### 1NC – T

#### Interpretation: appropriation involves permanent, exclusive use of land and resource extraction. The aff must defend that appropriation of outer space by private entities is unjust.

Stephen Gorove, Stephen Gorove (1917-2001) was a space law education pioneer. He served as a professor of space law and director of space studies and policy, from 1991-1998, at the University of Mississippi., 1969 " Interpreting Article II of the Outer Space Treaty" Fordham Law Review, https://ir.lawnet.fordham.edu/cgi/viewcontent.cgi?article=1966&context=flr

With respect to the concept of appropriation the basic question is **what constitutes "appropriation,"** as used in the Treaty, especially in contradistinction to casual or temporary use. The term "appropriation" is used most frequently to denote the taking of property for one's own or exclusive use with a sense of permanence. Under such interpretation the establishment of a permanent settlement or the carrying out of commercial activities by nationals of a country on a celestial body may constitute national appropriation if the activities take place under the supreme authority (sovereignty) of the state. Short of this, if the state wields no exclusive authority or jurisdiction in relation to the area in question, the answer would seem to be in the negative, unless, the nationals also use their individual appropriations as cover-ups for their state's activities.5 In this connection, it should be emphasized that the word "appropriation" indicates a taking which involves something more than just a casual use. Thus a temporary occupation of a landing site or other area, just like the **temporary or nonexclusive use of property, would not constitute appropriation**. By the same token, any use involving consumption or **taking with intention of keeping for one's own exclusive use would amount to appropriation.**

#### Violation – application of PTD to space isn’t permanent, it’s context dependent and depends on cost benefit analysis

**WEF n.d.** -- (“Public Trust Doctrine.” Water Education Foundation, The Water Education Foundation is a nonprofit organization whose goal is to provide unbiased, balanced information on water issues in California and the Southwestern United States. The Foundation's mission, since its founding in 1977, has been "to create a better understanding of water resources and foster public understanding and resolution of water resource issues through facilitation, education and outreach,” <https://www.watereducation.org/aquapedia/public-trust-doctrine>, HKR-AS)

Rooted in Roman law, the public trust doctrine recognizes the public right to many natural resources including “the air, running water, the sea and its shore.”

The public trust doctrine requires the sovereign, or state, to hold in trust designated resources for the benefit of the people. Traditionally, the public trust applied to commerce and fishing in navigable waters, but its uses were expanded in California in 1971 to include fish, wildlife, habitat and recreation.

At that time, the California Supreme Court in Marks v. Whitney broadened the definition of public trust because “public trust uses are sufficiently flexible to **encompass changing public needs**.” This definition would be first applied in a legal case in the 1980s (see below). [See also California water rights.]

Mono Lake Case

In California, public trust was most notably invoked in a landmark case involving water use at Mono Lake.

In a landmark case filed to protect the Mono Lake Basin from 40 years of water diversions by the city of Los Angeles, California’s Supreme Court ruled in 1983 that reasonable and beneficial uses of water **must be interpreted in accordance with public trust needs**. This was the first case in California where the public trust doctrine was applied.

Significantly, the Mono Lake decision held that the state retains jurisdiction over these rights and may reconsider the impact on public trust, which in addition to the traditional commerce, navigation and fishing, includes wildlife habitat. The necessity of protecting the public trust was to be determined by balancing the value and cost of instream water needs against the benefits and costs of diversions. [Purchase the Layperson’s Guide to Water Rights to learn more about public trust.]

#### Vote neg –

#### Ground – allowing affs to not defend permanent appropriation kills negative ground – we can’t read the innovation DA, since they can say innovative appropriation efforts are allowed, we can’t read asteroid mining or disads to specific types of appropriation since they can defend an exemption for that, etc

#### T is a voting issue that should be evaluated through competing interps – it tells the negative what to prepare for and reasonability invites judge intervention

### 1NC – DA

#### 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.

## Case

### Solvency

#### Expanding PTD shatters the entire legal-regulatory balance

Huffman 15 [James L. Huffman is Dean Emeritus of Lewis & Clark Law School and a Visiting Fellow at the Hoover Institution. He holds degrees from Montana State University (BS), The Fletcher School of Tufts University (MA) and the University of Chicago (JD). "WHY LIBERATING THE PUBLIC TRUST DOCTRINE IS BAD FOR THE PUBLIC." https://law.lclark.edu/live/files/19611-45-2huffman]

