume. [It should be noted that this is far from an extreme scenario: the low-probability, high-impact warming (five percent probability) can exceed 3.5–4°C by 2050 in the Xu and Ramanathan scheme.] 2050: By 2050, there is broad scientific acceptance that system tipping-points for the West Antarctic Ice Sheet and a sea-ice-free Arctic summer were passed well before 1.5°C of warming, for the Greenland Ice Sheet well before 2°C, and for widespread permafrost loss and large-scale Amazon drought and dieback by 2.5°C. The “hothouse Earth” scenario has been realised, and Earth is headed for another degree or more of warming, especially since human greenhouse emissions are still significant.20 While sea levels have risen 0.5 metres by 2050, the increase may be 2–3 metres by 2100, and it is understood from historical analogues that seas may eventually rise by more than 25 metres. Thirty-five percent of the global land area, and 55 percent of the global population, are subject to more than 20 days a year of lethal heat conditions, beyond the threshold of human survivability. The destabilisation of the Jet Stream has very significantly affected the intensity and geographical distribution of the Asian and West African monsoons and, together with the further slowing of the Gulf Stream, is impinging on life support systems in Europe. North America suffers from devastating weather extremes including wildfires, heatwaves, drought and inundation. The summer monsoons in China have failed, and water flows into the great rivers of Asia are severely reduced by the loss of more than one-third of the Himalayan ice sheet. Glacial loss reaches 70 percent in the Andes, and rainfall in Mexico and central America falls by half. Semi-permanent El Nino conditions prevail. Aridification emerges over more than 30 percent of the world’s land surface. Desertification is severe in southern Africa, the southern Mediterranean, west Asia, the Middle East, inland Australia and across the south-western United States. Impacts: A number of ecosystems collapse, including coral reef systems, the Amazon rainforest and in the Arctic. Some poorer nations and regions, which lack capacity to provide artificially-cooled environments for their populations, become unviable. Deadly heat conditions persist for more than 100 days per year in West Africa, tropical South America, the Middle East and South-East Asia, contributing to more than a billion people being displaced from the tropical zone. Water availability decreases sharply in the most affected regions at lower latitudes (dry tropics and subtropics), affecting about two billion people worldwide. Agriculture becomes nonviable in the dry subtropics. Most regions in the world see a significant drop in food production and increasing numbers of extreme weather events, including heat waves, floods and storms. Food production is inadequate to feed the global population and food prices skyrocket, as a consequence of a one-fifth decline in crop yields, a decline in the nutrition content of food crops, a catastrophic decline in insect populations, desertification, monsoon failure and chronic water shortages, and conditions too hot for human habitation in significant food-growing regions. The lower reaches of the agriculturally-important river deltas such as the Mekong, Ganges and Nile are inundated, and significant sectors of some of the world’s most populous cities — including Chennai, Mumbai, Jakarta, Guangzhou, Tianjin, Hong Kong, Ho Chi Minh City, Shanghai, Lagos, Bangkok and Manila — are abandoned. Some small islands become uninhabitable. Ten percent of Bangladesh is inundated, displacing 15 million people. Even for 2°C of warming, more than a billion people may need to be relocated and In high-end scenarios, the scale of destruction is beyond our capacity to model, with a high likelihood of human civilisation coming to an end.21 National security consequences: For pragmatic reasons associated with providing only a sketch of this scenario, we take the conclusion of the ​Age of Consequences ‘Severe’ 3°C scenario developed by a group of senior US national-security figures in 2007 as appropriate for our scenario too: Massive nonlinear events in the global environment give rise to ​massive nonlinear societal events.​ In this scenario, nations around the world will be ​overwhelmed by the scale of change and pernicious challenges, such as pandemic disease. The internal cohesion of nations will be under great stress, including in the United States, both as a result of a dramatic rise in migration and changes in agricultural patterns and water availability. The flooding of coastal communities around the world, especially in the Netherlands, the United States, South Asia, and China, has the potential to challenge regional and even national identities.​ Armed conflict between nations over resources, such as the Nile and its tributaries, is likely and nuclear war is possible. The social consequences range from increased religious fervor to ​outright chaos.​ In this scenario, climate change provokes ​a permanent shift in the relationship of humankind to nature​’.22 (emphasis added) DISCUSSION This scenario provides a glimpse into a world of “outright chaos” on a path to the end of human civilisation and modern society as we have known it, in which the challenges to global security are simply overwhelming and political panic becomes the norm. Yet the world is currently completely unprepared to envisage, and even less deal with, the consequences of catastrophic climate change.23 What can be done to avoid such a probable but catastrophic future? It is clear from our preliminary scenario that dramatic action is required this decade if the “hothouse Earth” scenario is to be avoided. To reduce this risk and protect human civilisation, a massive global mobilisation of resources is needed in the coming decade to build a zero-emissions industrial system and set in train the restoration of a safe climate. This would be akin in scale to the World War II emergency mobilisation. There is an increasing awareness that such a response is now necessary. Prof. Kevin Anderson makes the case for a Marshall Plan-style construction of zero-carbon-dioxide energy supply and major electrification to build a zero-carbon industrial strategy by “a shift in productive capacity of society akin to that in World War II”.24 Others have warned that “only a drastic, economy-wide makeover within the next decade, consistent with limiting warming to 1.5°C”, would avoid the transition of the Earth System to the Pliocene-like conditions that prevailed 3-3.3 million years ago, when temperatures were ~3°C and sea levels 25 metres higher.25 It should be noted here that the 1.5° goal is not safe for a number of Earth System elements, including Arctic sea-ice, West Antarctica and coral reefs.

