## NC

### FW

**My value is morality. LD is a debate about morals- all arguments collapse to what is moral or not.**

**The standard is maximizing expected wellbeing**

**First, pleasure and pain are intrinsically valuable. People consistently regard pleasure and pain as good reasons for action, despite the fact that pleasure doesn’t seem to be instrumentally valuable for anything.**

**Moen 16** [Ole Martin Moen, Research Fellow in Philosophy at University of Oslo “An Argument for Hedonism” Journal of Value Inquiry (Springer), 50 (2) 2016: 267–281] SJDI

Let us start by observing, empirically, that a widely shared judgment about intrinsic value and disvalue is that pleasure is intrinsically valuable and pain is intrinsically disvaluable. On virtually any proposed list of intrinsic values and disvalues (we will look at some of them below), pleasure is included among the intrinsic values and pain among the intrinsic disvalues**.** This inclusion makes intuitive sense, moreover, for there is something undeniably good about the way pleasure feels and something undeniably bad about the way pain feels, and neither the goodness of pleasure nor the badness of pain seems to be exhausted by the further effects that these experiences might have. “Pleasure” and “pain” are here understood inclusively, as encompassing anything hedonically positive and anything hedonically negative.2 The special value statuses of pleasure and pain are manifested in how we treat these experiences in our everyday reasoning about values**.** If you tell me that you are heading for the convenience store, I might ask: “What for?” This is a reasonable question, for when you go to the convenience store you usually do so, not merely for the sake of going to the convenience store, but for the sake of achieving something further that you deem to be valuable**.** You might answer, for example: “To buy soda.” This answer makes sense, for soda is a nice thing and you can get it at the convenience store. I might further inquire, however: “What is buying the soda good for?” This further question can also be a reasonable one, for it need not be obvious why you want the soda. You might answer: “Well, I want it for the pleasure of drinking it.” If I then proceed by asking “But what is the pleasure of drinking the soda good for?” the discussion is likely to reach an awkward end. The reason is that the pleasure is not good for anything further; it is simply that for which going to the convenience store and buying the soda is good.3 As Aristotle observes**:** “We never ask [a man] what his end is in being pleased, because we assume that pleasure is choice worthy in itself.”4 Presumably, a similar story can be told in the case of pains, for if someone says “This is painful!” we never respond by asking: “And why is that a problem?” We take for granted that if something is painful, we have a sufficient explanation of why it is bad. If we are onto something in our everyday reasoning about values, it seems that pleasure and pain are both places where we reach the end of the line in matters of value.

**Moreover, *only* pleasure and pain are intrinsically valuable. All other values can be explained with reference to pleasure; Occam’s razor requires us to treat these as instrumentally valuable.**

**Moen 16** [Ole Martin Moen, Research Fellow in Philosophy at University of Oslo “An Argument for Hedonism” Journal of Value Inquiry (Springer), 50 (2) 2016: 267–281] SJDI

I think several things should be said in response to Moore’s challenge to hedonists. First, **I do not think the burden of proof lies on hedonists to explain why the additional values are not intrinsic values. If someone claims that X is intrinsically valuable, this is a substantive, positive claim, and it lies on him or her to explain why we should believe that X is in fact intrinsically valuable.** Possibly, this could be done through thought experiments analogous to those employed in the previous section. Second, **there is something peculiar about the list of additional intrinsic values** that counts in hedonism’s favor**: the listed values have a strong tendency to be well explained as things that help promote pleasure and avert pain.** To go through Frankena’s list, life and consciousness are necessary presuppositions for pleasure; activity, health, and strength bring about pleasure; and happiness, beatitude, and contentment are regarded by Frankena himself as “pleasures and satisfactions.” The same is arguably true of beauty, harmony, and “proportion in objects contemplated,” and also of affection, friendship, harmony, and proportion in life, experiences of achievement, adventure and novelty, self-expression, good reputation, honor and esteem. Other things on Frankena’s list, such as understanding, **wisdom, freedom, peace, and security, although they are perhaps not themselves pleasurable, are important means to achieve a happy life, and as such, they are things that hedonists would value highly.** **Morally good dispositions and virtues, cooperation, and just distribution of goods and evils, moreover, are things that, on a collective level, contribute a happy society, and thus the traits that would be promoted and cultivated if this were something sought after.** To a very large extent, the intrinsic values suggested by pluralists tend to be hedonic instrumental values. Indeed, pluralists’ suggested intrinsic values all point toward pleasure, for while the other values are reasonably explainable as a means toward pleasure, pleasure itself is not reasonably explainable as a means toward the other values. Some have noticed this. Moore himself, for example, writes that though his pluralistic theory of intrinsic value is opposed to hedonism, its application would, in practice, look very much like hedonism’s: “Hedonists,” he writes “do, in general, recommend a course of conduct which is very similar to that which I should recommend.”24 Ross writes that “[i]t is quite certain that by promoting virtue and knowledge we shall inevitably produce much more pleasant consciousness. These are, by general agreement, among the surest sources of happiness for their possessors.”25 Roger Crisp observes that “those goods cited by non-hedonists are goods we often, indeed usually, enjoy.”26 What Moore and Ross do not seem to notice is that their observations give rise to two reasons to reject pluralism and endorse hedonism. The first reason is that if **the suggested non-hedonic intrinsic values are potentially explainable by appeal to just pleasure and pain** (which, following my argument in the previous chapter, we should accept as intrinsically valuable and disvaluable), **then—by appeal to Occam’s razor—we have at least a pro tanto reason to resist the introduction of any further intrinsic values and disvalues. It is ontologically more costly to posit a plurality of intrinsic values and disvalues, so in case all values admit of explanation by reference to a single intrinsic value and a single intrinsic disvalue, we have reason to reject more complicated accounts.** **The fact that suggested non-hedonic intrinsic values tend to be hedonistic instrumental values does not, however, count in favor of hedonism solely in virtue of being most elegantly explained by hedonism; it also does so in virtue of creating an explanatory challenge for pluralists.** The challenge can be phrased as the following question: **If the non-hedonic values suggested by pluralists are truly intrinsic values in their own right, then why do they tend to point toward pleasure and away from pain?**27

**Moral uncertainty means preventing extinction should be our highest priority.  
Bostrom 12** [Nick Bostrom. Faculty of Philosophy & Oxford Martin School University of Oxford. “Existential Risk Prevention as Global Priority.” Global Policy (2012)]  
These reflections on **moral uncertainty suggest** an alternative, complementary way of looking at existential risk; they also suggest a new way of thinking about the ideal of sustainability. Let me elaborate.¶ **Our present understanding of axiology might** well **be confused. We may not** nowknow — at least not in concrete detail — what outcomes would count as a big win for humanity; we might not even yet **be able to imagine the best ends** of our journey. **If we are** indeedprofoundly **uncertain** about our ultimate aims,then we should recognize that **there is a great** option **value in preserving** — and ideally improving — **our ability to recognize value and** to **steer the future accordingly. Ensuring** that **there will be a future** version of **humanity** with great powers and a propensity to use them wisely **is** plausibly **the best way** available to us **to increase the probability that the future will contain** a lot of **value.** To do this, we must prevent any existential catastrophe.

**Reducing the risk of extinction is always priority number one.   
Bostrom 12** [Faculty of Philosophy and Oxford Martin School, University of Oxford.], Existential Risk Prevention as Global Priority.  Forthcoming book (Global Policy). MP. http://www.existenti...org/concept.pdfEven if we use the most conservative of these estimates, which entirely ignores the   possibility of space colonization and software minds, **we find that the expected loss of an existential   catastrophe is greater than the value of 10^16 human lives**.  **This implies that the expected value of   reducing existential risk by a mere one millionth of one percentage point is at least a hundred times the   value of a million human lives.**  The more technologically comprehensive estimate of 10  54 humanbrain-emulation subjective life-years (or 10  52  lives of ordinary length) makes the same point even   more starkly.  Even if we give this allegedly lower bound on the cumulative output potential of a   technologically mature civilization a mere 1% chance of being correct, we find that the expected   value of reducing existential risk by a mere one billionth of one billionth of one percentage point is worth   a hundred billion times as much as a billion human lives. **One might consequently argue that even the tiniest reduction of existential risk has an   expected value greater than that of the definite provision of any ordinary good, such as the direct   benefit of saving 1 billion lives.**  And, further, that the absolute value of the indirect effect of saving 1  billion lives on the total cumulative amount of existential riskâ€”positive or negativeâ€”is almost   certainly larger than the positive value of the direct benefit of such an action.

#### Extinction first –

#### 1 – Forecloses future improvement – we can never improve society because our impact is irreversible

#### 2 – Turns suffering – mass death causes suffering because people can’t get access to resources and basic necessities

#### 3 – Moral obligation – allowing people to die is unethical and should be prevented because it creates ethics towards other people

#### 4 – Objectivity – body count is the most objective way to calculate impacts because comparing suffering is unethical

#### 5 – Moral uncertainty – if we’re unsure about which interpretation of the world is true – we ought to preserve the world to keep debating about it

### Xi Lashout

#### Xi’s regime is stable now, but its success depends on strong growth and private sector development.

**Mitter and Johnson 21** [Rana Mitter and Elsbeth Johnson, [Rana Mitter](https://hbr.org/search?term=rana%20mitter&search_type=search-all) is a professor of the history and politics of modern China at Oxford. [Elsbeth Johnson](https://hbr.org/search?term=elsbeth%20johnson&search_type=search-all), formerly the strategy director for Prudential PLC’s Asian business, is a senior lecturer at MIT’s Sloan School of Management and the founder of SystemShift, a consulting firm. May-June 2021, "What the West Gets Wrong About China," Harvard Business Review, [https://hbr.org/2021/05/what-the-west-gets-wrong-about-china accessed 12/14/21](https://hbr.org/2021/05/what-the-west-gets-wrong-about-china%20accessed%2012/14/21)] Adam

In China, however, growth has come in the context of stable communist rule, suggesting that democracy and growth are not inevitably mutually dependent. In fact, many Chinese believe that the country’s recent economic achievements—large-scale poverty reduction, huge infrastructure investment, and development as a world-class tech innovator—have come about because of, not despite, China’s authoritarian form of government. Its aggressive handling of Covid-19—in sharp contrast to that of many Western countries with higher death rates and later, less-stringent lockdowns—has, if anything, reinforced that view.