Since the beginning of the modern environmental movement in the 1960s, environmental advocates have been in search of ways to circumvent the twin obstacles of political compromise and vested property rights. In a 1970 article, Professor Joseph Sax suggested that the common law public trust doctrine might provide an avenue for judicial intervention in the name of claimed public rights in a wide array of natural resources. Because the traditional doctrine was narrowly limited in terms of both public rights and affected resources, Sax published a second article ten years later, calling for courts to liberate the public trust doctrine from its historical parameters. While a few judges responded with generally limited extensions of the doctrine, Sax’s plea has been ignored by most courts—but not by academics. A flood of law review articles have resorted to shoddy history, retrospective theorizing about the origins and purposes of the doctrine, appeals to higher law and moral imperatives, and confusion of the idea of public trust in representative government with the public rights protected by the public trust doctrine in efforts to persuade courts to liberate the doctrine. Implicit, if not explicit, in all of these arguments is the claim that the common law origins of American law and the American judicial system vest courts with authority to amend old law and make new law. At risk in this vast and imaginative effort to liberate the public trust doctrine from its common law confines are the constitutional separation of powers, the rule of law, due process and secure property rights, and the economic prosperity on which environmental protection ultimately depends.

#### Expanding PTD beyond precedent allows for unchecked judicial activism across the law – the plan applies it everywhere on earth, which ensures circumvention, authoritarianism, and shocks global rule of law

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Modern progressives, like their early twentieth century predecessors, tend to be skeptical of democratic policymaking. They prefer to rely on experts, scientific management and expeditious executive action to implement policies they know to be right and good. Democracy, the separation of powers, constitutional rights, and the rule of law all get in the way. It was early frustration with these traditional American principles that led Professor Sax to call for liberating the public trust doctrine from its historical shackles. He recognized that if courts could be persuaded to expand and extend the doctrine, environmentalists could revolutionize American property law while claiming the mantle of the rule of law. Courts would rule for environmentalist claims not because it was the right thing to do but because the law required it.

That barely a handful of courts have even acknowledged Sax’s invitation to liberate the public trust doctrine underscores that most judges, most of the time, do their best to interpret and apply the law as those affected by the law would reasonably expect them to. Most judges understand that people rely on those expectations in their interactions with others and in the risks they assume and to which they expose others. If it were otherwise, people would soon lose confidence in the courts as objective arbiters of disputes.

This does not mean that the law is stuck in the past. The common law has always evolved. But it has evolved in a way that respects rather than undermines expectations. One of the great strengths of the common law method is in “serving the rule of law by adapting legal rules to the demonstrated needs and wishes of those who rely on law to bring at least a degree of certainty to their day-to-day lives.”226

Perhaps the best indication of widespread commitment to the rule of law is that judges seduced into lawmaking of the kind urged by public trust liberationists, like the liberationists themselves, invariably appeal to precedent in seeking to justify their rulings. This does not mean that the lawmaking judges shy away from explaining the policy benefits of their decisions, but one would be hard pressed to find a case in which a court acknowledges that its new rule has no basis in preexisting law. Rather, lawmaking judges follow the path advocated by Judge Richard Posner in his commentary on the Supreme Court’s decision in Bush v. Gore.227 Posner explains that what he calls pragmatic judges should cover their lawmaking tracks by providing “legal-type judgment” as justification.228

Anyone who believes in the rule of law as a necessary principle of government in every free society should be troubled by this ends-driven, whatever-it-takes approach to judging in particular, and government in general. Even accepting, for the sake of argument, that we face a global environmental crisis as Professor Wood and many others assert,229 experience demonstrates that compromising the rule of law will harm rather than help efforts to meet any serious challenge. Saving a failing planet will require innovative thinking and creativity of the highest sort. History demonstrates that individual liberty and the rule of law are essential to such innovation and problem solving. Absent the rule of law, many a nation has failed to solve much lesser challenges.230

### Heritage

#### Recycling solves- as minerals get scarcer, there will be more investment.

Jean Kumagai 21, Senior Editor, Bachelor’s in Science Technology, and Society from Stanford, 1-5-2021, "Lithium-Ion Battery Recycling Finally Takes Off in North America and Europe," IEEE Spectrum, https://spectrum.ieee.org/lithiumion-battery-recycling-finally-takes-off-in-north-america-and-europe, Accessed 12-4-2021, LR

LATER THIS YEAR, the Canadian firm Li-Cycle will begin constructing a US $175 million plant in Rochester, N.Y., on the grounds of what used to be the Eastman Kodak complex. When completed, it will be the largest lithium-ion battery-recycling plant in North America.

