## Definitions

#### Appropriation means to take possession

Dictionary ND, Dictionary.com, “appropriation”, <https://www.dictionary.com/browse/appropriation>, DD AG

the act of appropriating or taking possession of something, often without permission or consent.

#### According to Merriam-Webster, outer space is the space immediately outside the earth’s atmosphere <https://www.merriam-webster.com/dictionary/outer%20space>

## Framing

I value morality, which considers the rightness and wrongness of actions

**The standard is maximizing expected wellbeing, or utilitarianism**

**1] Util is a lexical pre-requisite to any other framework: Threats to bodily security and life preclude the ability for moral actors to effectively utilize and act upon other moral theories since they are in a constant state of crisis that inhibit the ideal moral conditions which other theories presuppose – so, util comes first.**

**2] Default to util if there’s any uncertainty**

Walter **Sinnott-Armstrong 14** [American philosopher. He specializes in ethics, epistemology, and more recently in neuroethics, the philosophy of law, and the philosophy of cognitive science], "Consequentialism", The Stanford Encyclopedia of Philosophy (Spring 2014 Edition), Edward N. Zalta (ed), BE

Even if consequentialists can accommodate or explain away common moral intuitions, that might seem only to answer objections without yet giving any positive reason to accept consequentialism. However, **most people begin with the presumption that we morally ought to make the world better when we can. The question then is only whether any moral constraints or moral options need to be added to the basic consequentialist factor in moral reasoning.** (Kagan 1989, 1998) If no objection reveals any need for anything beyond consequences, then consequences alone seem to determine what is morally right or wrong, just as consequentialists claim.

#### 3] Extinction comes first under any framework

**Pummer 15** [Theron, Junior Research Fellow in Philosophy at St. Anne's College, University of Oxford. “Moral Agreement on Saving the World” Practical Ethics, University of Oxford. May 18, 2015] AT