China has also defied predictions that its authoritarianism would inhibit its capacity to [innovate](https://hbr.org/2011/06/what-the-west-doesnt-get-about-china). It is a global leader in AI, biotech, and space exploration. Some of its technological successes have been driven by market forces: People wanted to buy goods or communicate more easily, and the likes of Alibaba and Tencent have helped them do just that. But much of the technological progress has come from a highly innovative and well-funded military that has invested heavily in China’s burgeoning new industries. This, of course, mirrors the role of U.S. defense and intelligence spending in the development of Silicon Valley. But in China the consumer applications have come faster, making more obvious the link between government investment and products and services that benefit individuals. That’s why ordinary Chinese people see Chinese companies such as Alibaba, Huawei, and TikTok as sources of national pride—international vanguards of Chinese success—rather than simply sources of jobs or GDP, as they might be viewed in the West.

Thus July 2020 polling data from the Ash Center at Harvard’s Kennedy School of Government revealed 95% satisfaction with the Beijing government among Chinese citizens. Our own experiences on the ground in China confirm this. Most ordinary people we meet don’t feel that the authoritarian state is solely oppressive, although it can be that; for them it also provides opportunity. A cleaner in Chongqing now owns several apartments because the CCP reformed property laws. A Shanghai journalist is paid by her state-controlled magazine to fly around the world for stories on global lifestyle trends. A young student in Nanjing can study propulsion physics at Beijing’s Tsinghua University thanks to social mobility and the party’s significant investment in scientific research.

#### Xi has committed to the commercial space industry as the linchpin of China’s rise – the plan is seen as a complete 180

**Patel 21** [Neel V. Patel, Neel is a space reporter for MIT Technology Review. 1-21-2021, "China’s surging private space industry is out to challenge the US," MIT Technology Review, <https://www.technologyreview.com/2021/01/21/1016513/china-private-commercial-space-industry-dominance/> accessed 12/14/21] Adam

Until recently, China’s space activity has been overwhelmingly dominated by two state-owned enterprises: the China Aerospace Science & Industry Corporation Limited (CASIC) and the China Aerospace Science and Technology Corporation (CASC). A few private space firms have been allowed to operate in the country for a while: for example, there’s the China Great Wall Industry Corporation Limited (in reality a subsidiary of CASC), which has provided commercial launches since it was established in 1980. But for the most part, China’s commercial space industry has been nonexistent. Satellites were expensive to build and launch, and they were too heavy and large for anything but the biggest rockets to actually deliver to orbit. The costs involved were too much for anything but national budgets to handle.

That all changed this past decade as the costs of making satellites and launching rockets plunged. In 2014, a year after Xi Jinping took over as the new leader of China, the Chinese government decided to treat civil space development as a key area of innovation, as it had already begun doing with AI and solar power. It issued a policy directive called [Document 60](https://archive.md/o/bc9l4/www.cpppc.org/en/zy/994006.jhtml) that year to enable large private investment in companies interested in participating in the space industry.

“Xi’s goal was that if China has to become a critical player in technology, including in civil space and aerospace, it was critical to develop a space ecosystem that includes the private sector,” says Namrata Goswami, a geopolitics expert based in Montgomery, Alabama, who’s been studying China’s space program for many years. “He was taking a cue from the American private sector to encourage innovation from a talent pool that extended beyond state-funded organizations.”

As a result, there are now 78 commercial space companies operating in China, according to a[2019 report by the Institute for Defense Analyses](https://archive.md/o/bc9l4/https:/www.ida.org/-/media/feature/publications/e/ev/evaluation-of-chinas-commercial-space-sector/d-10873.ashx). More than half have been founded since 2014, and the vast majority focus on satellite manufacturing and launch services.

For example, Galactic Energy, founded in February 2018, is building its Ceres rocket to offer rapid launch service for single payloads, while its Pallas rocket is being built to deploy entire constellations. Rival company i-Space, formed in 2016, became the first commercial Chinese company to make it to space with its Hyperbola-1 in July 2019. It wants to pursue reusable first-stage boosters that can land vertically, like those from SpaceX. So does LinkSpace (founded in 2014), although it also hopes to use rockets to deliver packages from one terrestrial location to another.

Spacety, founded in 2016, wants to turn around customer orders to build and launch its small satellites in just six months. In December it launched a miniaturized version of a satellite that uses 2D radar images to build 3D reconstructions of terrestrial landscapes. Weeks later, it [released the first images taken by the satellite](https://archive.md/o/bc9l4/https:/spacenews.com/spacety-releases-first-sar-images/), Hisea-1, featuring three-meter resolution. Spacety wants to launch a constellation of these satellites to offer high-quality imaging at low cost.

To a large extent, China is following the same blueprint drawn up by the US: using government contracts and subsidies to give these companies a foot up. US firms like SpaceX benefited greatly from NASA contracts that paid out millions to build and test rockets and space vehicles for delivering cargo to the International Space Station. With that experience under its belt, SpaceX was able to attract more customers with greater confidence.

Venture capital is another tried-and-true route. The IDA report estimates that VC funding for Chinese space companies was up to $516 million in 2018—far shy of the $2.2 billion American companies raised, but nothing to scoff at for an industry that really only began seven years ago. At least 42 companies had no known government funding.

And much of the government support these companies do receive doesn’t have a federal origin, but a provincial one. “[These companies] are drawing high-tech development to these local communities,” says Hines. “And in return, they’re given more autonomy by the local government.” While most have headquarters in Beijing, many keep facilities in Shenzhen, Chongqing, and other areas that might draw talent from local universities.

There’s also one advantage specific to China: manufacturing. “What is the best country to trust for manufacturing needs?” asks James Zheng, the CEO of Spacety’s Luxembourg headquarters. “It’s China. It’s the manufacturing center of the world.” Zheng believes the country is in a better position than any other to take advantage of the space industry’s new need for mass production of satellites and rockets alike.

Making friends

The most critical strategic reason to encourage a private space sector is to create opportunities for international collaboration—particularly to attract customers wary of being seen to mix with the Chinese government. (US agencies and government contractors, for example, are barred from working with any groups the regime funds.) Document 60 and others issued by China’s National Development and Reform Commission were aimed not just at promoting technological innovation, but also at drawing in foreign investment and maximizing a customer base beyond Chinese borders.

“China realizes there are certain things they cannot get on their own,” says Frans von der Dunk, a space policy expert at the University of Nebraska–Lincoln. Chinese companies like LandSpace and MinoSpace have worked to accrue funding through foreign investment, escaping dependence on state subsidies. And by avoiding state funding, a company can also avoid an array of restrictions on what it can and can’t do (such as constraints on talking with the media). Foreign investment also makes it easier to compete on a global scale: you’re taking on clients around the world, launching from other countries, and bringing talent from outside China.

Although China is taking inspiration from the US in building out its private industry, the nature of the Chinese state also means these new companies face obstacles that their rivals in the West don’t have to worry about. While Chinese companies may look private on paper, they must still submit to government guidance and control, and accept some level of interference. It may be difficult for them to make a case to potential overseas customers that they are independent. The distinction between companies that are truly private and those that are more or less state actors is still quite fuzzy, especially if the government is a frequent customer. “That could still lead to a lack of trust from other partners,” says Goswami. It doesn’t help that the government itself is often [very cagey about what its national program is even up to](https://archive.md/o/bc9l4/https:/www.bbc.com/news/science-environment-54076895).

And Hines adds that it’s not always clear exactly how separate these companies are from, say, the People’s Liberation Army, given the historical ties between the space and defense sectors. “Some of these things will pose significant hurdles for the commercial space sector as it tries to expand,” he says.

#### Shifts in regime perception threatens CCP’s legitimacy from nationalist hardliners

Weiss 19 Jessica Weiss 1-29-2019 “Authoritarian Audiences, Rhetoric, and Propaganda in International Crises: Evidence from China” <http://www.jessicachenweiss.com/uploads/3/0/6/3/30636001/19-01-24-elite-statements-isq-ca.pdf> (Associate Professor of Government at Cornell University)//Elmer

Public support—or the appearance of it—matters to many autocracies. As Ithiel de Sola Pool writes, modern dictatorships are “highly conscious of public opinion and make major efforts to affect it.”6 Mao Zedong told his comrades: “When you make revolution, you must first manage public opinion.”7 Because autocracies often rely on **nationalist mythmaking**,8 success or failure in defending the national honor in international crises could burnish the leadership’s patriotic credentials or spark opposition. **Shared outrage at the regime’s foreign policy failures could galvanize street protests or elite fissures, creating intraparty upheaval** or inviting military officers to step in to restore order. Fearing a domestic backlash, authoritarian leaders may feel compelled to take a tough international stance. Although authoritarian leaders are rarely held accountable to public opinion through free and fair elections, fears of popular unrest and irregular ouster often weigh heavily on autocrats seeking to maximize their tenure in office. Considering the harsh consequences that authoritarian elites face if pushed out of office, even a small increase in the probability of ouster could alter authoritarian incentives in international crises.9 A history of nationalist uprisings make Chinese citizens and leaders especially aware of the linkage between international disputes and domestic unrest. The weakness of the PRC’s predecessor in defending Chinese sovereignty at the Paris Peace Conference in 1919 galvanized protests and a general strike, forcing the government to sack three officials and reject the Treaty of Versailles, which awarded territories in China to Japan. These precedents have made Chinese officials particularly sensitive to the appearance of hewing to public opinion. As the People’s Daily chief editor wrote: “History and reality have shown us that public opinion and regime safety are inseparable.”10 One Chinese scholar even claimed: “the Chinese government probably knows the public’s opinion better and reacts to it more directly than even the U.S. government.”11