The plant will have an eventual capacity of 25 metric kilotons of input material, recovering 95 percent or more of the cobalt, nickel, lithium, and other valuable elements through the company's zero-wastewater, zero-emissions process. “We'll be one of the largest domestic sources of nickel and lithium, as well as the only source of cobalt in the United States," says Ajay Kochhar, Li-Cycle's cofounder and CEO.

Founded in late 2016, the company is part of a booming industry focused on preventing tens of thousands of tons of lithium-ion batteries from entering landfills. Of the 180,000 metric tons of Li-ion batteries available for recycling worldwide in 2019, just a little over half were recycled. As lithium-ion battery production soars, so does interest in recycling.

According to London-based Circular Energy Storage, a consultancy that tracks the lithium-ion battery-recycling market, about a hundred companies worldwide recycle lithium-ion batteries or plan to do so soon. The industry is concentrated in China and South Korea, where the vast majority of the batteries are also made, but there are several dozen recycling startups in North America and Europe. In addition to Li-Cycle, that list includes Stockholm-based Northvolt, which is jointly building an EV-battery-recycling plant with Norway's Hydro, and Tesla alum J.B. Straubel's Redwood Materials, which has a broader scope of recycling electronic waste. [See sidebar, “14 Li-ion Battery-Recycling Projects to Watch."]

#### No warming impact --- adaptation and intervening actors.

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The most likely levels of global warming are very unlikely to cause human extinction.15 The existential risks of climate change instead stem from tail risk climate change – the low probability of extreme levels of warming – and interaction with other sources of risk. It is impossible to say with confidence at what point global warming would become severe enough to pose an existential threat. Research has suggested that warming of 11-12°C would render most of the planet uninhabitable,16 and would completely devastate agriculture.17 This would pose an extreme threat to human civilisation as we know it.18 Warming of around 7°C or more could potentially produce conflict and instability on such a scale that the indirect effects could be an existential risk, although it is extremely uncertain how likely such scenarios are.19 Moreover, the timescales over which such changes might happen could mean that humanity is able to adapt enough to avoid extinction in even very extreme scenarios.¶ The probability of these levels of warming depends on eventual greenhouse gas concentrations. According to some experts, unless strong action is taken soon by major emitters, it is likely that we will pursue a medium-high emissions pathway.20 If we do, the chance of extreme warming is highly uncertain but appears non-negligible. Current concentrations of greenhouse gases are higher than they have been for hundreds of thousands of years,21 which means that there are significant unknown unknowns about how the climate system will respond. Particularly concerning is the risk of positive feedback loops, such as the release of vast amounts of methane from melting of the arctic permafrost, which would cause rapid and disastrous warming.22 The economists Gernot Wagner and Martin Weitzman have used IPCC figures (which do not include modelling of feedback loops such as those from melting permafrost) to estimate that if we continue to pursue a medium-high emissions pathway, the probability of eventual warming of 6°C is around 10%,23 and of 10°C is around 3%.24 These estimates are of course highly uncertain.¶ It is likely that the world will take action against climate change once it begins to impose large costs on human society, long before there is warming of 10°C. Unfortunately, there is significant inertia in the climate system: there is a 25 to 50 year lag between CO2 emissions and eventual warming,25 and it is expected that 40% of the peak concentration of CO2 will remain in the atmosphere 1,000 years after the peak is reached.26 Consequently, it is impossible to reduce temperatures quickly by reducing CO2 emissions. If the world does start to face costly warming, the international community will therefore face strong incentives to find other ways to reduce global temperatures.