There appears to be lot of disagreement in moral philosophy. Whether these many apparent disagreements are deep and irresolvable, I believe there is at least one thing it is reasonable to agree on right now, whatever general moral view we adopt: that it is very important to reduce the risk that all intelligent beings on this planet are eliminated by an enormous catastrophe, such as a nuclear war. How we might in fact try to reduce such existential risks is discussed elsewhere. My claim here is only that we – whether we’re consequentialists, deontologists, or virtue ethicists – should all agree that we should try to save the world. According to consequentialism, we should maximize the good, where this is taken to be the goodness, from an impartial perspective, of outcomes. Clearly one thing that makes an outcome good is that the people in it are doing well. There is little disagreement here. If the happiness or well-being of possible future people is just as important as that of people who already exist, and if they would have good lives, it is not hard to see how reducing existential risk is easily the most important thing in the whole world. This is for the familiar reason that there are so many people who could exist in the future – there are trillions upon trillions… upon trillions. There are so many possible future people that reducing existential risk is arguably the most important thing in the world, even if the well-being of these possible people were given only 0.001% as much weight as that of existing people. Even on a wholly person-affecting view – according to which there’s nothing (apart from effects on existing people) to be said in favor of creating happy people – the case for reducing existential risk is very strong. As noted in this seminal paper, this case is strengthened by the fact that there’s a good chance that many existing people will, with the aid of life-extension technology, live very long and very high quality lives. You might think what I have just argued applies to consequentialists only. There is a tendency to assume that, if an argument appeals to consequentialist considerations (the goodness of outcomes), it is irrelevant to non-consequentialists. But **that is a huge mistake.** Non-consequentialism is the view that there’s more that determines rightness than the goodness of consequences or outcomes; **it is not the view that the latter don’t matter**. Even John Rawls wrote, “All ethical doctrines worth our attention take consequences into account in judging rightness. One which did not would simply be irrational, crazy.” **Minimally plausible versions of deontology and virtue ethics must be concerned in part with promoting the good**, from an impartial point of view. They’d thus imply very strong reasons to reduce existential risk, at least when this doesn’t significantly involve doing harm to others or damaging one’s character. What’s even more surprising, perhaps, is that even if our own good (or that of those near and dear to us) has much greater weight than goodness from the impartial “point of view of the universe,” indeed even if the latter is entirely morally irrelevant, we may nonetheless have very strong reasons to reduce existential risk. Even egoism, the view that each agent should maximize her own good, might imply strong reasons to reduce existential risk. It will depend, among other things, on what one’s own good consists in. If well-being consisted in pleasure only, it is somewhat harder to argue that egoism would imply strong reasons to reduce existential risk – perhaps we could argue that one would maximize her expected hedonic well-being by funding life extension technology or by having herself cryogenically frozen at the time of her bodily death as well as giving money to reduce existential risk (so that there is a world for her to live in!). I am not sure, however, how strong the reasons to do this would be. But views which imply that, if I don’t care about other people, I have no or very little reason to help them are not even minimally plausible views (in addition to hedonistic egoism, I here have in mind views that imply that one has no reason to perform an act unless one actually desires to do that act). To be minimally plausible, egoism will need to be paired with a more sophisticated account of well-being. To see this, it is enough to consider, as Plato did, the possibility of a ring of invisibility – suppose that, while wearing it, Ayn could derive some pleasure by helping the poor, but instead could derive just a bit more by severely harming them. Hedonistic egoism would absurdly imply she should do the latter. To avoid this implication, egoists would need to build something like the meaningfulness of a life into well-being, in some robust way, where this would to a significant extent be a function of other-regarding concerns (see chapter 12 of this classic intro to ethics). But once these elements are included, we can (roughly, as above) argue that this sort of egoism will imply strong reasons to reduce existential risk. Add to all of this Samuel Scheffler’s recent intriguing arguments (quick podcast version available here) that most of what makes our lives go well would be undermined if there were no future generations of intelligent persons. On his view, my life would contain vastly less well-being if (say) a year after my death the world came to an end. So obviously if Scheffler were right I’d have very strong reason to reduce existential risk. **We should also take into account moral uncertainty.** What is it reasonable for one to do, when one is uncertain not (only) about the empirical facts, but also about the moral facts? I’ve just argued that there’s agreement among minimally plausible ethical views that we have strong reason to reduce existential risk – not only consequentialists, but also deontologists, virtue ethicists, and sophisticated egoists should agree. But even those (hedonistic egoists) who disagree should have a significant level of confidence that they are mistaken, and that one of the above views is correct. Even if they were 90% sure that their view is the correct one (and 10% sure that one of these other ones is correct), they would have pretty strong reason, from the standpoint of moral uncertainty, to reduce existential risk. Perhaps most disturbingly still, even if we are only 1% sure that the well-being of possible future people matters, it is at least arguable that, from the standpoint of moral uncertainty, reducing existential risk is the most important thing in the world. Again, this is largely for the reason that there are so many people who could exist in the future – there are trillions upon trillions… upon trillions. (For more on this and other related issues, see this excellent dissertation). Of course, it is uncertain whether these untold trillions would, in general, have good lives. It’s possible they’ll be miserable. It is enough for my claim that there is moral agreement in the relevant sense if, at least given certain empirical claims about what future lives would most likely be like, all minimally plausible moral views would converge on the conclusion that we should try to save the world. While there are some non-crazy views that place significantly greater moral weight on avoiding suffering than on promoting happiness, for reasons others have offered (and for independent reasons I won’t get into here unless requested to), they nonetheless seem to be fairly implausible views. And even if things did not go well for our ancestors, I am optimistic that they will overall go fantastically well for our descendants, if we allow them to. I suspect that most of us alive today – at least those of us not suffering from extreme illness or poverty – have lives that are well worth living, and that things will continue to improve. Derek Parfit, whose work has emphasized future generations as well as agreement in ethics, described our situation clearly and accurately: “We live during the hinge of history. Given the scientific and technological discoveries of the last two centuries, the world has never changed as fast. We shall soon have even greater powers to transform, not only our surroundings, but ourselves and our successors. If we act wisely in the next few centuries, humanity will survive its most dangerous and decisive period. Our descendants could, if necessary, go elsewhere, spreading through this galaxy…. Our descendants might, I believe, make the further future very good. But that good future may also depend in part on us. If our selfish recklessness ends human history, we would be acting very wrongly.” (From chapter 36 of On What Matters)

## Contention 1 is asteroid mining

#### Mining creates space debris

Boley and Byers 20 (Arron, Department of Physics and Astronomy, University of British Columbia; Michael, Department of Political Science, University of British Columbia) U.S. policy puts the safe development of space at risk, SCIENCE, 9 Oct 2020, Vol 370, Issue 6513, pp. 174-175 <https://www.science.org/doi/full/10.1126/science.abd3402> EE

Mining can generate serious operational concerns. Lunar dust is a known challenge to operations on the Moon. Any surface activity could exacerbate lunar dust migration, including by lofting dust onto trajectories that cross lunar orbits, such as that of NASA's proposed Lunar Gateway (11). Moreover, without cooperation by all actors, the limited number of useful lunar orbits could quickly become filled with space debris.