## 2

### Reg CP

#### Counterplan text: The Committee on the Peaceful use of Outer Space ought to

#### establish an application system for property rights on celestial bodies. Applications and approval of property rights should be granted upon the condition of

#### open disclosure of data gathered in the exploration of a celestial body

#### Applications must be publicly announced

#### Property Rights will be made tradeable between private entities

#### Property Rights will be set to expire on the conclusion of a successful extraction mission

#### Private Entities will only be allowed one property right grant per celestial body and cannot have more than one grant at a time

#### The counterplan establishes international norms for safe extraction of resources on celestial bodies while increasing R&D in outer space.

**Steffen 21** [Olaf Steffen, Olaf is a scientist at the Institute of Composite Structures and Adaptive Sytems at the German Aerospace Center. 12-2-2021, "Explore to Exploit: A Data-Centred Approach to Space Mining Regulation," Institute of Composite Structures and Adaptive Systems, German Aerospace Center, [https://www.sciencedirect.com/science/article/pii/S0265964621000515 accessed 12/12/21](https://www.sciencedirect.com/science/article/pii/S0265964621000515%20accessed%2012/12/21)] Adam

4. The data-centred approach to space mining regulation

4.1. Core description of the regulatory regime and mining rights acquisition process

The data gathered in the exploration of a [celestial body](https://www.sciencedirect.com/topics/social-sciences/astronomical-systems) is not only of value for space mining companies for informing them whether, where and how to exploit resources from the body in question, but also for science. The irretrievability of information relating to the solar system contained in the body that will be lost during resource exploitation carries a value for humanity and future generations and can thus be assigned the characteristic of a common heritage for all mankind as invoked in the Moon Agreement. This characteristic makes exploration data an exceptional and unique candidate for use in a mechanism for acquiring mining rights because its preservation is of public interest and its disclosure in exchange for exclusive mining rights does not place any additional burden on the mining company. The following principles would form the cornerstones of the proposed regulatory regime and rights acquisition mechanism based on exploration data:

Without preconditions, no entity has a right to mine the resources of a celestial body.

An international regulatory body administers the existing rights of companies for mining a specific celestial body.

Mining rights to such bodies can be applied for from this international regulatory body, with applications made public. The application expires after a pre-set period.

Mining rights are granted on the provision and disclosure of exploration data on the celestial body within the pre-set period, proposedly gathered in situ, characterising this body and its resources in a pre-defined manner.

The explorer's mining right to the resources of the celestial body is published by the regulatory body in a mining rights grant.

The data concerning the celestial body are made public as part of the rights grant within the domain of all participating members of the regulatory regime.

The exclusive mining rights to any specific body are tradeable.

The scope of the regulatory body with respect to the granting of mining rights is not revenue-oriented.

The international regulatory body would thus act as a curator of a rights register and an attached database of exploration data. The concept is superficially comparable to patent law, where exclusive rights are granted following the disclosure of an invention to incentivise the efforts made in the development process. In the following section, the characteristics of such a regulatory regime are further discussed with respect to the formation of [monopolies](https://www.sciencedirect.com/topics/social-sciences/monopolies), market dynamics, conflict avoidance, inclusivity towards less developed countries and the viability of implementation.

4.2. Discussion and means of implementation

The proposed regulatory mechanism has advantages both from a business/investor and society perspective. First, it prevents already highly capitalised companies from acquiring exploitation rights in bulk to deny competitors those objects that are easiest to exploit or most valuable, which would otherwise be possible in any kind of pay-for-right mechanism and could result in preventing market access to smaller, emerging companies. Thus, early monopoly formation can be avoided.