### !T – Shortages

#### Resource conflict is inevitable from population and economic shifts---water scarcity creates cooperation that defuses it

Dr. Thomas Bernauer 20, Professor of Political Science and Director of the Institute of Science, Technology and Policy (ISTP) at ETH Zurich, and Dr. Tobias Böhmelt, Professor of Government at the University of Essex, “International Conflict and Cooperation Over Freshwater Resources”, Nature Sustainability, Volume 3, https://www.nature.com/articles/s41893-020-0479-8

Unsustainable use of freshwater resources worldwide creates enormous challenges for human societies populating these natural systems, and these challenges are likely to grow with climate change. Will societies respond with increased cooperation to manage freshwater resources more sustainably or will there be more conflict over this scarce but vital resource? This review of research on conflict and cooperation over transboundary freshwater resources shows that, thus far, the prevailing response is cooperation, albeit non-violent conflict is quite frequent, too. It also documents substantial progress in understanding the drivers of water-related cooperation and conflict. Key knowledge gaps remain, particularly with respect to transboundary water conflict and cooperation in the past 10 to 15 years and in terms of local water-related events. The key prerequisite for filling these gaps is that the research community engages in a joint effort to address persistent shortcomings in existing event datasets on water cooperation and conflict.

Main

Scientific and policy debates over human impacts on global freshwater resources have been intensifying, particularly in the context of growing concerns about the implications of climate change for already stressed freshwater systems1,2,3. Climate change is likely to lead to greater variability and, in some places, an overall decrease of available freshwater, while human water use is likely to increase. The latter is driven primarily by population and economic growth as well as more consumption of goods with a high water footprint4. Projections such as these have led some scholars and policymakers to expect an increasing risk of conflicts, including violent ones, over scarce freshwater resources. Others, objecting to this Neo-Malthusian predicament, are more optimistic in view of humanity’s potential for social and technological innovation. While such expectations about the future are marked by great uncertainty, empirical research can help us understand whether and under what conditions human and climate-induced water scarcity has led to conflict or cooperative problem solving.

Human impacts on freshwater systems are well understood from a geophysical and biological perspective5,6,7,8,9,10. Much less is known about the implications of these impacts for the wellbeing of human societies relying on them. For example, controversy surrounds whether and how higher freshwater-related stress, resulting from overconsumption (water demand) or from climate-related variability and scarcity (water supply), might affect people, and how societies will respond and perform in terms of adaptive capacity and resilience. Potential effects of increased water stress on human security range from higher poverty and social instability to human migration and violent conflict within and between nations11,12,13,14.

Research on freshwater conflict and cooperation to mitigate and adapt to water problems has contributed in important ways to scientific and policy debates over the past two decades. Scholars have developed concepts and approaches to measure conflict and cooperation and to systematically assess their drivers. The most important literature in this field focuses on international freshwater catchments, on global comparisons of such catchments, and conflict and cooperation amongst riparian countries15,16,17,18,19,20. International river basins are defined by either a common water flow destination, or water flowing year-round across boundaries21. There currently are around 310 international river basins that are shared by 150 countries. They cover 47% of the world’s land surface and are home to 52% of the world’s population15. In this Review, we assess what we can learn from research on international freshwater conflict and cooperation, where our understanding remains limited, and how we can overcome existing gaps22.

Most studies on freshwater conflict and cooperation focus on individual international freshwater catchments and on policy options for dealing with the respective local challenges (for example, the Brahmaputra23, Indus24 or La Plata25 river basins). Complementing case-specific studies, we focus this Review on more general, global answers to several key questions: how prevalent are water conflict and cooperation in international freshwater catchments globally? Which catchments are more prone to water conflict or cooperation, and under what circumstances do we observe more conflict or cooperation? What conditions make catchments and their riparian countries more resilient to water-related stress and what role does international cooperation play here? Together with insights on specific freshwater catchments, answers to these questions contribute to a comprehensive assessment of anthropogenic impacts, adaptation and vulnerability with respect to global freshwater resources, and also to more informed policy choices.

Why focus on international water basins?

Freshwater-related conflict and cooperation can, in principle, be studied at any geographic, hydrological or social scale, for example, from small social groups such as a village to the water-catchment level as a hydrological unit. Climate change may be more likely to lead to local or sub-national than to international conflicts and there is an urgent need to concentrate more strongly on those as well. However, most scientific progress so far has been made on international freshwater conflict and cooperation, and we focus on this research for two additional reasons. The first reason is analytical. Generalizable conclusions about conflict and cooperation over freshwater resources should be based on a systematic comparison of a large number of clearly defined and homogeneous units, ideally for a known population. These conditions are met for countries and international freshwater catchments, all of which can be systematically identified and characterized, based on hydrological, political and other data. Such identification is more difficult for other units of analysis, such as social or ethnic groups, villages, cities and subsystems of water catchments. This also explains why the literature on freshwater conflict and cooperation at sub-national scales remains less developed (for exceptions, see refs. 18,26,27).