On asteroids, low escape speeds will make it difficult to prevent the loss of surface material. Even if full enclosures are used, waste material may be purposefully jettisoned. Mining could also lead to uncontrolled outbursts of volatile sublimation after the removal of surface layers. Because the asteroids targeted for mining are likely to be those with small minimum orbit intersection distances, the resulting meteoroid debris streams could threaten lunar operations as well as satellites in Earth's orbit (12). In a worst-case scenario, a trajectory change resulting from mining could eventually lead to an Earth-impact emergency.

Space missions already provide some evidence of these risks. In 2019, during the course of Japan's Hayabusa2 mission, a small impactor was used to make a crater on (162173) Ryugu (13). Some of the resulting anthropogenic meteoroids could begin reaching Earth during the 2033 apparition. In 2022, NASA will test its ability to deflect an asteroid by striking (65803) Didymos B (Dimorphos) with the Double Asteroid Redirection Test spacecraft. This impact will produce anthropogenic meteoroids, with the possibility of immediate delivery to Earth (14). Although these risks are small, they demonstrate how easily human actions can change the near-Earth environment.

#### An increase in space debris and dust from mining collides with key defense satellites

Scoles 15 Sarah Scoles [Freelance science writer, and a contributing writer at WIRED Science, with articles in places like Popular Science, the New York Times, Scientific American, Vice, Outside, and others.], 5-27-2015, "Dust from asteroid mining spells danger for satellites," New Scientist, <https://www.newscientist.com/article/mg22630235-100-dust-from-asteroid-mining-spells-danger-for-satellites/> DD AG

IF THE gold mine is too far from home, why not move it nearby? It sounds like a fantasy, but would-be miners are already dreaming up ways to drag resource-rich space rocks closer to home. Trouble is, that could threaten the web of satellites around Earth.

Asteroids are not only stepping stones for cosmic colonisation, but may contain metals like gold, platinum, iron and titanium, plus life-sustaining hydrogen and oxygen, and rocket-fuelling ammonia. Space age forty-niners can either try to work an asteroid where it is, or tug it into a more convenient orbit.

NASA chose the second option for its Asteroid Redirect Mission, which aims to pluck a boulder from an asteroid’s surface and relocate it to a stable orbit around the moon. But an asteroid’s gravity is so weak that it’s not hard for surface particles to escape into space. Now a new model warns that debris shed by such transplanted rocks could intrude where many defence and communication satellites live – in geosynchronous orbit.

According to Casey Handmer of the California Institute of Technology in Pasadena and Javier Roa of the Technical University of Madrid in Spain, 5 per cent of the escaped debris will end up in regions traversed by satellites. Over 10 years, it would cross geosynchronous orbit 63 times on average. A satellite in the wrong spot at the wrong time will suffer a damaging high-speed collision with that dust.

The study also looks at the “catastrophic disruption” of an asteroid 5 metres across or bigger. Its total break-up into a pile of rubble would increase the risk to satellites by more than 30 per cent (arxiv.org/abs/1505.03800).

That may not have immediate consequences. But as Earth orbits get more crowded with spent rocket stages and satellites, we will have to worry about cascades of collisions like the one depicted in the movie Gravity.

#### Laundry list of impacts – compromised communication, loss of military capability and more

Divorsky 15 George Divorsky [George P. Dvorsky (born May 11, 1970) is a Canadian bioethicist, transhumanist and futurist. He is a contributing editor at io9[1] and producer of the Sentient Developments blog and podcast. He was Chair of the Board for the Institute for Ethics and Emerging Technologies (IEET)[2][3] and is the founder and chair of the IEET's Rights of Non-Human Persons Program], 6-4-2015, "What Would Happen If All Our Satellites Were Suddenly Destroyed?," Gizmodo <https://gizmodo.com/what-would-happen-if-all-our-satellites-were-suddenly-d-1709006681> DD AG

Given these grim prospects, it’s fair to ask what might happen to our civilization if any of these things happened. At the risk of gross understatement, the complete loss of our satellite fleet would instigate a tremendous disruption to our current mode of technological existence—disruptions that would be experienced in the short, medium, and long term, and across multiple domains.

Compromised Communications

Almost immediately we’d notice a dramatic reduction in our ability to communicate, share information, and conduct transactions.

“If our communications satellites are lost, then bandwidth is also lost,” Jonathan McDowell tells io9. He’s an astrophysicists and Chandra Observatory scientist who works out of the Harvard-Smithsonian Center for Astrophysics.

McDowell says that, with telecommunication satellites wiped out, the burden of telecommunications would fall upon undersea cables and ground-based communication systems. But while many forms of communication would disappear in an instant, others would remain.