The use of data disclosure for the granting of mining rights ensures the scientific community has access to this invaluable source of information. In this way, space mining prospecting missions can lead to a boost in research on small celestial bodies at a speed unmatchable by pure government/agency funded science probes. This usefulness to the scientific community could lead to sustained partnerships between prospecting companies and scientific institutions and could even provide a source of funding for the companies through R&D grants and public-private partnerships. The results of the exploration efforts contribute to research on the formation of planets and the history of the solar system and provide valuable insight for space defence against asteroids. The transition of exploration from a tailored mission profile with a purpose-built spacecraft to a standard task in space flight would also lead to a cost reduction of the respective exploration spacecraft through [economies of scale](https://www.sciencedirect.com/topics/social-sciences/economies-of-scale). This describes the very benefits Elvis [[24](https://www.sciencedirect.com/science/article/pii/S0265964621000515" \l "bib24)] and Crawford [[25](https://www.sciencedirect.com/science/article/pii/S0265964621000515" \l "bib25)] imagined as possible effects of a space economy. Thus, there is an immediate return for society from the exploitation rights grant. It also reconciles the adverse interests of space development and [space science](https://www.sciencedirect.com/topics/social-sciences/space-sciences) as laid out by Schwartz [[26](https://www.sciencedirect.com/science/article/pii/S0265964621000515" \l "bib26)]. It ensures that, by exploitation, information contained in celestial bodies is not lost for future generations.The application period should not be set in a manner that creates a situation that can be abused through the potential for stockpiling inventory rights. Rather, it is intended to prevent conflict in the phase before exploration data gathered by a mission, as a prerequisite to the mining rights grant, is available. In other words, only one exploration effort at a time can be permitted for a specific body. The time frame between the application and the granting of mining rights (meaning: availability of the required exploration data set) should be tight and should only consider necessary exploration time on site, transit time and possibly a reasonable launch preparation and data processing markup. These contributors to the application period make it clear that the time frame could be dynamic and individualistic, depending on the exploration target (transit time and duration of exploration) and the technology of the exploration probe (transit time). After the expiration of the application period, applications for the exploration target would again be permissible. To prevent the previously mentioned stockpiling of inventory rights, credible proof of an imminent exploration intention would need to be part of the application process, for example, a fixed launch contract or the advanced build status of the exploration probe. Such a mechanism would not contradict the statement in the OST that outer space shall be free for both exploration and scientific investigation. Applications would not apply to purely scientific exploration. An application would only be necessary as a prerequisite for mining. Even resource prospecting could take place without an application (for whatever reason), with a subsequent application comprising in situ data already gathered. For such cases, the application process would need to provide a short period for objections to enable the secretive explorer to make their efforts public. The publication of the application for the mining rights, which is nothing more than a statement of intention to explore, thus provides a strong measure for avoiding conflict.

The transparency of where exploration spacecraft are located and, at a later stage, where mining activities take place, provides additional benefits for the sustainable use of space, trust building and deterrence against malign misuse of mining technology. Involuntary spacecraft collisions of competitors in deep space are prevented by the reduction of exploration efforts at the same destination through the application for mining rights by one applicant at a time. As pointed out by Newman and Williamson [[20](https://www.sciencedirect.com/science/article/pii/S0265964621000515" \l "bib20)], this is relevant because space debris does not de-orbit in deep space as in the case of LEO. Deep space may be vast, but the velocities involved mean that small debris particles are no less dangerous. Considering NEO mining with fleets of small spacecraft, malfunctions and/or destructive events could create debris clouds crossing Earth's orbit around the sun on a regular basis, presenting another danger to satellites in Earth's own orbit. Thus, by effectively preventing the collision of two spacecraft, one source of debris creation can be mitigated through this regulation mechanism. With respect to Deudney's [[11](https://www.sciencedirect.com/science/article/pii/S0265964621000515" \l "bib11)] scepticism of asteroid mining and the dual-use character of technology to manipulate orbits of celestial bodies, it has to be stated that this potential is truly inherent to asteroid mining. An asteroid redirect mission for scientific purposes was pursued by NASA [[49](https://www.sciencedirect.com/science/article/pii/S0265964621000515" \l "bib49)] before reorientation towards a manned lunar mission. In one way or another, each type of asteroid mining will require the delivery of the targeted resource to a destination via a comparable technology as formerly envisioned by NASA, be it as a raw material or a useable resource processed in situ, even if this is not necessarily done through redirecting the whole asteroid and placing it in a lunar orbit. However, to be misused as a weapon, space mined resources would have to surpass a certain mass threshold to survive atmospheric entry at the target. This seems unfeasible for currently discussed mining concepts using small-scale spacecraft as described in this article. Redirecting larger masses or whole asteroids would require far more powerful mining vessels or small amounts of thrust over long periods of time. The continuous, (for a mining activity) untypical change in the orbit of an asteroid would make a redirect attempt with hostile intent easily identifiable, effectively deterring such an activity in the first place by ensuring the identification of the aggressor long before the projectile hits its target. The proposed database would provide a catalogue of asteroids with exploration and mining activities in place that should be tracked more closely because of their interaction with spacecraft. This would, in fact, be necessary per se as a precaution to avoid catastrophic mishaps, such as the accidental change of a NEO's orbit to intercept Earth by changing its mass through mining.

#### Space mining fails now due to profitability and unsafe tech which only the cp solves

**Steffen 21** [Olaf Steffen, Olaf is a scientist at the Institute of Composite Structures and Adaptive Sytems at the German Aerospace Center. 12-2-2021, "Explore to Exploit: A Data-Centred Approach to Space Mining Regulation," Institute of Composite Structures and Adaptive Systems, German Aerospace Center, [https://www.sciencedirect.com/science/article/pii/S0265964621000515 accessed 12/12/21](https://www.sciencedirect.com/science/article/pii/S0265964621000515%20accessed%2012/12/21)] Adam

* answers timeframe deficits
* creates solvency vs inequality/developing nation affs