#### Xi will launch diversionary war to domestic backlash – escalates in multiple hotspots

Norris 17, William J. Geostrategic Implications of China’s Twin Economic Challenges. CFR Discussion Paper, 2017. (Associate professor of Chinese foreign and security policy at Texas A&M University’s Bush School of Government and Public Service)//Elmer

Populist pressures might tempt the **party leadership** to encourage **diversionary nationalism**. The logic of this concern is straightforward: the Communist Party might seek to **distract a restless domestic population** with **adventurism abroad**.19 The **Xi** administration wants to **appear tough** in its **defense of foreign encroachments** against China’s interests. This need stems from a long-running narrative about how a weak Qing dynasty was unable to defend China in the face of European imperial expansion, epitomized by the Opium Wars and the subsequent treaties imposed on China in the nineteenth century. The party is **particularly sensitive** to **perceptions of weakness** because much of its **claim to legitimacy**—manifested in **Xi’s Chinese Dream** campaign today—stems from the party’s claims of leading the **restoration of Chinese greatness**. For example, the May Fourth Movement, a popular protest in 1919 that helped catalyze the CPC, called into question the legitimacy of the Republic of China government running the country at that time because the regime was seen as not having effectively defended China’s territorial and sovereignty interests at the Versailles Peace Conference. **Diversionary nationalist frictions** would likely occur if the Chinese leadership portrayed a foreign adversary as having made the first move, thus forcing Xi to stand up for China’s interests. An example is the 2012 attempt by the nationalist governor of Tokyo, Shintaro Ishihara, to buy the Senkaku/Diaoyu Islands from a private owner.20 Although the Japanese central government sought to avert a crisis by stepping in to purchase the islands—having them bought and administered by Ishihara’s Tokyo metropolitan government would have dragged Japan into a confrontation with China—China saw this move as part of a deliberate orchestration by Japan to nationalize the islands. Xi seemingly had no choice but to defend China’s claims against an attempt by Japan to consolidate its position on the dispute.21 This issue touched off a period of heated tensions between China and Japan, lasting more than two years.22 Such dynamics are not limited to Japan. Other possible areas of conflict include, but are not necessarily limited to, **Taiwan**, **India**, and the **South China Sea** (especially with the **Philippines** and **Vietnam**). The Chinese government will use such tactics if it believes that the costs are relatively low. Ideally, China would like to appear tough while avoiding material repercussions or a serious diplomatic breakdown. Standing up against foreign encroachment—without facing much blowback—could provide Xi’s administration with a tempting source of noneconomic legitimacy. However, over the next few years, Xi will probably not be actively looking to get embroiled abroad. Cushioning the fallout from slower growth while managing a structural economic transition will be difficult enough. Courting potential international crises that distract the central leadership would make this task even more daunting. Even if the top leadership did not wish to provoke conflict, a smaller budgetary allotment for security could cause **military interests** in China to **deliberately instigate trouble** to **justify** their **claims over increasingly scarce resources**. For example, an air force interested in ensuring its funding for a midair tanker program might find the existence of far-flung territorial disputes to be useful in making its case. Such a case would be made even stronger by a pattern of recent frictions that highlights the necessity of greater air power projection. Budgetary pressures may be partly behind a recent People’s Liberation Army reorganization and headcount reduction. A slowing economy might cause a further deceleration in China’s military spending, thus increasing such pressures as budgetary belts tighten. Challenges to Xi’s Leadership Xi Jinping’s efforts to address economic challenges could fail, unleashing consequences that extend well beyond China’s economic health. For example, an **economic collapse** could give rise to a Vladimir **Putin–like redemption figure** in China. Xi’s approach of centralizing authority over a diverse, complex, and massive social, political, and economic system is a **recipe for brittleness**. Rather than designing a resilient, decentralized governance structure that can gracefully cope with localized failures at particular nodes in a network, a highly centralized architecture **risks catastrophic**, **system-level failure**. Although centralized authority offers the tantalizing chimera of stronger control from the center, it also puts all the responsibility squarely on Xi’s shoulders. With China’s ascension to great power status, the consequences of internecine domestic political battles are increasingly playing out on the world stage. The international significance of China’s domestic politics is a new paradigm for the Chinese leadership, and one can expect an adjustment period during which the outcome of what had previously been relatively insulated domestic political frictions will likely generate **unintended international repercussions**. Such dynamics will influence Chinese foreign policy and security behavior. Domestic arguments over ideology, bureaucratic power struggles, and strategic direction could all have **ripple effects abroad**. Many of China’s party heavyweights still employ a narrow and exclusively domestic political calculus. Such behavior increases the possibility of international implications that are not fully anticipated, **raising the risks** of **strategic miscalculation** on the world stage. For example, the factional power struggles that animated the Cultural Revolution were largely driven by domestic concerns, yet manifested themselves in Chinese foreign policy for more than a decade. During this period, China was not the world’s second largest economy and, for much of this time, did not even have formal representation at the United Nations. If today’s globally interconnected China became engulfed in similar domestic chaos, the effects would be felt worldwide.23 Weakened Fetters of Economic Interdependence If China successfully transitioned away from its export-driven growth model toward a consumption-driven economic engine over the next four or five years, it could no longer feel as constrained by economic interdependence. To the extent that such constraints are loosened, the U.S.-China relationship will be more prone to conflict and friction.24 While China has never been the archetypal liberal economic power bent on benign integration with the global economy, its export-driven growth model produced a strong strategic preference for stability. Although past behavior is not necessarily indicative of future strategic calculus, China’s “economic circuit breaker” logic seems to have held its most aggressive nationalism below the threshold of war since 1979. A China that is both comparatively strong and less dependent on the global economy would be a novel development in modern geopolitics. As China changes the composition of its international economic linkages, global integration could place fewer constraints on it. Whereas China has been highly reliant on the import of raw materials and semifinished goods for reexport, a consumption-driven China could have a different international trade profile. China could still rely on imported goods, but their centrality to the country’s overall economic growth would be altered. Imports of luxury goods, consumer products, international brands, and services may not exert a significant constraining influence, since loss of access to such items may not be seen as strategically vital. If these flows were interrupted or jeopardized, the result would be more akin to an inconvenience than a strategic setback for China’s rise. That said, China is likely to continue to highly depend on imported oil even if the economic end to which that energy resource is directed shifts away from industrial and export production toward domestic consumption.

#### **US–China war goes nuclear – crisis mis-management ensures conventional escalation - extinction**

Kulacki 20 [Dr. Gregory Kulacki focuses on cross-cultural communication between the United States and China on nuclear and space arms control and is the China Project Manager for the Global Security Program at the Union of Concerned Scientists, 2020. Would China Use Nuclear Weapons First In A War With The United States?, Thediplomat.com, https://thediplomat.com/2020/04/would-china-use-nuclear-weapons-first-in-a-war-with-the-united-states/] srey