All international calls and data traffic would have to be re-routed, placing tremendous pressure on terrestrial and undersea lines. Oversaturation would stretch the capacity of these systems to the limit, preventing many calls from going through. Hundreds of millions of Internet connections would vanish, or be severely overloaded. A similar number of cell phones would be rendered useless. In remote areas, people dependent on satellite for television, Internet, and radio would practically lose all service.

“Indeed, a lot of television would suddenly disappear,” says McDowell. “A sizable portion of TV comes from cable whose companies relay programming from satellites to their hubs.”

It’s important to note that we actually have a precedent for a dramatic—albeit brief —disruption in com-sat capability. Back in 1998, there was a day in which a single satellite failed and all the world’s pagers stopped working.

The sudden loss of satellite capability would have a profound effect on the military.

The Marshall Institute puts it this way: “Space is a critical enabler to all U.S. warfare domains,” including intelligence, navigation, communications, weather prediction, and warfare. McDowell describes satellite capability as as the “backbone” of the U.S. military.

And as 21st century warfare expert Peter W. Singer from New America Foundation tells io9, “He who controls the heavens will control what happens in the battles of Earth.” Singer summarized the military consequences of losing satellites in an email to us:

Moreover, and as McDowell explains to io9, the loss of satellite capability would have a profound effect on arms control capabilities. Space systems can monitor compliance; without them, we’d be running blind.

“The overarching consideration is that you wouldn’t really know what’s going on,” says McDowell. “Satellites provide for both global and local views of what’s happening. We would be less connected, less informed—and with considerably degraded situational awareness.”

One great thing satellites have done for us is improve our ability to forecast weather. Predicting a slight chance of cloudiness is all well and good, but some areas, like India, Pakistan, and Bangladesh, are dependent on such systems to predict potentially hazardous monsoons. And in the U.S., the NOAA has estimated that, during a typical hurricane season, weather satellites save as much as $3 billion in lives and property damage.

There’s also the effect on science to consider. Much of what we know about climate change comes from satellites.

As McDowell explains, the first couple of weeks without satellites wouldn’t make much of a difference. But over a ten-year span, the lack of satellites would preclude our ability to understand and monitor such things as the ozone layer, carbon dioxide levels, and the distribution of polar ice. Ground-based and balloon-driven systems would help, but much of the data we’re currently tracking would suddenly become much spottier.

#### Cascades and increases the effect exponentially+ increases the chance of war

Orwig 16 [(Jessica, MS in science and tech journalism from Texas A&M, BS in astronomy and physics from Ohio State) “Russia says a growing problem in space could be enough to spark a war,” Insider,’ January 26, 2016, <https://www.businessinsider.com/russia-says-space-junk-could-spark-war-2016-1>] [pT]

NASA has already warned that the large amount of space junk around our planet is growing beyond our control, but now a team of Russian scientists has cited another potentially unforeseen consequence of that debris: War.

Scientists estimate that anywhere from 500,000 to 600,000 pieces of human-made space debris between 0.4 and 4 inches in size are currently orbiting the Earth and traveling at speeds over 17,000 miles per hour.

If one of those pieces smashed into a military satellite it "may provoke political or even armed conflict between space-faring nations," Vitaly Adushkin, a researcher for the Institute of Geosphere Dynamics at the Russian Academy of Sciences, reported in a paper set to be published in the peer-reviewed journal Acta Astronautica, which is sponsored by the International Academy of Astronautics.

Say, for example, that a satellite was destroyed or significantly damaged in orbit — something that a 4-inch hunk of space junk could easily do traveling at speeds of 17,500 miles per hour, Adushkin reported. (Even smaller pieces no bigger than size of a pea could cause enough damage to the satellite that it would no longer operate correctly, he notes.)

It would be difficult for anyone to determine whether the event was accidental or deliberate.

This lack of immediate proof could lead to false accusations, heated arguments and, eventually, war, according to Adushkin and his colleagues.

A politically dangerous dilemma

In the report, the Adushkin said that there have already been repeated "sudden failures" of military spacecraft in the last two decades that cannot be explained.

"So, there are two possible explanations," he wrote. The first is "unregistered collisions with space objects." The second is "machinations" [deliberate action] of the space adversary.

"This is a politically dangerous dilemma," he added.

But these mysterious failures in the past aren't what concerns Adushkin most.

It's a future threat of what experts call the cascade effect that has Adushkin and other scientists around the world extremely concerned.

The Kessler Syndrome

In 1978, American astrophysicist Donald Kessler predicted that the amount of space debris around Earth would begin to grow exponentially after the turn of the millennium.

Kessler 's predictions rely on the fact that over time, space junk accumulates. We leave most of our defunct satellites in space, and when meteors and other man-made space debris slam into them, you get a cascade of debris.