The data-driven mechanism also addresses another potential risk of an emerging space-based resource economy: the reinforcing of the incontestable market positions of the market leaders based on an advantage in knowledge unattainable by new competitors. Explorations of celestial bodies will have a likelihood of failing from the perspective of the actual value of the explored object vs. the expected value. In this case, the costs of exploration would be a loss for the company, which could be significant and possibly ruinous considering the budgets needed for contemporary space agency-led exploration missions. Sanchez and McInnes [[5](https://www.sciencedirect.com/science/article/pii/S0265964621000515" \l "bib5)] explicitly mention the uncertainties in object distribution models used in their asteroid distribution study and for the conclusions drawn concerning reachable object masses with certain delta-v capabilities of spacecraft. With an increasing number of exploration missions led by a company, the data collected may lead to better in-house models and a higher probability of exploring the ‘right’ body for the value/resources aimed at. This may even provide information on the best spacecraft designs for matching the targeted objects’ orbit distribution. This risk is known from the digital platform economy, where the companies that are now leading have an uncatchable advantage in user data compared with market newcomers, translatable to a more refined and comfortable user experience, attracting additional users and thus offering superior services to business customers. This also holds true for space mining companies. Through their lack of legacy mission data, market newcomers would have a higher risk of misallocating exploration missions, making investments in those companies riskier than in established companies. To avoid the preferred investment in a single or a few companies, the risk of the investment in emerging companies is reduced by the proposed mechanism by ensuring the equal access to data for market newcomers and established companies alike. From a prospecting risk perspective, the market entrance of a new company becomes progressively less risky for investors with increasing amounts of publicly available exploration data, promoting progressive and dynamic development.

The long lead times of asteroid mining ventures coincide with a long time frame for an ROI. The exclusive mining rights granted after the exploration phase give investors security half-way into their space mining endeavours. The proposed tradability of the rights offers an early chance of gaining investment proceeds. It also offers the possibility of new business models: the classical asteroid mining system concept, as shown by Andrews et al. [[43](https://www.sciencedirect.com/science/article/pii/S0265964621000515" \l "bib43)], for example, covers exploration, exploitation and resource transfer. This maximises the investment needed to develop the technologies required for the entire process chain. Giving exploration a value could lead to a division of labour. Dedicated prospecting companies could emerge, providing mining companies with the data and mining rights to a body with the specific resource profile they are seeking. In this way, the investment needed for a successful mining endeavour is divided between different specialised companies. This considerably reduces the risk for investors as well as the investment needed for a company to meet their business goals, which are now aimed at just a particular part of the overall space mining endeavour. Third-party applications for mining rights should be possible to allow a mining company to subcontract to exploration companies. Such a regulatory mechanism design would also be more easily inclusive of less developed countries. They could simply contract exploration missions made affordable through economies of scale to become part of the emerging space mining economy as holders of tradeable mining rights. Through a wise selection of such missions’ targets, they could gain powerful positions of influence.

## Case

#### The mining DA outweighs on timeframe because emissions will kill us in 30 years, capitalism needs to wait until we run out of all resources on Earth.

#### The mining DA solves case because when we get more resources from outer space, we no longer have to worry about the effects of resource extraction on Earth.

#### **Capitalism is the only way to incentivize the innovation necessary to solve the environment**

Franz 4/25 (Caleb, podcast director for *Outset* magazine. “Markets Work: Capitalism and Innovation Heal the Earth”, 4/25/17. <http://outsetmagazine.com/2017/04/25/capitalism-and-innovation-heal-the-earth/>, 7/7/17)//JM

When it comes to opposing factions, it seems as though no two factions could be more averse to each other than environmentalists and capitalists. We are taught to believe that those who care about economic growth cannot possibly care about environmental protection and vice versa. While this rhetoric is a good way to polarize those with opposing priorities, the truth is that they can co-exist. In fact, not only can capitalism and environmentalism co-exist, but only with free market capitalism can the environment ever hope to be clean. Even though critics of capitalism accuse the system of placing profits above people or the environment, the reality sets a different tone. The market demand for clean and renewable energy is growing every day. Companies and businesses are finding it profitable to keep the environment that their costumers live in clean. There is also an opportunity for those who care about the cause to take action like never before and to do so within the market. Technology and innovation are evolving at such a rate that dirty fuels and pollution will soon become a thing of the past. Elon Musk is the perfect example of this concept. Musk has created an entire empire based on clean and affordable energy; not because of government decree or regulation, but from private incentives to innovate and compete, which drives product quality up. Because Musk is allowed to profit and gain from the demand of the marketplace, his companies are on the cutting edge of innovation changing the world and the environment. Musk recently announced that he could produce roof solar panels at a cheaper rate than even conventional roofs. He is using Tesla Motors to revolutionize the automobile and clean energy industries. While Tesla cars are currently not as quite as profitable as I’m sure he would like, these innovations are setting the essential groundwork for years to come. On a smaller scale, new industries are finding innovative ways to help fight pollution and restore clean water to the planet. The only reason any company is even able to do this is capitalism. Competition is a powerful force, and people often forget that the market is what we make it. Going to government is not just a lazy way of trying to achieve sustainability, but it is also ineffective and does more harm than good. The market, so long as it is free and without crony assistance from the government, always hold businesses accountable. Sure, in a genuinely free market, a business might pollute, but the decision to pollute in excess will eventually prove counter to business interests. First, a company’s pollution would significantly affect the water that their employees drink or the air that they breathe, which would raise employment costs. Second, and more importantly, the company would also be polluting the water or air of their customers, who will be far less likely to continue doing business with the company after they have damaged the ecosystem of the community. Pollution would leave the company vulnerable to outside competition that recognizes these environmental concerns as well as the economic concerns. The business that pollutes the air and waters of the community it serves will quickly lose customers and suffer significant losses because the community, and not the government, will punish the business. Not only should we explore innovation with the market to protect the environment, but we must also act to curtail the world’s largest polluter: the U.S. Government. While environmentalist protest and rally against large corporations who pollute the air and water, the government remains the world’s largest overall polluter. Calls for government reform are silent. Not only are they the largest overall, but the federal government is also the fourth largest contributor to greenhouse gas pollution alone. Of course, we also cannot forget about the terrible EPA mine spill polluting the Colorado River in 2015. If environmentalists want to be serious about reducing pollution, they must focus on cutting the size of government. We should all strive for sustainability. Therefore, we should not view capitalism at odds with a clean Earth. Only through capitalism can we have a realistic expectation of a cleaner Earth. Government intervention only hinders economic progress and does little to protecting the environment. The path to a clean and sustainable planet cannot and should not go through the government but through competition and innovation. The government cannot mandate economic growth. The only thing it can and should do is get out of the way and remove all restrictions that slow innovation. Fossil fuels are already on their way out, and clean energy is the way of the future. But that fact does not, by itself make clean energy affordable. Only with the creative destruction that the market provides can we have a clean and sustainable future that coincides with our economic growth and prosperity. Capitalism leading the way to heal the planet is just one excellent example of how well markets work.