Admiral Charles A. Richard, the head of the U.S. Strategic Command, recently told the Senate Armed Service Committee he “could drive a truck” through the holes in China’s no first use policy. But when Senator John Hawley (R-MO) asked him why he said that, Commander Richard backtracked, described China’s policy as “very opaque” and said his assessment was based on “very little” information. That’s surprising. **China** has been exceptionally **clear** **about** its **intentions** **on** the possible **first** **use** **of** **nuclear** **weapons**. On the day of its first nuclear test on October 16, 1964, China declared it “will never at any time or under any circumstances be the first to use nuclear weapons.” That **unambiguous** **statement** **has** **been** a **cornerstone** **of** **Chinese** **nuclear** **weapons** policy for 56 years and has been repeated frequently in authoritative Chinese publications for domestic and international audiences, including a highly classified training manual for the operators of China’s nuclear forces. Richard should know about those publications, particularly the training manual. A U.S. Department of Defense translation has been circulating within the U.S. nuclear weapons policy community for more than a decade. The commander’s comments to the committee indicate a familiarity with the most controversial section of the manual, which, in the eyes of some U.S. analysts, indicates there may be some circumstances where **China** **would** **use** **nuclear** **weapons** **first** **in** a **war** **with** **the** **U**nited **S**tates. This U.S. misperception is understandable, especially given the difficulties the Defense Department encountered translating the text into English. The language, carefully considered in the context of the entire book, articulates a strong reaffirmation of China’s no first use policy. But it also reveals **Chinese** military planners are **struggling** **with** **crisis** **management** **and** **considering** **steps** **that** could **create** **ambiguity** **with** **disastrous** **consequences**. Towards the end of the 405-page text on the operations of China’s strategic rocket forces, in a chapter entitled, “Second Artillery Deterrence Operations,” the authors explain what China’s nuclear forces train to do if **“**a strong military power possessing nuclear‐armed missiles and an absolute advantage in high‐tech conventional weapons is carrying out intense and continuous attacks against our major strategic targets and we have no good military strategy to resist the enemy.**”** The military power they’re talking about is the United States. The authors indicate China’s nuclear missile forces train to take specific steps, including increasing readiness and conducting launch exercises, to “dissuade the continuation of the strong enemy’s conventional attacks.” The manual refers to these steps as an “adjustment” to China’s nuclear policy and a “lowering” of China’s threshold for brandishing its nuclear forces. Chinese leaders would only take these steps in extreme circumstances. The text highlights several triggers such as U.S. conventional bombing of China’s nuclear and hydroelectric power plants, heavy conventional bombing of large cities like Beijing and Shanghai, or other acts of **conventional** **warfare** **that** “**seriously** **threatened**” the “safety and **survival**” of the nation. U.S. Misunderstanding Richard seems to believe this planned adjustment in China’s nuclear posture means China is **preparing** **to** **use** **nuclear** **weapons** first under these circumstances. He told Hawley that there are a “number of situations where they may conclude that first use has occurred that do not meet our definition of first use.” The head of the U.S. Strategic Command appears to assume, as do other U.S. analysts, that the **Chinese** would **interpret** **these** types of U.S. conventional **attacks** **as** **equivalent** **to** a **U.S. first use** **of** **nuclear** **weapons** against China. But that’s not what the text says. “Lowering the threshold” refers to China putting its nuclear weapons on alert — it does not indicate Chinese leaders might lower their threshold for deciding to use nuclear weapons in a crisis. Nor does the text indicate Chinese nuclear forces are training to launch nuclear weapons first in a war with the United States. China, unlike the United States, keeps its nuclear forces off-alert. Its warheads are not mated to its missiles. China’s nuclear-armed submarines are not continuously at sea on armed patrols. The manual describes how China’s nuclear warheads and the missiles that deliver them are controlled by two separate chains of command. Chinese missileers train to bring them together and launch them after China has been attacked with nuclear weapons. All of these behaviors are consistent with a no first use policy. The “adjustment” Chinese nuclear forces are preparing to make if the United States is bombing China with impunity is to place China’s nuclear forces in a state of readiness similar to the state the nuclear forces of the United States are in all the time. This step is intended not only to end the bombing, but also to convince U.S. decision-makers they cannot expect to destroy China’s nuclear retaliatory capability if the crisis escalates. Chinese Miscalculation Unfortunately, alerting Chinese nuclear forces at such a moment could have terrifying consequences. Given the relatively small size of China’s nuclear force, a U.S. president might be tempted to try to limit the possible damage from a Chinese nuclear attack by destroying as many of China’s nuclear weapons as possible before they’re launched, especially if the head of the U.S. Strategic Command told the president China was preparing to strike first. One study concluded that if the United States used nuclear weapons to attempt to knock out a small fraction of the Chinese ICBMs that could reach the United States it may kill tens of millions of Chinese civilians. The authors of the text assume alerting China’s nuclear forces would “create a great shock in the enemy’s psyche.” That’s a fair assumption. But they also assume this shock could “dissuade the continuation of the strong enemy’s conventional attacks against our major strategic targets.” That’s highly questionable. There is a **substantial** **risk** **the** **U**nited **S**tates **would** **respond** **to** this implicit **Chinese** **threat** **to** **use** **nuclear** **weapons** **by** **escalating**, rather than halting, its **conventional** **attacks**. If China’s nuclear forces were targeted, it would put even greater strain on the operators of China’s nuclear forces. A **slippery** **slope** **to** **nuclear** **war** Chinese military planners are aware that attempting to coerce the United States into halting conventional bombardment by alerting their nuclear forces could fail. They also know it might trigger a nuclear war. But if it does, they are equally clear China won’t be the one to start it. Nuclear attack is often preceded by nuclear coercion. Because of this, in the midst of the process of a high, strong degree of nuclear coercion we should prepare well for a nuclear retaliatory attack. The more complete the preparation, the higher the credibility of nuclear coercion, the easier it is to accomplish the objective of nuclear coercion, and the lower the possibility that the nuclear missile forces will be used in actual fighting. They assume if China demonstrates it is well prepared to retaliate the United States would not risk a damage limitation strike using nuclear weapons. And even if the United States were to attack China’s nuclear forces with conventional weapons, China still would not strike first. In the opening section of the next chapter on “nuclear retaliatory attack operations” the manual instructs, as it does on numerous occasions throughout the entire text: According to our country’s principle, its stand of no first use of nuclear weapons, the Second Artillery will carry out a nuclear missile attack against the enemy’s important strategic targets, according to the combat orders of the Supreme Command, only after the enemy has carried out a nuclear attack against our country. Richard is wrong. There are no holes in China’s no first use policy. But the worse-case planning articulated in this highly classified military text is a significant and deeply troubling departure from China’s traditional thinking about the role of nuclear weapons. Mao Zedong famously called nuclear weapons “a paper tiger.” Many assumed he was being cavalier about the consequences of nuclear war. But what he meant is that they would not be used to fight and win wars. U.S. nuclear threats during the Korean War and the Taiwan Strait Crisis in the 1950s – threats not followed by an actual nuclear attack – validated Mao’s intuition that nuclear weapons were primarily psychological weapons. Chinese leaders decided to acquire nuclear weapons to free their minds from what Mao’s generation called “**nuclear** **blackmail**.” A former director of China’s nuclear weapons laboratories told me China developed them so its leaders could “sit up with a straight spine.” Countering nuclear blackmail – along with compelling other nuclear weapons states to negotiate their elimination – were the only two purposes Chinese nuclear weapons were meant to serve. Contemporary Chinese military planners appear to have added a new purpose: compelling the United States to halt a conventional attack. Even though it only applies in extreme circumstances, it **increases** the **risk** **that** a **war** between the United States and China **will** **end** **in** a nuclear exchange with unpredictable and **catastrophic** **consequences**. Adding this new purpose could also be the first step on a slippery slope to an incremental broadening the role of nuclear weapons in Chinese national security policy. Americans would be a lot safer if we could avoid that. The United States government should applaud China’s no first use policy instead of repeatedly calling it into question. And it would be wise to adopt the same policy for the United States. If both countries declared they would never use nuclear weapons first it may not guarantee they can avoid a nuclear exchange during a military crisis, but it would make one far less likely.

### Mining

#### Asteroid mining solves rare earth mineral shortages, resource conflicts, and toxic waste

Kevin MacWhorter 16, J.D. Candidate, William & Mary Law School, "Sustainable Mining: Incentivizing Asteroid Mining in the Name of Environmentalism", William & Mary Environmental Law and Policy Review, Vol 40, Issue 2, Article 11, https://scholarship.law.wm.edu/cgi/viewcontent.cgi?referer=https://www.google.com/&httpsredir=1&article=1653&context=wmelpr

A. Rare Element Mining on Earth

In the next sixty years, scientists predict that certain elements crucial to modern industry such as platinum, zinc, copper, phosphorous, lead, gold, and indium could be exhausted on Earth. 12 Many of these have no synthetic alternative, unlike chemical elements such as oil or diamonds.13 Liquid-crystal display (LCD) televisions, cellphones, and laptops are among the various consumer technologies that use precious metals.14Further, green technologies including wind turbines, solar panels, and catalytic converters require these rare elements. 15 As demand rises for both types of technologies, and as reserves of rare metals fall, prices skyrocket.16 Demand for nonrenewable resources creates conflict, and consumerism in rich countries results in harsh labor treatment for poorer countries.17

In general, the mining industry is extremely destructive to Earth’s environment.18 In fact, depending on the method employed, mining can destroy entire ecosystems by polluting water sources and contributing to deforestation.19 It is by its nature an unsustainable practice, because it involves the extraction of a finite and non-renewable resource.20 Moreover, by extracting tiny amounts of metals from relatively large quantities of ore, the mining industry contributes the largest portion of solid wastes in the world.21 The Environmental Protection Agency (EPA) describes the industry as the source of more toxic and hazardous waste than any other industrial sector [in the United States], costing billions of dollars to address the public health and environmental threats to communities. 22 Poor regulations and oxymoronic corporate definitions of sustainability, however, make it unclear as to just how much waste the industry actually produces.23

Platinum provides an excellent case study of the issue, because it is an extremely rare and expensive metal—an ore expected to exist in vast quantities in asteroids.24 Further, production of platinum has increased sharply in the past sixty years in order to keep up with growing demand for use in new technologies.25 In fact, despite their high costs, platinum group metals are so useful that [one] of [four] industrial goods on Earth require them in production. 26 Scholars do not expect demand to slow any time soon.27 Among other technologies, industries use platinum in products such as catalytic converters, jewelry production, various catalysts for chemical processing, and hydrogen fuel cells.28 While there is no consensus on how far the Earth’s reserves of platinum will take humanity, many scientists agree that platinum ore reserves will deplete in a relatively short amount of time.29

With the rate of mining at an all-time high,30 it is increasingly clear that historical patterns of mineral resources and development cannot simply be assumed to continue unaltered into the future. 31 The platinum mining industry, however, has a strong incentive to increase its rate of extraction as profits grow with the rate of demand. Without any alternative, this destructive practice will continue into the future.32

So-called platinum-group metal (PGM) ores are mined through underground or open cut techniques.33 Due to these practices, all but a very small fraction of the mined platinum ore is disposed of as solid waste.34 The environmental consequences of platinum production are thus quite significant, but like the mining industry in general, the amount of waste is typically under-reported.35

While this is due to high production levels at the moment, those levels will only increase given the estimated future demand of platinum.36 In spite of the negative consequences, mining continues unabated because it is economically important to many areas.37 The future environmental costs provide a major challenge in creating a sustainable system. Relegating at least some mining companies to near-Earth asteroids would reduce the negative effects of future mining levels on Earth. The economic benefits of mining need not be sacrificed for the sake of the environment.38

#### Mineral shortages prevent the transition to clean energy needed to solve warming

Nafeez Ahmed 18, DPhil in international relations from the School of Global Studies at Sussex University, an investigative journalist and international security scholar, Dec 12 2018, "We Don't Mine Enough Rare Earth Metals to Replace Fossil Fuels With Renewable Energy", Vice, https://www.vice.com/en\_us/article/a3mavb/we-dont-mine-enough-rare-earth-metals-to-replace-fossil-fuels-with-renewable-energy

A new scientific study supported by the Dutch Ministry of Infrastructure warns that the renewable energy industry could be about to face a fundamental obstacle: shortages in the supply of rare metals.

To meet greenhouse gas emission reduction targets under the Paris Agreement, renewable energy production has to scale up fast. This means that global production of several rare earth minerals used in solar panels and wind turbines—especially neodymium, terbium, indium, dysprosium, and praseodymium—must grow twelvefold by 2050.

But according to the new study by Dutch energy systems company Metabolic, the “current global supply of several critical metals is insufficient to transition to a renewable energy system.”

The study focuses on demand for rare metals in the Netherlands and extrapolates this to develop a picture of how global trends are likely to develop.

“If the rest of the world would develop renewable electricity capacity at a comparable pace with the Netherlands, a considerable shortage would arise,” the study finds. This doesn’t include other applications of rare earth metals in other electronics industries (rare earth metals are widely used in smartphones, for example). “When other applications (such as electric vehicles) are also taken into consideration, the required amount of certain metals would further increase.”