The cascade effect — also known as the Kessler Syndrome — refers to a critical point wherein the density of space junk grows so large that a single collision could set off a domino effect of increasingly more collisions.

For Kessler, this is a problem because it would "create small debris faster than it can be removed," Kessler said last year. And this cloud of junk could eventually make missions to space too dangerous.

For Adushkin, this would exacerbate the issue of identifying what, or who, could be behind broken satellites.

The future

So far, the US and Russian Space Surveillance Systems have catalogued 170,000 pieces of large space debris (between 4 and 8 inches wide) and are currently tracking them to prevent anymore dilemmas like the ones Adushkin and his colleagues cite in their paper.

But it's not just the large objects that concern Adushkin, who reported that even small objects (less than 1/3 of an inch) could damage satellites to the point they can't function properly.

Using mathematical models, Adushkin and his colleagues calculated what the situtation will be like in 200 years if we continue to leave satellites in space and make no effort to clean up the mess. They estimate we'll have:

1.5 times more fragments greater than 8 inches across

3.2 times more fragments between 4 and 8 inches across

13-20 times more smaller-sized fragments less than 4 inches across

"The number of small-size, non-catalogued objects will grow exponentially in mutual collisions," the researchers reported.

#### Debris makes space unusable

Garcia-Navarro 20, Lulu Garcia-Navarro, 9-27-2020, "Space Debris Buildup Could Threaten Satellites, Space Travel," NPR.org, <https://www.npr.org/2020/09/27/917424830/space-debris-buildup-could-threaten-satellites-space-travel> Livingston RB

This past week, the International Space Station almost came into contact with space junk. That's the third time a near-collision has happened this year, and it's something scientists say will get worse if nothing is done to clean up space debris. The trash that circles our planet is from the last 63 years of space travel - broken bits of satellite and other items flying up to 18,000 miles per hour, often colliding and breaking apart into smaller pieces that themselves zoom and collide. And it could all lead to something called Kessler syndrome, where so many objects hit one another, creating so much debris that space becomes unusable. Raffi Khatchadourian wrote about space debris for this week's New Yorker, and he joins us now. Welcome. RAFFI KHATCHADOURIAN: Thank you. It's very nice to be here. GARCIA-NAVARRO: Your piece begins with another story of a near-collision with the ISS a few years ago. What happened then? KHATCHADOURIAN: Yeah. So that was back in 2015, and an object was projected to hit the ISS at 31,000 miles an hour. And it was detected within four hours, and that gave the ground control and the crew on the ISS very little time to deal with that. The incident that you mentioned that happened last week - they had time to move the ISS out of the way. And in this instance, they didn't. And so what they had to do was effectively hunker down in a Soyuz capsule, which was like kind of like a lifeboat, and cross their fingers and hope that it missed. GARCIA-NAVARRO: Which is terrifying. I mean, how many objects are up there flying around, and how big are they? KHATCHADOURIAN: So almost an uncountable number of objects. It's estimated that there are 8,000 metric tons of sort of human-engineered mass zooming around the planet. About 26,000 of those are of a size that the U.S. military can track, so 10 centimeters or larger. But when you get below the size of 10 centimeters, then you end up with, you know, something like a hundred million pieces that are the size of a millimeter or even a hundred trillion, the size of a micron. At the speeds we're talking about, something the size of a grain of sand can destroy an entire spacecraft.

### Contention 2 is the ozone

#### Ozone is improving in the status quo

**UN 19**, United Nations Report, 9-16-2019, "Ozone on track to heal completely in our lifetime, UN environment agency declares on World Day.," UN News, <https://news.un.org/en/story/2019/09/1046452> Livingston RB

The phaseout of controlled uses of ozone-depleting substances has not only helped replenish the protective layer for future generations but is also helping guard human health by filtering harmful rays from reaching Earth, said [UNEP](https://www.unep.org/) shared in a[statement](https://ozone.unep.org/ozone-day/32-years-and-healing). The recognition of this success comes on [World Ozone Day,](https://www.un.org/en/events/ozoneday/) marked 16 September. This year celebrates “32 Years and Healing”; a commemoration of the international commitment to protect the ozone later and the climate under the historic [Montreal Protocol](https://ozone.unep.org/sites/default/files/2019-08/MP_Handbook_2019_0.pdf), which has led to the phase-out of 99 per cent of ozone-depleting chemicals in refrigerators, air-conditioners and other consumer products. **Since 2000**, parts of **the ozone** layer **have recovered at a rate of 1-3 per cent** every ten years, the latest [Scientific Assessment of Ozone Depletion](https://www.esrl.noaa.gov/csd/assessments/ozone/2018/)estimates. At projected rates the “**Northern Hemisphere and mid-latitude ozone will heal completely by the 2030’s**”, UNEP said, with the Southern Hemisphere repaired by the 2050’s, and Polar Regions in the following decade. UN Secretary-General, António Guterres [said](https://www.unenvironment.org/news-and-stories/statement/secretary-generals-message-world-ozone-day-2019) “**we must be careful not to neglect the ozone layer**,” as we “rightly focus our energies on tackling climate change”, spotlighting the importance of preventing threats posed by emission of ozone-depleting gases**. Regenerating the ozone has helped curb the effects of climate change** - with approximately 135 billion tonnes of carbon dioxide emissions from 1990 to 2010 averted by a strong protective shield.