#### Capitalism will protect us from environmental catastrophe before socialism does.

**Hahnel and Young 16** – (7/7, interview with Robin Hahnel, Visiting Professor of Economics at Portland State University, Professor Emeritus of Economics at American University, by Kevin Young, PhD in History from Stony Brook University, Assistant Professor of History at the University of Massachusetts Amherst, “Ecologically Sustainable Growth Is Possible: An Interview With Economist Robin Hahnel,” http://www.truth-out.org/news/item/36723-ecologically-sustainable-growth-is-possible-an-interview-with-robin-hahnel)

Can we have economic growth while confronting climate change? In this interview, radical economist Robin Hahnel argues that ecological sustainability is perfectly compatible with increases in economic well-being. While we must drastically reduce the physical matter used and discharged within the global economy ("throughput"), we can simultaneously improve life for most people. Fighting for an ecologically sustainable form of growth must be central to the work of the climate justice movement.

Kevin Young: Many environmentalists argue that we must limit economic growth or even undergo de-growth in order to adequately reduce greenhouse gas (GHG) emissions. Many economists argue that it's possible to "decouple" growth and emissions. Who's right?

Robin Hahnel: With few exceptions economists were completely oblivious to the fact that our economic train was barreling toward environmental disaster. So we owe a huge "thank you" to environmentalists for warning us that the kind of economic growth we have been pursuing will not only continue to damage the environment in myriad ways, it is on course to trigger irreversible, cataclysmic climate change within a few decades.

However, those who point out that it is possible for economic well-being per capita to grow indefinitely while protecting the environment are correct. Yes! Green growth is possible. When spokespeople for the steady-state and de-growth movements deny that green growth is possible and say that we must reconcile ourselves to stagnant or declining living standards to avoid environmental disaster, they are wrong, and do the environmental movement great harm.

What cannot continue to grow indefinitely is throughput. Ecological economists define throughput as physical inputs from the natural environment (e.g., iron ore or topsoil) used in production processes, as well as physical outputs of production (usually thought of as waste or pollution) such as airborne particulate matter and greenhouse gases released back into the environment where they are absorbed in natural "sinks." Throughput must be measured in some appropriate physical units such as tons of iron ore, cubic meters of topsoil, and cubic tons of carbon dioxide.

What economists define as economic growth is not the same as growth of throughput. When economists refer to economic growth they mean growth of GDP, the value of the final goods and services produced during a year. Of course, growth of GDP fails to represent growth of economic well-being for a host of reasons that are well known. Nonetheless, assuming it could be measured properly**,** economic well-being can grow even as throughput remains constant or decreases**. In** the literature this is called decoupling, which means separating the growth of the value of what we produce from the quantity of throughput we use to produce it.

Where critics are correct is that business-as-usual economic growth has failed to decouple. In fact, it has us on a suicidal trajectory! But that does not mean that a different kind of growth -- growth that increases throughput efficiency at the same rate that it increases labor productivity, and therefore puts no more strain on the environment -- is impossible. And that is what decoupling means: increasing throughput efficiency as much as we increase labor productivity. (As long as the rate of growth of productivity rises no faster than the rate of growth of throughput efficiency, throughput will not increase.) Moreover, there is plenty of evidence that decoupling is possible. We are doing it right now for greenhouse gas throughput. Of course we have to reduce GHG throughput much faster still to avoid cataclysmic climate change. The name of the game is to decouple increases in economic well-being from throughput big time. But anyone who argues that decoupling is impossible is wrong on both theoretical and empirical grounds.