Demand for rare metals is pitched to rise exponentially across the world, and not just due to renewables. Demand is most evident in “consumer electronics, military applications, and other technical equipment in industrial applications. The growth of the global middle class from 1 billion to 3 billion people will only further accelerate this growth.”

But the study did not account for those other industries. This means the actual problem could be far more intractable. In 2017, a study in Nature found that a range of minerals essential for smartphones, laptops, electric cars and even copper wiring could face supply shortages in coming decades.

#### China’s Asteroid Mining efforts are light-years ahead of everyone else – now is key for Asteroid Mining. Successful Mining solves Warming through Green Transition.

Cohen 21 Ariel Cohen 10-26-2021 "China’s Space Mining Industry Is Prepping For Launch – But What About The US?" <https://www.forbes.com/sites/arielcohen/2021/10/26/chinas-space-mining-industry-is-prepping-for-launch--but-what-about-the-us/?sh=6b8bea862ae0> (I am a Senior Fellow at the Atlantic Council and the Founding Principal of International Market Analysis, a Washington, D.C.-based global risk advisory boutique.)//Elmer

Exploration of space-based natural resources are on the Chinese policy makers’ mind. The question is, what Joe Biden thinks? In April of this year, China’s Shenzen Origin Space Technology Co. Ltd. launched the NEO-1, the first commercial spacecraft dedicated to the mining of space resources – from asteroids to the lunar surface. Falling costs of space launches and spacecraft technology alongside existing infrastructure provides a unique opportunity to explore extraterrestrial resource extraction. Current technologies are equipped to analyze and categorize asteroids within our solar system with a limited degree of certainty. One of the accompanying payloads to the NEO-1 was the Yuanwang-1, or “little hubble” satellite, which searches the stars for possible asteroid mining targets. The NEO-1 launch marks another milestone in private satellite development, adding a new player to space based companies which include Japan’s Astroscale. Private asteroid identification via the Sentinel Space Telescope was supported by NASA until 2015. As private investment in space grows, the end goal is to be capable of harvesting resources to bring to Earth. “Through the development and launch of the spacecraft, Origin Space is able to carry out low-Earth orbit space junk cleanup and prototype technology verification for space resource acquisition, and at the same time demonstrate future asteroid defense related technologies.” In the end, it will come down to progressively lowering the cost of launched unit of weight and booster rocket reliability – before fundamentally new engines may drive the launch costs even further down. The April launch demonstrates that China is already succeeding while the West is spinning its wheels. The much touted Planetary Resources and Deep Space Industries (DSI) DSI -1% were supposed to be the vanguard of extra-terrestrial resource acquisition with major backers including Google’s GOOG -1.4% Larry Page. But both have since been acquired, the former by block chain company ConsenSys and the latter by Bradford Space, neither of which are prioritizing asteroid mining. This is too bad, given that that supply chain crunches here on Earth – coupled with the global green energy transition – are spiking demand for strategic minerals that are increasingly hard to come by on our environmentally stressed planet. And here China currently holds a monopoly on rare earth element (REE) extraction and processing to the tune of 90%. REE’s 17 minerals essential for modern computing and manufacturing technologies for everything from solar panels to semi-conductors. Resource-hungry China also has major involvement in global critical mineral supply chains, which include cobalt, tungsten, and lithium. As I’ve written before, the Chinese hold of upstream and downstream markets is staggering. Possessing 30% of the global mined ore, 80% of the global processing facilities, and an ever increasing list of high dollar investments around the world, China boasts over $36 billion invested in mining projects in Africa alone. Beijing’s space program clearly indicates that the Chinese would also like to tighten their grip on space-based resources as well. According to research, it is estimated that a small asteroid roughly 200 meters in length that is rich in platinum could be worth up to $300 million. Merrill Lynch predicts the space industry — including extraterrestrial mining industry – to value $2.7 trillion in the next three decades. REEs are fairly common in the solar system, but to what degree remains unknown. The most sought after are M-type asteroids which are mostly metal and hundreds of cubic meters. While these are not the most common, the 27,115 Near Earth asteroids are bound to contain a few. This – and military applications – are no doubt a driving factor of China’s ever increasing space ambitions.

#### Warming causes Extinction

Kareiva 18, Peter, and Valerie Carranza. "Existential risk due to ecosystem collapse: Nature strikes back." Futures 102 (2018): 39-50. (Ph.D. in ecology and applied mathematics from Cornell University, director of the Institute of the Environment and Sustainability at UCLA, Pritzker Distinguished Professor in Environment & Sustainability at UCLA)//Re-cut by Elmer

In summary, six of the nine proposed planetary boundaries (phosphorous, nitrogen, biodiversity, land use, atmospheric aerosol loading, and chemical pollution) are unlikely to be associated with existential risks. They all correspond to a degraded environment, but in our assessment do not represent existential risks. However, the three remaining boundaries (**climate change**, global **freshwater** cycle, **and** ocean **acidification**) do **pose existential risks**. This is **because of** intrinsic **positive feedback loops**, substantial lag times between system change and experiencing the consequences of that change, and the fact these different boundaries interact with one another in ways that yield surprises. In addition, climate, freshwater, and ocean acidification are all **directly connected to** the provision of **food and water**, and **shortages** of food and water can **create conflict** and social unrest. Climate change has a long history of disrupting civilizations and sometimes precipitating the collapse of cultures or mass emigrations (McMichael, 2017). For example, the 12th century drought in the North American Southwest is held responsible for the collapse of the Anasazi pueblo culture. More recently, the infamous potato famine of 1846–1849 and the large migration of Irish to the U.S. can be traced to a combination of factors, one of which was climate. Specifically, 1846 was an unusually warm and moist year in Ireland, providing the climatic conditions favorable to the fungus that caused the potato blight. As is so often the case, poor government had a role as well—as the British government forbade the import of grains from outside Britain (imports that could have helped to redress the ravaged potato yields). Climate change intersects with freshwater resources because it is expected to exacerbate drought and water scarcity, as well as flooding. Climate change can even impair water quality because it is associated with heavy rains that overwhelm sewage treatment facilities, or because it results in higher concentrations of pollutants in groundwater as a result of enhanced evaporation and reduced groundwater recharge. **Ample clean water** is not a luxury—it **is essential for human survival**. Consequently, cities, regions and nations that lack clean freshwater are vulnerable to social disruption and disease. Finally, ocean acidification is linked to climate change because it is driven by CO2 emissions just as global warming is. With close to 20% of the world’s protein coming from oceans (FAO, 2016), the potential for severe impacts due to acidification is obvious. Less obvious, but perhaps more insidious, is the interaction between climate change and the loss of oyster and coral reefs due to acidification. Acidification is known to interfere with oyster reef building and coral reefs. Climate change also increases storm frequency and severity. Coral reefs and oyster reefs provide protection from storm surge because they reduce wave energy (Spalding et al., 2014). If these reefs are lost due to acidification at the same time as storms become more severe and sea level rises, coastal communities will be exposed to unprecedented storm surge—and may be ravaged by recurrent storms. A key feature of the risk associated with climate change is that mean annual temperature and mean annual rainfall are not the variables of interest. Rather it is extreme episodic events that place nations and entire regions of the world at risk. These extreme events are by definition “rare” (once every hundred years), and changes in their likelihood are challenging to detect because of their rarity, but are exactly the manifestations of climate change that we must get better at anticipating (Diffenbaugh et al., 2017). Society will have a hard time responding to shorter intervals between rare extreme events because in the lifespan of an individual human, a person might experience as few as two or three extreme events. How likely is it that you would notice a change in the interval between events that are separated by decades, especially given that the interval is not regular but varies stochastically? A concrete example of this dilemma can be found in the past and expected future changes in storm-related flooding of New York City. The highly disruptive flooding of New York City associated with Hurricane Sandy represented a flood height that occurred once every 500 years in the 18th century, and that occurs now once every 25 years, but is expected to occur once every 5 years by 2050 (Garner et al., 2017). This change in frequency of extreme floods has profound implications for the measures New York City should take to protect its infrastructure and its population, yet because of the stochastic nature of such events, this shift in flood frequency is an elevated risk that will go unnoticed by most people. 4. The combination of positive feedback loops and societal inertia is fertile ground for global environmental catastrophes **Humans** are remarkably ingenious, and **have adapted** to crises **throughout** their **history**. Our doom has been repeatedly predicted, only to be averted by innovation (Ridley, 2011). **However**, the many **stories** **of** human ingenuity **successfully** **addressing** **existential risks** such as global famine or extreme air pollution **represent** environmental c**hallenges that are** largely **linear**, have immediate consequences, **and operate without positive feedbacks**. For example, the fact that food is in short supply does not increase the rate at which humans consume food—thereby increasing the shortage. Similarly, massive air pollution episodes such as the London fog of 1952 that killed 12,000 people did not make future air pollution events more likely. In fact it was just the opposite—the London fog sent such a clear message that Britain quickly enacted pollution control measures (Stradling, 2016). Food shortages, air pollution, water pollution, etc. send immediate signals to society of harm, which then trigger a negative feedback of society seeking to reduce the harm. In contrast, today’s great environmental crisis of climate change may cause some harm but there are generally long time delays between rising CO2 concentrations and damage to humans. The consequence of these delays are an absence of urgency; thus although 70% of Americans believe global warming is happening, only 40% think it will harm them (http://climatecommunication.yale.edu/visualizations-data/ycom-us-2016/). Secondly, unlike past environmental challenges, **the Earth’s climate system is rife with positive feedback loops**. In particular, as CO2 increases and the climate warms, that **very warming can cause more CO2 release** which further increases global warming, and then more CO2, and so on. Table 2 summarizes the best documented positive feedback loops for the Earth’s climate system. These feedbacks can be neatly categorized into carbon cycle, biogeochemical, biogeophysical, cloud, ice-albedo, and water vapor feedbacks. As important as it is to understand these feedbacks individually, it is even more essential to study the interactive nature of these feedbacks. Modeling studies show that when interactions among feedback loops are included, uncertainty increases dramatically and there is a heightened potential for perturbations to be magnified (e.g., Cox, Betts, Jones, Spall, & Totterdell, 2000; Hajima, Tachiiri, Ito, & Kawamiya, 2014; Knutti & Rugenstein, 2015; Rosenfeld, Sherwood, Wood, & Donner, 2014). This produces a wide range of future scenarios. Positive feedbacks in the carbon cycle involves the enhancement of future carbon contributions to the atmosphere due to some initial increase in atmospheric CO2. This happens because as CO2 accumulates, it reduces the efficiency in which oceans and terrestrial ecosystems sequester carbon, which in return feeds back to exacerbate climate change (Friedlingstein et al., 2001). Warming can also increase the rate at which organic matter decays and carbon is released into the atmosphere, thereby causing more warming (Melillo et al., 2017). Increases in food shortages and lack of water is also of major concern when biogeophysical feedback mechanisms perpetuate drought conditions. The underlying mechanism here is that losses in vegetation increases the surface albedo, which suppresses rainfall, and thus enhances future vegetation loss and more suppression of rainfall—thereby initiating or prolonging a drought (Chamey, Stone, & Quirk, 1975). To top it off, overgrazing depletes the soil, leading to augmented vegetation loss (Anderies, Janssen, & Walker, 2002). Climate change often also increases the risk of forest fires, as a result of higher temperatures and persistent drought conditions. The expectation is that **forest fires will become more frequent** and severe with climate warming and drought (Scholze, Knorr, Arnell, & Prentice, 2006), a trend for which we have already seen evidence (Allen et al., 2010). Tragically, the increased severity and risk of Southern California wildfires recently predicted by climate scientists (Jin et al., 2015), was realized in December 2017, with the largest fire in the history of California (the “Thomas fire” that burned 282,000 acres, https://www.vox.com/2017/12/27/16822180/thomas-fire-california-largest-wildfire). This **catastrophic fire** embodies the sorts of positive feedbacks and interacting factors that **could catch humanity off-guard and produce a** true **apocalyptic event.** Record-breaking rains produced an extraordinary flush of new vegetation, that then dried out as record heat waves and dry conditions took hold, coupled with stronger than normal winds, and ignition. Of course the record-fire released CO2 into the atmosphere, thereby contributing to future warming. Out of all types of feedbacks, water vapor and the ice-albedo feedbacks are the most clearly understood mechanisms. Losses in reflective snow and ice cover drive up surface temperatures, leading to even more melting of snow and ice cover—this is known as the ice-albedo feedback (Curry, Schramm, & Ebert, 1995). As snow and ice continue to melt at a more rapid pace, millions of people may be displaced by flooding risks as a consequence of sea level rise near coastal communities (Biermann & Boas, 2010; Myers, 2002; Nicholls et al., 2011). The water vapor feedback operates when warmer atmospheric conditions strengthen the saturation vapor pressure, which creates a warming effect given water vapor’s strong greenhouse gas properties (Manabe & Wetherald, 1967). Global warming tends to increase cloud formation because warmer temperatures lead to more evaporation of water into the atmosphere, and warmer temperature also allows the atmosphere to hold more water. The key question is whether this increase in clouds associated with global warming will result in a positive feedback loop (more warming) or a negative feedback loop (less warming). For decades, scientists have sought to answer this question and understand the net role clouds play in future climate projections (Schneider et al., 2017). Clouds are complex because they both have a cooling (reflecting incoming solar radiation) and warming (absorbing incoming solar radiation) effect (Lashof, DeAngelo, Saleska, & Harte, 1997). The type of cloud, altitude, and optical properties combine to determine how these countervailing effects balance out. Although still under debate, it appears that in most circumstances the cloud feedback is likely positive (Boucher et al., 2013). For example, models and observations show that increasing greenhouse gas concentrations reduces the low-level cloud fraction in the Northeast Pacific at decadal time scales. This then has a positive feedback effect and enhances climate warming since less solar radiation is reflected by the atmosphere (Clement, Burgman, & Norris, 2009). The key lesson from the long list of potentially positive feedbacks and their interactions is that **runaway climate change,** and runaway perturbations have to be taken as a serious possibility. Table 2 is just a snapshot of the type of feedbacks that have been identified (see Supplementary material for a more thorough explanation of positive feedback loops). However, this list is not exhaustive and the possibility of undiscovered positive feedbacks **portends** even greater **existential risks**. The many environmental crises humankind has previously averted (famine, ozone depletion, London fog, water pollution, etc.) were averted because of political will based on solid scientific understanding. We cannot count on complete scientific understanding when it comes to positive feedback loops and climate change.