#### Even getting into space harms the environment by punching holes in the ozone

**Mortillaro 21**, Nicole Mortillaro · Cbc News · Posted, 4-22-2021, "Rocket launches could be affecting our ozone layer, say experts," CBC, <https://www.cbc.ca/news/science/rocket-launches-environment-1.5995252> Livingston RB

Rocket launches are a breathtaking culmination of human ingenuity as they propel us into the future, but there is a growing concern that not enough research has been done on their effect on the environment. While some may be worried about potential greenhouse gas emissions that's not the main issue. Instead, **it's ozone depletion and the potential effects in our upper atmosphere,** specifically the stratosphere, **along with concerns about toxic fuels.** **The problem has flown under the radar**, according to Martin Ross, an atmospheric scientist at The Aerospace Corporation, **because people still think of rocket launches as rare**.  But it's time to face the fact that we may be entering a boom era, he said. "One of the arguments that people have used in the past was to say that we don't really need to pay attention to rockets or to the space industry, or the space industry is small, and it's always going to be small," Ross said.  "But I think the developments that we're seeing the past few years show that … space is entering this very rapid growth phase like aviation saw in the '20s and '30s." The stratosphere is an important weather driver for Earth's systems, and that's where some particles from rocket launches are ending up. **The ozone layer, which helps protect us from the sun's** harmful ultraviolet **rays**, is also located in the stratosphere. In 1990, the [Montreal Protocol was signed into law](https://ozone.unep.org/treaties/montreal-protocol), banning harmful ozone-depleting substances, such as chlorofluorocarbons (CFCs), used in things like refrigerators and air conditioners, after it was revealed that the ozone layer was being stripped away by these chemicals. While the protocol touched on airlines, there was no mention of the aerospace industry. But now some industry experts are concerned that with no oversight, we could be in for a problem**. There are different types of rocket propellants**. Some, like liquid oxygen and liquid hydrogen, produce mainly water vapour and have little environmental impact. These were used in past shuttle launches and even in the Apollo-era Saturn V vehicles.  Then there are those that produce alumina particles in the stratosphere, such as those in solid rocket boosters, which were also used in past shuttle launches, and are still being used today by some launch companies. Finally, **there are those that deposit black soot in the stratosphere, such as kerosene used in SpaceX's Falcon** 9 and Russia's Soyuz rockets. **It's the alumina and black soot that is most concerning to experts.** "The atmosphere is complex," said Jessica Dallas, a PhD candidate at the Australian Centre for Space Engineering Research, in New South Wales. "We don't have a complete understanding of atmospheric circulation and how all of the mechanisms in the atmosphere actually work. And so that means that we also don't have a good idea of what happens when we're injecting these particles into the stratosphere."

#### Ozone is key to human survival

**European Commission ND**, “Protection of the ozone layer” European Commission Official Website, <https://ec.europa.eu/clima/eu-action/protection-ozone-layer_en> Livingston RB

**World governments agreed** in the late 1980s **to protect th**e Earth’s **ozone** layer by phasing out ozone-depleting substances emitted by human activities, **under the Montreal Protocol**. In Europe, the Protocol is implemented through EU-wide legislation that not only meets its objectives but also contains stricter, more ambitious measures. Global action taken under the Montreal Protocol has halted the depletion of the ozone layer and allowed it to start recovering, but much remains to be done to ensure a steady recovery. **The ozone layer** is a natural layer of gas in the upper atmosphere that **protects humans and other living things from harmful ultraviolet (UV) radiation from the sun**. Although ozone is present in small concentrations throughout the atmosphere, most (around 90%) exists in the stratosphere, a layer 10 to 50 kilometres above the Earth’s surface. **The ozone** layer filters out most of the sun's harmful UV radiation and **is therefore crucial to life on Earth**. Scientists discovered in the 1970s that the ozone layer was being depleted. Atmospheric concentrations of ozone vary naturally depending on temperature, weather, latitude and altitude, while substances ejected by natural events such as volcanic eruptions can also affect ozone levels. However, these natural phenomena could not explain the levels of depletion observed and scientific evidence revealed that certain man-made chemicals were the cause. These ozone-depleting substances were mostly introduced in the 1970s in a wide range of industrial and consumer applications, mainly refrigerators, air conditioners and fire extinguishers.