[KY] From the perspective of the climate justice movement, what are the concrete implications of the debate about growth?

[RH] Those who deny the possibility of decoupling are both wrong and detract us from the task at hand. Worse still, they make it impossible to build a political coalition sufficiently numerous and powerful to prevent climate change. Why would lower classes in advanced economies support a movement that says their children cannot aspire to a higher standard of living? Why would any of the four billion people living in less developed economies who have yet to enjoy the benefits of economic development sign onto a movement that tells them they must give up any hope of enjoying those benefits? The answer is they won't! Because economic growth is necessary to improve the lives of most of the world's population, a "de-growth" platform is suicidal when trying to build a mass movement to prevent climate change. The tragedy is that our environmental movement does not have to preach this self-defeating sermon. Preventing climate change, and better protecting the environment in general, is perfectly compatible with increases in economic well-being.

[KY] Some argue that while ecologically sustainable growth is hypothetically possible, it is impossible within a capitalist system. Richard Harris, for instance, claims that green-growth advocates "assume that capitalism is sufficiently malleable that capitalist fundamentals can be 'inverted' such that corporations can, in one way or another, be induced to subordinate profit-making to 'saving the Earth.'"

[RH] Capitalism can become a lot more green than it has been to date -- which is damn lucky since replacing capitalism with eco-socialism isn't going to happen fast enough to prevent climate change. Capitalists pursue profits via the easiest route. Of course they are not going to save the Earth out of the goodness of their hearts. But there is no reason we cannot make the route to profits from extracting and burning fossil fuels more difficult or impossible. And there is no reason we cannot make the route to profits by producing renewable energy and retrofitting buildings much more lucrative. There are many ways to intervene in markets to change results, and we will have to use all of them over the next decades because the kind of green new deal we need is going to have to be launched while economies are still very much capitalist.

[KY] What would a "green new deal" look like under capitalism? And are there any precedents for that kind of massive shift in economic priorities?

[RH] Replacing fossil fuels with renewables, transforming not only transportation but industry and agriculture as well to be much more energy efficient, and rebuilding our entire built infrastructure to conserve energy, will be an immense, historic undertaking. What is needed if we are to avoid unacceptable climate change is the greatest technological "reboot" in economic history. This is the only way to avoid literally broiling ourselves to death at some point in the century ahead, and, I might add, the only way to re-employ the tens of millions who lost their jobs in the Great Recession and the hundred million young people who will need jobs over the next two decades. The precedent is the massive shift of economic priorities the US economy went through between 1939 and 1942. Just as we responded to the menace of global fascism by shifting over 50 percent of production from consumption goods to war materials, we need a similar response to the equally dangerous menace of cataclysmic climate change.

Robert Pollin and collaborators at the Political Economy Research Institute have fleshed out the details of what a Green New Deal would look like not only for the United States, but also for many other parts of the world economy. A major finding is how little it would cost over the next several decades for the world to become free of fossil fuels. In short, Pollin and his collaborators demonstrate that the barriers to preventing climate change are political, not technological.

[KY] To what extent does confronting the climate crisis require changes in the consumption of the average working person in the global North?

[RH] What we consume will have to change. Where and how we live and work and transport ourselves will have to change. We will live more compactly. We will share larger, superior open spaces than we have today. We will consume more public and fewer private goods. But there is no reason that economic well-being cannot increase for future generations in the global North while adequately protecting the environment. Decarbonization will require that we live differently, but we can all live far better -- and that is the message the environmental movement needs to emphasize.

[KY] You've also written a lot about international climate policy. Could you comment on the strategy of the Climate Justice Movement (CJM) vis-à-vis the 2015 COP 21 meeting in Paris?

[RH] The Climate Justice Movement made a strategic blunder. After every country announced its emission reduction pledge, the CJM had the opportunity to launch a major international campaign explaining which pledges were consistent with a country's responsibilities (for creating the problem) and capabilities (for making contributions toward solving the problem.) Before the Paris meetings equity researchers had reached a broad consensus for how to judge proposals, and evaluations were readily available (see for example the Climate Equity Calculator). These evaluations showed that the pledges of more developed countries in most cases fell far short of their fair shares, while most pledges from less developed countries were consistent with their fair shares. The CJM should have made support for countries making fair pledges, and criticism of countries whose pledges fell short, its major priority in Paris.

[KY] Progressives' suspicions of global climate deals stem partly from the carbon trading mechanisms included in prior accords. Most leftists in the global North seem to reject carbon trading unequivocally, as a scam devised by polluters to thwart real change. But you've argued that carbon trading can be an effective short-term way to cut emissions while we work toward the longer-term goal of replacing the capitalist system.

[RH] The amount of ill-informed criticism of carbon markets, carbon trading, carbon offsets, etc., from the left over the past two decades would fill an ocean. Two things drive this fury: (1) None of us likes the idea of placing a price on nature and putting nature up for sale. In other words, rejection of carbon markets in any form is part of a justifiable disgust with the commercialization of life. (2) Many on the left -- although by no means all -- understand that markets are part of the problem. The problem is not just private ownership of the means of production. Coordinating our economic activities through markets is also an integral part of the economics of competition and greed we need to extricate ourselves from. So, people reason, if markets are part of the problem, how can a carbon market be part of the solution?