### Reg CP

#### CP Text: State ought to implement cooperative active debris removal measures by private entities to mitigate debris from mega-constellations

Hardy 20, Brian Patrick. Long-term effects of satellite megaconstellations on the debris environment in low earth orbit. Diss. 2020. (Master of Science in Aerospace Engineering in the Graduate College of the University of Illinois at Urbana-Champaign)//Elmer

The results of this thesis demonstrate that satellite megaconstellations have the potential to leave a significant mark on the LEO debris environment, even centuries after they cease operations. Various test cases for the Starlink megaconstellation were analyzed in a new, medium-fidelity simulation for orbital debris evolution, and a variety of PMD and ADR rates for Starlink were considered. It was shown that if Starlink adheres only to the minimum regulatory requirement of 90% PMD for large constellations, then LEO debris levels will grow almost twice as fast as the baseline scenario with no megaconstellations. Improving Starlink’s PMD rate to 95% would lead to only 19% more debris, while 99% PMD is the preferred option that prevents any significant debris contributions at all. Importantly, Starlink’s choice of PMD strategy will affect its own collision risk very little over the short term, but the impact will be noticeable on multi-century timescales by the overall LEO environment. Finally, in scenarios with 90% and 95% PMD, active debris removal of non-operating Starlink satellites yields significant, if limited, benefits. The 90% PMD scenario combined with an ADR rate of 5 Starlink satellites per year, for example, is able to reduce debris levels to those seen for the 95% PMD scenario. This result suggests that active debris removal could be a viable mitigation strategy for megaconstellations with sub-optimal PMD rates.

### Case

#### Tracking debris exists now and solves collisions.

**Mosher** **’19** [Dave; September 3rd; Journalist with more than a decade of experience reporting and writing stories about space, science, and technology; Business Insider, “Satellite collisions may trigger a space-junk disaster that could end human access to orbit. Here’s How,” <https://www.usafa.edu/app/uploads/Space_and_Defense_2_3.pdf>; GR]

The Kessler syndrome plays center-stage in the movie "Gravity," in which an accidental space collision endangers a crew aboard a large space station. But Gossner said that type of a runaway space-junk catastrophe is unlikely. "Right now I don't think we're close to that," he said. "I'm not saying we couldn't get there, and I'm not saying we don't need to be smart and manage the problem. But I don't see it ever becoming, anytime soon, an unmanageable problem." There is no current system to remove old satellites or sweep up bits of debris in order to prevent a Kessler event. Instead, space debris is monitored from Earth, and new rules require satellites in low-Earth orbit be deorbited after 25 years so they don't wind up adding more space junk. "Our current plan is to manage the problem and not let it get that far," Gossner said. "I don't think that we're even close to needing to actively remove stuff. There's lots of research being done on that, and maybe some day that will happen, but I think that — at this point, and in my humble opinion — an unnecessary expense." A major part of the effort to prevent a Kessler event is the Space Surveillance Network (SSN). The project, led by the US military, uses 30 different systems around the world to identify, track, and share information about objects in space. Many objects are tracked day and night via a networkof radar observatories around the globe. Optical telescopes on the ground also keep an eye out, but they aren't always run by the government. "The commercial sector is actually putting up lots and lots of telescopes," Gossner said. The government pays for their debris-tracking services. Gossner said one major debris-tracking company is called Exoanalytic. It uses about 150 small telescopes set up around the globe to detect, track, and report space debris to the SSN. Telescopes in space track debris, too. Far less is known about them because they're likely top-secret military satellites. Objects detected by the government and companies get added to a catalog of space debris and checked against the orbits of other known bits of space junk. New orbits are calculated with supercomputers to see if there's a chance of any collisions. Diana McKissock, a flight lead with the US Air Force's 18th Space Control Squadron, helps track space debris for the SSN. She said the surveillance network issues warnings to NASA, satellite companies, and other groups with spacecraft, based on two levels of emergency: basic and advanced. The SSN issues a basic emergency report to the public three days ahead of a 1-in-10,000 chance of a collision. It then provides multiple updates per day until the risk of a collision passes. To qualify for such reporting, a rogue object must come within a certain distance of another object. In low-Earth orbit, that distance must be less than 1 kilometer (0.62 mile); farther out in deep space, where the precision of orbits is less reliable, the distance is less than 5 kilometers (3.1 miles). Advanced emergency reports help satellite providers see possible collisions much more than three days ahead. "In 2017, we provided data for 308,984 events, of which only 655 were emergency-reportable," McKissock told Business Insider in an email. Of those, 579 events were in low-Earth orbit (where it's relatively crowded with satellites).

#### The debris propagation model is a process not an event---timeframe is decades and intervening actors check. Err neg -- this is Kessler, the guy who made that model.