### Contention 3 is developing countries

#### Outer space houses tons of valuable resources, it’s about who can get there first

**Blair 15**, Brad Blair, Expert in commercial space law, Winter 2015, "Space Mineral Resources," National Space Society - Working to Create a Spacefaring Civilization, <https://space.nss.org/space-mineral-resources/> Livingston RB

**A recently released study** by the International Academy of Astronautics (IAA) **found that space mineral resources** (SMR) **can serve as an economic gamechang**er, **opening a vast new source of wealth to benefit humanity**. The study examined technical, economic, legal, and policy-related requirements to enable SMR, and offered specific recommendations to international space agencies and commercial enterprise for moving humanity forward into a new era of space settlement and commercial resource development. The study was assembled by two prominent space lawyers. Art Dula is a professor of law at the Houston Law School, trustee of the Heinlein Prize Trust, and founder of Excalibur Exploration Limited. Zhang Zhenjun is secretary general of the China Institute of Space Law, a resident director of the Chinese Society of Astronautics, and holds an MBA from George Washington University. The work solicited and included extensive input by entrepreneurial startup companies including Deep Space Industries, Shackleton Energy Company, Planetary Resources, Excalibur Exploration, Moon Express, and Tethers Unlimited. Study findings on SMR technology and engineering design are that **mining asteroids and lunar regolith is within reach of the current state of the technical art.** The extrapolation of Earth-based mining appears to be a one-for-one trade with alterations due to vacuum, low gravity, and temperature, with bench and lab-scale testing to date in private and government labs on Earth affirming this conclusion. Indeed, the primary roadblocks to SMR today are more intimately related to reducing market, legal, and financial risk. A focus on customers, demographics, and increasing market certainty is needed to create a solid foundation for the future of space enterprise. The study found that the cost to develop Moon or asteroid water sources could become significantly lower than the delivery price from Earth, especially as distance increases, making space water a potential basis for future currency. Indeed, establishing spaceports and selling water mined in space is a key to unlocking a robust and sustainable space economy, enabling human expansion into the Solar System.

#### The ability to appropriate space keeps developing nations out of these valuable resources- it’s already happened with satellites

**Giacomin 19**, Nicolas Giacomin, author on space, 12-4-2019, "The Bogotá Declaration and space law," Space Legal Issues, <https://www.spacelegalissues.com/the-bogota-declaration-and-space-law/> Livingston RB

The practice of developed states **is based** on free access and priority given to the first **satellites** placed in the geostationary orbit. The placing into orbit of satellites is in accordance with the 1967 Outer Space Treaty. These satellites have the right to pursue a trajectory without interference from satellites later placed in orbit. In addition, the international regulation of the radio spectrum has favored the development of satellite telecommunications systems. Increasing congestion of the orbit and frequencies may **limit the access and opportunities of developing countries in the future**. **It will become more and more difficult** to use frequencies from the geostationary orbit under satisfactory conditions (without creating or suffering radio interference, or without incurring additional costs). Common law regime for the use of frequencies traditionally protects the first users against such interference. In this situation, new entrants must design their space telecommunication systems taking into account both the trajectory and the frequencies used by the satellites in place. Unlike the regime of orbit and outer space in general, for more than half a century, there has already been an institutionalized mechanism for access to radio frequencies. This mechanism makes it possible to coordinate the use of frequencies and thereby, prevents harmful interference between radio stations under the jurisdiction of different states. In order to avoid anarchy in this area, ITU distributes radio waves between recognized radio services. Thus, the frequencies used by the various services at the international level are determined in advance before the establishment of telecommunications stations. Any state wishing to establish a station and allocate a frequency band, must comply with the service allocation deriving from international regulations. While inter-service distribution is pre-established, the distribution among states within a given service is traditionally done according to their order of arrival: the first to notify the use of a frequency band by a station under its jurisdiction acquires a right of priority at the international level. Frequency assignments by states must be registered with the ITU. Within the latter, the International Frequency Registration Board examines the compliance of these assignments with the regulations in force and the possibility of interference with other stations already in operation. In case of conflict between an existing user registered before the International Frequency Registration Board and a newcomer, preference is given to the first one; this is sometimes described as **“first come, first served”**. Some **developing countries have argued that** the utilization of geostationary **orbit by developed countries is contrary to the 1967 Outer Space Treaty** and, in particular, to the principle of non-appropriation. For a variety of reasons, **this challenge to current practice does not really addresses the problem** of orbital saturation. First, the 1967 Outer Space Treaty and the prohibition of appropriation do not limit the use of orbital space. In addition, this instrument appears unable to provide a solution to the problem of saturation of the orbit, because it is primarily due to exogenous constraints related to the use of radio frequencies. Access to the frequency spectrum depends on International Telecommunications Law and not on space law.