Second, because international freshwater catchments extend beyond national jurisdictions and their policy-making structures, effective policy responses to water stress require international collective action. In contrast to domestic water problems, which in principle can be addressed through interventions by a single government, problem-solving approaches among countries in international freshwater catchments are more complex and potentially more prone to failure15,19,20,28.

Characterizing freshwater catchments

A large literature focuses on individual cases and provides valuable insights into how water stress may lead to cooperative or conflictive outcomes, for example, via differences in how international negotiations and river management institutions are designed29,30,31,32,33,34,35,36,37. The main limitation of this research is that cooperation and conflict are empirically identified and measured differently, and explanations of particular outcomes are case-specific and based mostly on qualitative interpretation of evidence. This makes it difficult to generate generalizable conclusions about international freshwater cooperation and conflict, such as global development over time, spatial and temporal drivers, and which freshwater systems are at particular risk.

Quantitative research on conflict and cooperation in international river basins has made substantial progress over the past two decades. This applies in particular to generating better empirical data on the characteristics of international freshwater catchments and a widely accepted approach to measuring levels of cooperation and conflict. With regard to the characteristics of international freshwater catchments, based on geographic information systems and geophysical, political and other data, researchers have characterized the global landscape of international freshwater catchments. Generating this information is challenging, particularly because of technical difficulties in delineating, with high spatial resolution, the geophysical boundaries of freshwater catchments and the (sometimes time-varying) political boundaries of countries15,20,38.

One example for why increased spatial resolution is important concerns a popular hypothesis in the international water management literature. It holds that river settings with an upstream–downstream political geography are more prone to conflict. In such settings, the upstream country is likely to have an incentive to exploit its position in ways to impose damages on the downstream state (for example, reduced river flow). However, identifying where any given country in a catchment is located relative to other states is far from trivial, particularly in complex river geographies. Available data and methods now allow us to capture country and catchment boundaries with adequate precision. This also facilitates determining which countries in a catchment are more upstream or downstream, and how two or more states relate to each other in terms of freshwater dependencies15. We can thus use these measures to assess, for instance, whether upstream–downstream asymmetries between countries in freshwater catchments are, all else equal, associated with more water conflict and less cooperation.

To capture hydro-political dependence among riparian states, Beck et al.16, for example, employ a flow accumulation matrix that was created for each international river basin. They calculate the number of cells draining into a given country and determine the dependence of each riparian country on the other countries within a basin16. A flow interdependence matrix then indicates the flow contribution to each of the riparian countries. Based on these new data, they show that, contrary to conventional wisdom, there is no robust evidence for the claim that upstream–downstream catchments suffer from more water conflict than catchments with less pronounced upstream–downstream asymmetries.

Quantifying water conflict and cooperation

Generating accurate data on international freshwater conflict and cooperation is associated with a variety of challenges. In contrast to geophysical phenomena, social or political ones are usually not directly observable, but must be inferred from secondary sources. That said, most scholars now agree on what water-related cooperation and conflict means at the conceptual level, what procedures should be used to assess information from particular sources to generate numerical scores from this information, and how to structure such data for meaningful analysis14,20,39. In line with common practice in conflict research, conflict and cooperation are viewed as a social interaction that involves at least two actors. Hence, freshwater catchments with more than two countries are disaggregated into country pairs (for example, three country pairs, or dyads, in a catchment with three riparians).

Three main approaches capture conflict and/or cooperation over international freshwater catchments. First, conflict can be measured by means of widely available data on armed conflict40 and/or so-called militarized interstate disputes41. These outcomes are then combined with explanatory variables characterizing freshwater systems. Using this approach, various studies have examined whether water scarcity could, all else equal, increase the probability of armed hostilities between countries42. Second, cooperation over international freshwater resources can be operationalized via international water agreements, treaties, or joint river basin management approaches, among other variables along those lines43,44,45,46,47,48. For example, Giordano et al.47 identify 688 agreements signed between 1820 and 2007 that constitute 250 independent treaties and apply to 113 basins. Third, research coding event data for both conflict and cooperation builds on data collection approaches used in the study of international relations and conflict between countries (for example, the WEIS49 coding project or, more recently, the CAMEO50 framework and the Open Event Data Alliance51). Such coding is based on content analysis of global news media reporting, available from digital archives of translated reports, such as BBC Monitoring52 or Factiva53. Research teams have extracted large amounts of text material from these sources, using search algorithms that seek to strike a balance between capturing relevant reports and avoiding too many irrelevant items38. Human coders then identified water-related events and scored these on scales ranging from conflict to cooperation.