Burns Interviewing Kessler **’**13 Corrinne Burns, interviewing Donald Kessler, who made up the concept. [Space junk apocalypse: just like Gravity? 11-15-2013, https://www.theguardian.com/science/blog/2013/nov/15/space-junk-apocalypse-gravity]//BPS

Now? Are we in trouble? Not yet. Kessler syndrome isn't an acute phenomenon, as depicted in the movie – it's a slow, decades-long process. "It'll happen throughout the next 100 years – we have time to deal with it," Kessler says. "The time between collisions will become shorter – it's around 10 years at the moment. In 20 years' time, the time between collisions could be reduced to five years." Fortunately, communications satellites are, in the main, situated high up in geosynchronous orbit (GEO), whereas the risk of collisions lies mainly in the much lower, and more crowded, low Earth orbit (LEO). But that doesn't mean we can relax. "We've got to get a handle on it – we need to prevent the cascade process from speeding up." And the only way to do that is, he says, to begin actively removing junk from space. Charlotte Bewick agrees. She's a mission concepts engineer with the German space technology company OHB System, with special expertise in space junk – specifically, how we can capture it and bring it back to Earth. While agreeing with Kessler that the movie scenario is exaggerated, she remains concerned. "Fragments of junk can naturally re-enter the atmosphere [and so be removed from orbit]. But we're at the stage where the rate of creation of new debris fragments is higher than the rate of natural removal. The orbits most at risk harbour important space assets – satellites for weather forecasting, oil spill and bush fire detection, and polar ice monitoring." Bewick highlights the case of Envisat, a defunct 8,000kg spacecraft circling Earth in an orbit that is very popular with space agencies and, hence, pretty crowded. "If Envisat collides with a piece of debris or a micrometeorite, the fragments could render the whole orbital region unusable." So can we get the junk down, I asked Massimiliano Vasile, part of the Mechanical & Aerospace Department at the University of Strathclyde and co-ordinator of the Stardust network. He told me defunct satellites in the high GEO region have, for some time, been shifted to higher "graveyard orbits" to keep them out of the way. But that's not an option for items in low Earth orbit. For this, he tells me, researchers are looking seriously into active debris removal – in-orbit capture techniques like harpooning, netting and tethering, the use of contactless systems like ion-beams or lasers, and even onboard robotics to position the junk away from high-risk orbital regions. As for middle Earth orbit – well, ideas are welcome, he says. We're in no immediate danger from Kessler syndrome – but it's not a problem that's going away. Despite Gravity's artistic license, Donald Kessler is pleased to see the phenomenon represented on the big screen. "It is very improbable that events would play out as they did in the film," he says. "But if it raises awareness, then that's great."

#### No miscalc from satellite disruptions or space dust -- empirically denied. Also takes out the Russia scenario---their ev casually asserts escalation while we have examples from after their card was written that disprove it.

Mazur 12 (Jonathan Mazur, Manager Engineering at Northrop Grumman, writing in Space & Defense, from the Eisenhower Center for Space and Defense Studies. Past U.S. Actions: Redlines in Space. Space & Defense, Volume 6, Number 1, Fall 2012. https://inss.ndu.edu/Portals/97/Space\_and\_Defense\_6\_1.pdf?ver=2018-09-06-135424-147)

U.S. Reactions To Foreign Disruption Of U.S. Capabilities In the 1970s, it was suspected that a U.S. maritime communications satellite was turned off by the Soviets when it was outside of the range of U.S. tracking stations.25 There does not appear to be any documented U.S. reaction, and I suspect there was none. In the mid-1990s, satellite hackers in Brazil began hijacking U.S. military communication satellite signals to broadcast their own information, though it took until 2009 for Brazil to crack down on the illegal activity with the support of the DoD.26 In 1998, a U.S.-German satellite known as ROSAT was rendered useless after it turned suddenly toward the sun. NASA investigators later determined the accident was possibly linked to a cyber-intrusion by Russia. The fallout? Though there was an ongoing criminal investigation as of 2008; NASA security officials have seemed determined to publicly minimize the seriousness of the threat.27 In 2003, a signal originating from Cuba—later determined to be coming from Iranian embassy property— was jamming a U.S. communications satellite that was transmitting Voice of America programming over Iran, which was publicly referred to as an “act of war” by a U.S. official. 28 Press reporting indicates the U.S. administration was [frozen]“paralyzed” about how to cope with the jamming that continued for at least a month, even after U.S. diplomatic protests to Cuba.29 In 2005, U.S. diplomats protested to the Libyan government after two international satellites were illegally jammed disrupting American diplomatic, military, and FBI communications.30 In 2006, press reporting indicates that China hit a U.S. spy satellite with a ground-based laser. This action was acknowledged by the then director of the NRO, though the DoD remained tight lipped about the incident.31 “We’re at a point where the technology’s out there, and the capability for people to do things to our satellites is there. I’m focused on it beyond any single event.” – Air Force Space Command Commander, General Chilton, 2006 32 In 2009, a U.S. commercial Iridium communications satellite—extensively used by the DoD—was accidently destroyed by a collision with a dead Russian satellite.33 The U.S. company, Iridium, was able to minimize any loss of service by implementing a network solution within a few days.34 As of early 2011, no legal action had been taken by the company either because it is not clear who was at fault or because it might be politically problematic for the United States, which is trying to enter into bi-lateral transparency and confidence-building measures (TCBM) with Russia regarding space activities.35 Since August of 2010, North Korea has been intermittently using GPS jamming equipment, which reportedly has been interfering with U.S. and South Korean military operations and civilian use south of the North Korean border.36 Reportedly, only South Korea and the United Nations International Telecommunications Union—at the request of South Korea—have issued letters to Pyongyang demanding the cessation of disruptive communications signals in South Korea.37 It appears that the only time the U.S. military has responded with force to a disruption in U.S. space capabilities was in 2003, a few days after the start of the Iraq war.38 According to U.S. officials, Iraq was using multiple GPS jammers—which supposedly did not affect military GPS functionality. However, the U.S. military bombed the jammers anyway after a diplomatic complaint to Russia.39 The use of military force against the GPS jamming threat was possibly because the United States was already intervening in Iraq, and the bombing probably would not have occurred if the United States was not at war.

#### Alt cause – broad space privatization and existing debris.

Muelhapt et al 19 [(Theodore J., Center for Orbital and Reentry Debris Studies, Center for Space Policy and Strategy, The Aerospace Corporation, 30 year Space Systems Analyst and Operator, Marlon E. Sorge, Jamie Morin, Robert S. Wilson), “Space traffic management in the new space era,” Journal of Space Safety Engineering, 6/18/19, https://doi.org/10.1016/j.jsse.2019.05.007] TDI

The last decade has seen rapid growth and change in the space industry, and an explosion of commercial and private activity. Terms like NewSpace or democratized space are often used to describe this global trend to develop faster and cheaper access to space, distinct from more traditional government-driven activities focused on security, political, or scientific activities. The easier access to space has opened participation to many more participants than was historically possible. This new activity could profoundly worsen the space debris environment, particularly in low Earth orbit (LEO), but there are also signs of progress and the outlook is encouraging. Many NewSpace operators are actively working to mitigate their impact. Nevertheless, NewSpace represents a significant break with past experience and business as usual will not work in this changed environment. New standards, space policy, and licensing approaches are powerful levers that can shape the future of operations and the debris environment.

2. Characterizing NewSpace: a step change in the space environment

In just the last few years, commercial companies have proposed, funded, and in a few cases begun deployment of very large constellations of small to medium-sized satellites. These constellations will add much more complexity to space operations. Table 1 shows some of the constellations that have been announced for launch in the next decade. Two dozen companies, when taken together, have proposed placing well over ~~20,000~~ [twenty thousand] satellites in orbit in the next ~~10~~ [10]years. For perspective, fewer than ~~8100~~[eight thousand one hundred] payloads have been placed in Earth orbit in the entire history of the space age, only 4800 [1] remain in orbit and approximately 1950 [2] of those are still active. And it isn't simply numbers – the mass in orbit will increase substantially, and long-term debris generation is strongly correlated with mass.

[Table 1 Omitted]

This table is in constant flux. It is based largely on U.S. filings with the Federal Communications Commission (FCC) and various press releases, but many of the companies here have already altered or abandoned their original plans, and new systems are no doubt in work. Although many of these large constellations may never be launched as listed, the traffic created if just half are successful would be more than double the number of payloads launched in the last 60 years and more than 6 times the number of currently active satellites.

Current space safety, space surveillance, collision avoidance (COLA) and debris mitigation processes have been designed for and have evolved with the current population profile, launch rates and density of LEO space.

By almost any metric used to measure activity in space, whether it is payloads in orbit, the size of constellations, the rate of launches, the economic stakes, the potential for debris creation, the number of conjunctions, NewSpace represents a fundamental change.

3. Compounding effects of better SSA, more satellites, and new operational concepts

The changes in the space environment can be seen on this figurative map of low Earth orbit. Fig. 1 shows the LEO environment as a function of altitude. The number of objects found in each 10 km “bin” is plotted on the horizontal axis, while the altitude is plotted vertically. Objects in elliptical orbits are distributed between bins as partial objects proportional to the time spent in each bin. Some notable resident systems are indicated in blue text on the right to provide an altitude reference. The (dotted) red line shows the number of objects in the current catalog tracked by the U.S. Space Surveillance Network (SSN). All the COLA alerts and actions that must be taken by the residents are due to their neighbors in the nearby bins, so the currently visible risk is proportional to the red line.

The red line of the current catalog does not represent the complete risk; it indicates the risk we can track and perhaps avoid. A rule of thumb is that the current SSN LEO catalog contains objects about 10 cm or larger. It is generally accepted that an impact in LEO with an object 1 cm or larger will cause damage likely to be fatal to a satellite's mission. Therefore, there is a large latent risk from unobserved debris. While we cannot currently track and catalog much smaller than 10 cm, experiments have been performed to detect and sample much smaller objects and statistically model the population at this size [3]. The (solid) blue line represents the model of the 1 cm and larger debris that is likely mission-ending, usually called lethal but not trackable. If LEO operators avoid collisions with all the objects in the red line, they are nonetheless inherently accepting the risk from the blue line. This risk is already present.

The (dashed) orange line is an estimate of the population at 5 cm and larger and is thus an estimate of what the catalog might conservatively be a few years after the Space Fence, a new radar system being built by the Air Force, comes on line (currently planned for 2019) [4]. Commercial companies offering space surveillance services, such as LeoLabs, ExoAnalytics, Analytic Graphics Inc., Lockheed, and Boeing, might also add to the number of objects currently tracked. Space Policy Directive 3 (SPD-3) [13] specifically seeks to expand the use of commercial SSA services.

Existing operators can expect a sharp increase in the number of warnings and alerts they will receive because of the increase in the cataloged population. Almost all the increase will come from newly detected debris [5].