But besides massive ignorance regarding how carbon markets do and can work, here is what many leftists fail to understand: We live in a market system. And until we do not, the only way to change what happens is to intervene in or regulate markets. Do socialists denounce campaigns to raise the minimum wage on grounds that anything short of eliminating wage slavery altogether is a "false solution?" No. We recognize that until we can eliminate wage slavery, a higher price for wage-slaves is better than a lower one. The same holds for cutting carbon emissions. Until we can replace the market system we need to intervene in the market system to reduce GHG emissions. Right now those who find it in their interests to abuse nature by releasing GHGs into the atmosphere do so without paying a cent. In a market system one way to reduce emissions is to force emitters to pay for the damage they cause by charging them a tax per unit of emissions. Another way is to cap total emissions and require emitters to purchase permits for whatever they emit. In both cases we are selling off rights to abuse nature. Sorry about that, but until we replace the market system there is no alternative except to allow businesses to abuse nature.

#### TURN - Private ownership and appropriation encourage environmental preservation in space

Reinstein 99

Ezra J. Reinstein (JD, Associate at Kirkland & Ellis), Owning Outer Space, 20 Nw. J. Int'l L. & Bus. 59 (1999). JDN. https://scholarlycommons.law.northwestern.edu/njilb/vol20/iss1/7

Another way to solve the problem of space **environmental ruination** is by accepting the right of ownership into our system of space law. It would be a simple but effective step in the right direction. As Lawrence Roberts has written, the current law "is rather damaging from an environmental perspective," because "without a means to secure control of a resource in the ground," i.e. without ownership, "each individual developer will seek to maximize his or her own gain by extracting as much value as quickly as possible without regard to the effect on the communal resource.

Ownership creates a strong incentive to act with an environmentalist ethos. As owner of a site, SpaceCorp would want to maximize the site's value. This self-interest protects the environment in two related ways. First, because SpaceCorp is not just a squatter on a plot of celestial territory, because it will have more than an expiring usufructary interest, SpaceCorp will avoid wanton despoliation of the land. Despoliation would reduce the value of the property to a purchaser, and thus SpaceCorp's potential revenue. Poor land management might also harm SpaceCorp's current interests, if its actions contaminate its own site to the point that its settlement loses viability. Second, SpaceCorp will avoid ripping through the site; instead, it will either preserve materials it does not use to maximize the site's resale value, or it will itself use the site as fully and efficiently as possible. SpaceCorp will either use the site with preservationist techniques, sparing the site from wasteful destruction, or it will use the site as a conservationist, i.e. wholly and completely, sparing other sites from exploitation. The incentive to use space non-wastefully, discussed above in the context of economic efficiency, clearly has positive environmental repercussions. An owner has an interest in keeping his own site clean, as well as using it with minimal waste and maximum efficiency, because if he wants to eventually sell the property, any despoliation will devalue it. This carrot, because it is self-executing, is better than any stick.

Of course, the right of ownership would not make an environmental violation whose harm extends onto another site less likely -- but it wouldn't make it more likely, either. As under the current system, lawsuits should still be available to remedy harms. Hopefully the requirement of environmental review would act as a prior restraint to prevent these harms. And ownership, by creating an incentive to care about one's own property, protects the interests of others: both those nearby (who instantly feel the effects of more care given to, e.g., waste disposal and water management), and those who come later.

#### TURN - Private ownership provides additional sources of income and benefits developing economies in the Global South, which promotes further equity and justice in international space capability so none of their colonialism offense matters

Reinstein 99

Ezra J. Reinstein (JD, Associate at Kirkland & Ellis), Owning Outer Space, 20 Nw. J. Int'l L. & Bus. 59 (1999). JDN. https://scholarlycommons.law.northwestern.edu/njilb/vol20/iss1/7

The changes to the OST proposed in this essay would encourage and hasten the conversion of potential wealth-in-space into actual wealth-on-Earth. As already argued, bringing wealth into a system is an absolute good, aiding all humanity (however indirectly), including developing nations.

But there is another, more direct way in which low-tech nations can benefit. As ownership rights boost the incentive to exploit outer space's resources, more developers will jump at the chance. And the more people jumping at the chance and flying up into space to glean the space-borne profits, the cheaper and safer it will become to carry out such space projects. That is, the more profitable it becomes to exploit space, the greater the impetus will be to develop new technology that permits easier access to space. And among the prime beneficiaries of more accessible space travel will be those nations -- the developing, low-tech nations -- who are currently not space-capable.

This, of course, will work with, and be facilitated by, the openness of plans under the UNSER system. We should not force the space-capable nations to share their wealth (as is required by the Moon Treaty, and as developing nations are pushing for in interpreting the OST), for to do so would discourage exploitation and space travel, and thus make space projects less regular, and thus less affordable and safe. Instead, by supporting the development of new technology in an efficient, free market environment, we thereby give developing nations the chance to go into space on their own. In this way we can increase everyone's access to space. And that's one of the designated goals of the OST itself.