Studies based on the first approach, that is, those explaining armed conflict or militarized disputes in terms of water stress, have produced inconclusive findings15,16,41. Even if there is evidence for some water-related influence, other determinants of armed conflict actually play a much more important role than water stress. For example, Beck et al.16 or Bernauer and Böhmelt17 report a stronger impact of factors like income or population, which are indeed among the most robust predictors in ‘traditional’ armed-conflict models54. This finding mirrors the literature on climate change and political violence. Besides, this literature has three limitations. First, it focuses on identifying a possible correlation (all else equal) between water stress and conflict, but cannot tell us whether conflict, if observed, was directly water-related. This raises questions about the causal influence of water stress. Second, armed conflict is an extreme, and rare, form of social interactions. Concentrating on this disregards other types of conflictive interactions that water stress may induce. In fact, the basins-at-risk (BAR) scale discussed below demonstrates that non-violent conflict events are far more prevalent than violent ones. Third, this literature does not tell us much about the flip-side of conflict, that is, the conditions under which water stress may induce cooperative efforts and motivate societies to unleash their adaptive capacities11,13,27,41. The works on transboundary water cooperation42,43,44,45,46,47 address the latter point to some extent, but many of these studies focus on binary classifications of treaty formation. However, the overall degree of cooperation and eventual success cannot be comprehensively captured by a dichotomous item on whether states concluded a treaty on a transboundary water resource or not.

The main limitations of event-data coding, which we consider the most promising approach, pertain to the quality of the text material and the human-coding process. Media reporting in richer countries with free media is more likely to pick up events of interest and report on them with accuracy. This means, for instance, that conflictive events, relative to cooperative ones, might be underreported in authoritarian political systems. While this problem is not trivial, it is usually mitigated because at least the more important events (because of scale and intensity) tend to be covered by several media sources, including those in neighbouring countries or the international press. One alternative is to scrape the Internet or use social-media data, such as data from Twitter. But such information suffers from biases, too, because governments and other actors can manipulate Internet access and post wrong or misleading information. In addition, there are no information platforms that would offer consistent information for events-data coding in one or a few languages—the latter is needed to make the task manageable for a small- to medium-size research team (there are around 6,500 spoken languages in the world).

Another challenge is that in extracting and characterizing events from media text material, humans can make mistakes (for example, overlook certain information) or subjective assessments. Agreed definitions of key concepts and detailed coding instructions, scales and procedures have helped to reduce subjectivity and error. While the obvious next step would be to use automated (computerized) coding approaches, the material from which to code freshwater conflict and cooperation is more heterogeneous than for other applications, such as central bank statements, consumer sentiment or political party programs. Moreover, machine-learning algorithms may also be biased due to the data they are trained on. In sum, while some challenges remain and the data generated on freshwater conflict and cooperation are not perfect, they are probably as good in quality as the most commonly used social-sciences data, such as economic growth, democracy, poverty and so on.

Event-data coding of transboundary water conflict and cooperation is arguably the most widely used approach and has generated numerical information on freshwater-related events between pairs of countries in a given international catchment over time38. The BAR55,56,57 scale is one of the most prominent measures here: it ranges between –7 (maximum conflict) and +7 (maximum cooperation) and captures the degree of conflict and cooperation over international freshwater catchments between 1948 and 2008. Other datasets include the International River Basin Conflict and Cooperation (IRCC) data38 and the Issue Correlates of War − River Claims dataset56. Evidently, one shortcoming of the BAR data is that the most recent year covered is 2008. While we can still learn a lot from analysing data for 50 years, including information on the more recent past remains highly desirable from a policy perspective and in the scholarly interest.

Figure 1 illustrates the distribution of cooperation and conflict events across all freshwater catchments and countries, using median values of conflict and cooperation per year from 1948–2008. Perhaps surprisingly, states’ interaction over freshwater catchments is generally, that is, on global average of all catchments and countries in a given year, characterized by more cooperation than conflict. For the majority of years from 1948–2008, the median values of the BAR scale are well above 0, indicating that cooperation was more prevalent than conflict. From a policy perspective, it is interesting to pinpoint those catchments that experience most conflict or cooperation: hence, disaggregating the BAR scale by catchment.