#### This locks in existing global structural violence by perpetuating inequality into space

**Reinstein 99**, Ezra J. Reinstein, Owning Outer Space, 20 Nw. J. Int'l L. & Bus. 59 (1999-2000) <https://scholarlycommons.law.northwestern.edu/cgi/viewcontent.cgi?referer=&httpsredir=1&article=1500&context=njilb> Livingston RB

The rights of less-developed nations create a concern that is both political and moral in character. As a matter of political reality, the less developed nations wield considerable power, due in no small part to majority voting systems in the major international regulatory bodies. Some feel, and developing nations argue, that **it is morally imperative to take the interests of the non-space-capable nations into account when designing a system of space property law.** A regime based on **the "right of grab,"** the first-come, first-served theory of property acquisition**, should be feared**. **By the time space-incapable nations develop the** technological **prowess and capital** reserves **to fund** meaningful **development of** outer **space, the earlier** space-faring **nations,** left unchecked, might already **have locked up the** most accessible and valuable **resources. Present inequities of global wealth distribution** thus **would be carried forward into** the **space** age. 38

#### Global Inequality has severe impacts for all- Kills innovation, education, etc.

**Doucouliagos 17** Chris Doucouliagos, Professor of Economics, Department of Economics, Deakin Business School and Alfred Deakin Institute for Citizenship and Globalisation, Deakin University 8-6-2017, "Don't listen to the rich: inequality is bad for everyone," Conversation, <https://theconversation.com/dont-listen-to-the-rich-inequality-is-bad-for-everyone-81952> Livingston RB

A world where a few people have most of the wealth [motivates others](https://www.economist.com/blogs/economist-explains/2015/06/economist-explains-11) who are poor to strive to earn more. And when they do, they’ll [invest](http://www.jstor.org/stable/2296292?origin=JSTOR-pdf&seq=1#fndtn-page_scan_tab_contents) in businesses and other areas of the economy. That’s the argument for inequality. But it’s wrong. [**Our study**](http://business.monash.edu/__data/assets/pdf_file/0017/455111/1816inequalitymadsenislamdoucouliagos-002.pdf)**of 21 OECD countries over more than a 100 years shows income inequality actually** **restricts** people from **earning** more, **educating** themselves **and** becoming **entrepreneurs**. That flows on to businesses who in turn invest less in things like plant and equipment**. Inequality makes it harder for economies to benefit from innovation.** However, if people have access to credit or the money to move up, it can offset this effect. We measured the impact of this by looking at the number of patents for new inventions and then also looking at the Gini coefficient and the income share of the top 10%. The Gini coefficient is a measure of the distribution of income or wealth within a nation. Don’t let yourself be misled. Understand issues with help from experts. How inequality reduces innovation From 1870 to 1977, inequality measured by the Gini coefficient fell by about 40%. During this time people actually got more innovative and productivity increased, incomes also increased. **But inequality has increased in recent decades and it’s** having the opposite effect Inequality is **preventing pe**ople [with less income and wealth](https://www.jstor.org/stable/2297811?seq=1#page_scan_tab_contents) **from reaching their potential in terms of education and invention**. There’s also less [entrepreneurship](http://www.journals.uchicago.edu/doi/abs/10.1086/261876). Inequality also means **the market for new goods shrinks.** [One study](https://link.springer.com/article/10.1023/A:1009889321237) shows that if incomes are more equal among people, people who are less well off, buy more. Having this larger market for new products, incentivises companies to create new things to sell. If wealth is concentrated among only a small group of people, [it actually increases](https://www.jstor.org/stable/2937810?seq=1#page_scan_tab_contents) demand for imported luxuries and handmade products. In contrast to this, distributed incomes means more mass produced goods are manufactured. What’s been driving inequality since the 1980s is changes to economies - countries trading more with each other and advances in technology. As this happens old products and industries fade while new ones take their place. These changes have delivered significant [net benefits](http://www.pc.gov.au/research/completed/rising-protectionism/rising-protectionism.pdf) to society. **Reducing trade and innovation will only make everyone poorer.**