The pace of safety operations for each satellite on orbit will significantly change because of the increase in the catalog from the Space Fence. This effect is compounded because the NewSpace constellations described in Table 1 will drastically change the profile of satellites in LEO. The green bars in Fig. 1 represent the number of objects that will be added to the catalog (red or orange lines) from only the NewSpace large LEO constellations at their operational altitudes. This does not include the rocket stages that launch them, or satellites in the process of being phased into or removed from the operational orbits. Neighbors of one of these new constellations may face a radically different operations environment than their current practices were designed to address.

Satellites in these large LEO constellations typically have planned operational lifetimes of 5–10 years. Some companies have proposed to dispose of their satellites using low thrust electric propulsion systems, which would spiral satellites down over a period of months or years from operating altitudes as high as 1500 km through lower orbits where the Hubble Space Telescope, the International Space Station, and other critical LEO satellites operate [6]. Similar propulsive techniques would raise replacement satellites from lower launch injection orbits to higher operational orbits. These disposal and replenishment activities will add thousands of satellites each year transiting through lower altitudes and posing a risk to all resident satellites in those lower orbits. More importantly, failures will occur both among transiting satellites and operational constellations, potentially leaving hundreds more stranded along the transit path.

1. **No ‘space war’ – Insurmountable barriers and everyone has an interest in keeping space peaceful**

**Dobos 19** [(Bohumil Doboš, scholar at the Institute of Political Studies, Faculty of Social Sciences, Charles University in Prague, Czech Republic, and a coordinator of the Geopolitical Studies Research Centre) “Geopolitics of the Outer Space, Chapter 3: Outer Space as a Military-Diplomatic Field,” Pgs. 48-49] TDI

Despite the theorized potential for the achievement of the terrestrial dominance throughout the utilization of the ultimate high ground and the ease of destruction of space-based assets by the potential space weaponry, the utilization of space weapons is with current technology and no effective means to protect them far from fulfilling this potential (Steinberg 2012, p. 255). In current global international political and technological setting, the utility of space weapons is very limited, even if we accept that the ultimate high ground presents the potential to get a decisive tangible military advantage (which is unclear). This stands among the reasons for the lack of their utilization so far. Last but not the least, it must be pointed out that the states also develop passive defense systems designed to protect the satellites on orbit or critical capabilities they provide. These further decrease the utility of space weapons. These systems include larger maneuvering capacities, launching of decoys, preparation of spare satellites that are ready for launch in case of ASAT attack on its twin on orbit, or attempts to decrease the visibility of satellites using paint or materials less visible from radars (Moltz 2014, p. 31). Finally, we must look at the main obstacles of connection of the outer space and warfare. The first set of barriers is comprised of physical obstructions. As has been presented in the previous chapter, the outer space is very challenging domain to operate in. Environmental factors still present the largest threat to any space military capabilities if compared to any man-made threats (Rendleman 2013, p. 79). A following issue that hinders military operations in the outer space is the predictability of orbital movement. If the reconnaissance satellite's orbit is known, the terrestrial actor might attempt to hide some critical capabilities-an option that is countered by new surveillance techniques (spectrometers, etc.) (Norris 2010, p. 196)-but the hide-and-seek game is on. This same principle is, however, in place for any other space asset-any nation with basic tracking capabilities may quickly detect whether the military asset or weapon is located above its territory or on the other side of the planet and thus mitigate the possible strategic impact of space weapons not aiming at mass destruction. Another possibility is to attempt to destroy the weapon in orbit. Given the level of development for the ASAT technology, it seems that they will prevail over any possible weapon system for the time to come. Next issue, directly connected to the first one, is the utilization of weak physical protection of space objects that need to be as light as possible to reach the orbit and to be able to withstand harsh conditions of the domain. This means that their protection against ASAT weapons is very limited, and, whereas some avoidance techniques are being discussed, they are of limited use in case of ASAT attack. We can thus add to the issue of predictability also the issue of easy destructibility of space weapons and other military hardware (Dolman 2005, p. 40; Anantatmula 2013, p. 137; Steinberg 2012, p. 255). Even if the high ground was effectively achieved and other nations could not attack the space assets directly, there is still a need for communication with those assets from Earth. There are also ground facilities that support and control such weapons located on the surface. Electromagnetic communication with satellites might be jammed or hacked and the ground facilities infiltrated or destroyed thus rendering the possible space weapons useless (Klein 2006, p. 105; Rendleman 2013, p. 81). This issue might be overcome by the establishment of a base controlling these assets outside the Earth-on Moon or lunar orbit, at lunar L-points, etc.-but this perspective remains, for now, unrealistic. Furthermore, no contemporary actor will risk full space weaponization in the face of possible competition and the possibility of rendering the outer space useless. No actor is dominant enough to prevent others to challenge any possible attempts to dominate the domain by military means. To quote 2016 Stratfor analysis, "(a) war in space would be devastating to all, and preventing it, rather than finding ways to fight it, will likely remain the goal" (Larnrani 20 16). This stands true unless some space actor finds a utility in disrupting the arena for others.

#### Space debris creates existential deterrence and a taboo

Bowen 18 [(Bleddyn, lecturer in International Relations at the University of Leicester) “The Art of Space Deterrence,” European Leadership Network, February 20, 2018, https://www.europeanleadershipnetwork.org/commentary/the-art-of-space-deterrence/] TDI

Fourth, the ubiquity of space infrastructure and the fragility of the space environment may create a degree of existential deterrence. As space is so useful to modern economies and military forces, a large-scale disruption of space infrastructure may be so intuitively escalatory to decision-makers that there may be a natural caution against a wholesale assault on a state’s entire space capabilities because the consequences of doing so approach the mentalities of total war, or nuclear responses if a society begins tearing itself apart because of the collapse of optimised energy grids and just-in-time supply chains. In addition, the problem of space debris and the political-legal hurdles to conducting debris clean-up operations mean that even a handful of explosive events in space can render a region of Earth orbit unusable for everyone. This could caution a country like China from excessive kinetic intercept missions because its own military and economy is increasingly reliant on outer space, but perhaps not a country like North Korea which does not rely on space. The usefulness, sensitivity, and fragility of space may have some existential deterrent effect. China’s catastrophic anti-satellite weapons test in 2007 is a valuable lesson for all on the potentially devastating effect of kinetic warfare in orbit.

#### Debris doesn’t matter there

Von Fange 17 [Daniel Von Fange is a full stack developer that builds web platforms and engineer, with a particular interest in space applications. Kessler Syndrome is Over Hyped. May 21, 2017. braino.org/essays/kessler\_syndrome\_is\_over\_hyped/]

GEO - If you put a satellite far enough out from earth, the speed that the satellite travels around the earth will match the speed of the surface of the earth rotating under it. From the ground, the satellite will appear to hang motionless. Usually the geostationary orbit is used by big weather satellites and big TV broadcasting satellites. (This apparent motionlessness is why satellite TV dishes can be mounted pointing in a fixed direction. You can find approximate south just by looking around at the dishes in your northern hemisphere neighborhood.) For Kessler purposes, GEO orbit is roughly a ring 384,400 km around. However, all the satellites here are moving the same direction at the same speed - debris doesn’t get free velocity from the speed of the satellites. Also, it’s quite expensive to get a satellite here, and so there aren’t many, only about one satellite per 1000km of the ring. Kessler is not a problem here.

#### Collision risk is tiny

Wein 9 [Lawrence M. Wein, Professor & Senior Fellow at Stanford’s Center for International Security and Cooperation Jeffrey S. Skoll Professor of Management Science at Stanford University and Senior Fellow at Stanford’s Center for International Security and Cooperation, former DEC Leaders for Manufacturing Professor of Management Science at MIT, and Andrew M. Bradley, PhD-Institute for Computational and Mathematical Engineering at Stanford University, Space debris: Assessing risk and responsibility, Advances in Space Research 43 (2009) 1372–1390]

More importantly, while our numerical results mimic earlier results (Liou and Johnson, 2005; Walker and Martin, 2004) that stressed the importance of postmission deorbiting, we do not necessarily agree with the claim that the only way to prevent future problems is to remove existing large intacts from space (Liou and Johnson, 2006, 2008). The divergence between our views and those in Liou and Johnson (2006, 2008) is perhaps due to the different performance metrics used. The root causes for alarm in Liou and Johnson (2006, 2008) appear to be the growth rate of fragments and the small increase in the rate of catastrophic collisions over the next 200 years (Liou and Johnson, 2008, Fig. 2). However, the great majority of catastrophic collisions in the SOI do not involve operational spacecraft, and are hazardous only in the sense that the fragments generated from such a collision could subsequently damage or destroy operational spacecraft. Therefore, we introduced the notion of the lifetime risk of an operational spacecraft as the primary performance metric. Our model predicts that the lifetime risk is <5x10^-4 [less than .0005%] over the next two centuries, and always stays <10^-3 [less than .001%] than if there is very high (>98%) spacecraft deorbiting compliance. These risks appear to be low relative to the immense cost and considerable technological uncertainty involved in removing large objects from space, are dwarfed by the ~20% historical mission-impacting (but not necessarily mission-ending) failure rate of spacecraft (Frost and Sullivan, 2004), and could be overestimated if improved traffic management techniques lower future collision risks (Johnson, 2004). Hence, the need to bring large objects down from space does not appear to be as clear cut as suggested in Liou and Johnson (2006, 2008). Nonetheless, our model does not incorporate the possibility of intentional catastrophic collisions (ASAT tests, space wars) that could conceivably occur in the future. In addition, Fig. 5 considers only catastrophic collisions, whereas noncatastrophic intact-fragment collisions could easily disable an operational spacecraft. If the operational lifetime risk is modified to include noncatastrophic collisions with fragments >= 10cm, then the sustainable risk rises by ~50%: it increases from 2.19x10^-2 [.0219%] to 3.09x10^-2 in the base case, and increases from 4.91x10^-4 [.000491%] to 7.94x10^-4 in the full compliance case. Moreover, if fragments >= 1 cm (rather than >= 10 cm) are harmful to spacecraft (Johnson, 2004), then we (as well as other researchers) could be underestimating the risk.