### Solvency

#### No solvency – the aff takes no direct action to do anything to stop galactic capitalism – it’s just a statement

#### No solvency – the aff doesn’t solve for the most prevalent form of capitalism: on Earth; in fact it moves the attention away from capitalism that has been harming people for centuries and moves it towards a new terrain that is necessary to mitigate the impacts of capitalism on Earth

#### Even if cap is bad Space should be the one exception for allowing cap because we need to go to space to move mining elsewhere and protect the planet

#### Outer Space Laws are unclear – private entities can circumvent due to loopholes in the plan.

**Green and Stark 17** [Christopher and Eda, “Outer Space Treaty and Beyond: Do Existing Space Laws Put an Astronomical Barrier to Private IP Rights in Space?”, JDSUPRA. 8 September 2020 https://www.jdsupra.com/legalnews/outer-space-treaty-beyond-do-existing-44028/] //DebateDrills LC

Our **limited body of space law provides little guidance**. The first international treaty, the “Outer Space Treaty,” was signed by the U.S., Russia, and the U.K. in 1967, quickly followed by the Rescue Agreement. Over the next two decades, three other treaties—the Liability Convention, the Registration Convention, and the Moon Agreement—were also signed by these nations, with most countries following in their footsteps.[3] But after that rapid succession of international treaties, there have since been few others. These five documents form the basis of the international space law we have today, but **none address the issue of**[**intellectual property rights in space**](https://www.fr.com/fish-litigation/ip-rights-outer-space/). Rather, upon inspection, it appears that **the stated purpose of these treaties may be antithetical to intellectual property protection.**

The “Outer Space Treaty” espouses communal themes in characterizing space as the “province of all mankind,” the “common heritage of mankind” and to the “benefit of all countries.”[4] Unsurprisingly, Article II of the Outer Space Treaty prohibits any appropriation of areas in space, keeping in line with its principle of communal property.[5] On the other hand, **patents are fundamentally territorial and grant monopoly rights for a period of time. Applied to space, it is unclear just what is open for patent protections.**

For example, **can private companies patent orbital patterns of satellites**? Currently, companies may patent the technology or design of satellites that stay in a particular orbit, even if not the orbital pattern itself.[6] The practical implications of this are significant, especially with the advent of satellite constellations. If particular satellite technologies, and, indirectly, their orbital patterns, are patentable, then a significant portion of space may be occupied by one satellite constellation, i.e. one company alone.[7] Does this private apportionment of space run counter to our notions of sharing space? Some argue that **the Outer Space Treaty only bans sovereign appropriation and does not limit private entities from exerting claims**. Others counter that private property rights flow from sovereign property claims, so the former is meaningless without the latter.[8] So the question remains, **can the stated goals of sharing outer space be reconciled with the proprietary nature of patents**?

**Our current corpus of space treaties comes from a period of history when space exploration was undertaken primarily by governments** rather than private actors. The cooperative goals were likely a reaction to the time, as the world was coming out of a charged space race. **The silence of these space treaties on intellectual property rights presents an opportunity for modern-day agreements to provide patent protections for private companies**. Without robust international agreement on patents for space, we may even see less international cooperation as companies refuse to divulge their discoveries.[9] Now, as more and more private companies enter space exploration and carry the torch of innovation, **it is more important than ever to strike a balance between sharing our “common heritage” and providing patent protections that incentivize invention.**[10]

#### The aff has no enforcement mechanism – private corporations can just circumvent since they have the funding to launch rockets on their own.

**Sheetz 21** [Michael, “Elon Musk’s SpaceX raised about $850 million, jumping valuation to about $74 billion”, CNBC. 16 February 2021. https://www.cnbc.com/2021/02/16/elon-musks-spacex-raised-850-million-at-419point99-a-share.html] //DebateDrills LC

**SpaceX completed another monster equity funding round of $850 million last week**, people familiar with the financing told CNBC, sending **the company’s valuation skyrocketing to about $74 billion.**

**The company raised the new funds at $419.99 a share**, those people said — or just 1 cent below the $420 price that [Elon Musk](https://www.cnbc.com/elon-musk/) [made infamous in 2018](https://www.cnbc.com/2018/09/28/sec-says-elon-musk-at-tesla-chose-420-price-as-pot-reference.html) when he declared **he had “funding secured” to take**[**Tesla**](https://www.cnbc.com/quotes/TSLA)**private** at that price.

The latest round also represents **a jump of about 60% in the company’s valuation** from its previous round in August, when [S**paceX raised near $2 billion at a $46 billion valuation**](https://www.cnbc.com/2020/10/14/tesla-investor-ron-baron-spacex-has-a-chance-to-be-just-as-large.html).

SpaceX did not immediately respond to CNBC’s request for comment. In addition to SpaceX further building a war chest for its ambitious plans, **company insiders and existing investors were able to sell $750 million in a secondary transaction**, one of the people said.

The people spoke on condition of anonymity because SpaceX is not a publicly traded company and the fundraising talks were private. SpaceX raised only a portion of the funding available in the marketplace, with one person telling CNBC that **the company received “insane demand” of about $6 billion in offers over the course of just three days**.