Chart

Description automatically generated with medium confidence

The graph depicts three median splines across the BAR scale’s observation period for all possible BAR values, only cooperative (positive) ones, and only conflictive (negative) ones. The graph is based on data from www.transboundarywaters.science.oregonstate.edu.

Understanding the spatial and temporal distribution of international freshwater conflict and cooperation, in a descriptive sense, is important in its own right. However, it is also imperative to understand the drivers of variation in conflict and cooperation. Why do some catchments and/or pairs of countries in those catchments experience more conflict? Why is cooperation more prevalent in other cases?

Predictors of water cooperation and conflict

Accurate characterizations of international freshwater catchments and precise data on water conflict and cooperation are a precondition for meaningful analysis of drivers of water conflict and cooperation. Such analysis views conflict and cooperation as the outcomes to be explained and focuses both on conflict and cooperation at varying levels of intensity (for example, from conflictual verbal exchanges to violent conflict over water). Such research is obviously also of interest to practitioners because they are interested in which particular factors induce conflict or cooperation to identify risks and opportunities for cooperative solutions. Studies of factors associated with, or that cause variation in, the outcome variable (for example, the outbreak of armed conflict, the emergence of a water treaty, or values on the BAR scale) are based on a range of statistics, from correlational analysis to estimating the predictive power of specific determinants. In the following, we discuss the most common and robust predictors of transboundary water conflict and cooperation55,58,59.

#### It causes water diplomacy---that defuses war AND is a CBM that de-escalates other disputes

Sarah Forland 21, Public Diplomacy and Strategic Communications Intern at the American Security Project and Master's in Public Relations Candidate at Syracuse University, “Water: A Tool for Peace and Diplomacy”, American Security Project, 4/30/2021, https://www.americansecurityproject.org/water-a-tool-for-peace-and-diplomacy/

With over two billion people around the world lacking access to safe drinking water and twice as many without safely managed sanitation service, the United Nations has made reducing water stress and scarcity the priority of the decade. A 2021 World Economic Report listed water crises as one of the top five threats to global security due to its wide-reaching impact, from food security and agriculture to sanitation and health.

Consequently, water diplomacy—the process of negotiating sustainable water sharing, management, and governance practices for transboundary resources—is vital to promoting a more water secure world, reducing regional instability, and advancing U.S. interests. To mitigate future water stress, water diplomacy should be prioritized in international climate action.

WATER DIPLOMACY: A SOURCE OF COOPERATION AND SUSTAINABLE DEVELOPMENT

Water has long been a source of both international conflict and cooperation. Transboundary water basins cover almost half of the world’s land surface and 153 nations share rivers, lakes, and aquifers. While states are actually more likely to cooperate when it comes to shared water resources, some evidence points to a potential recent rise in water-based conflict. One study identified five “hot spot” basins for future water-related disputes: the Nile, the Ganges/Brahmaputra, the Indus, the Tigris/Euphrates, and the Colorado River.

Water diplomacy can be an effective tool in fostering cooperation among states with shared water sources. Water sharing agreement mechanisms, such as governance meetings and prior notification for projects that may impact the shared water, requires ongoing communication between states. By facilitating greater dialogue between nations at all levels—governmental, private industry, and civil society—water diplomacy can forge deeper people-to-people and expert-to-expert connections. In addition, water diplomacy agreements can serve as frameworks for negotiation that can be used to address other potential disputes and act as a confidence-building measure between nations, allowing agreements to persist even in the presence of other regional tensions. For example, the 1960 Indus Water Treaty between India and Pakistan has remained in place despite strained relations between the countries. Despite regional tensions, Jordan and Israel signed a water-sharing treaty in 1994, which the nations renewed in 2015.

#### Solidifying CBMs stops military miscalc that goes nuclear---the threat’s increasing

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Militaries around the world believe that the integration of machine learning methods throughout their forces could improve their effectiveness. From algorithms to aid in recruiting and promotion, to those designed for surveillance and early warning, to those used directly on the battlefield, applications of artificial intelligence (AI) could shape the future character of warfare. These uses could also generate significant risks for international stability. These risks relate to broad facets of AI that could shape warfare, limits to machine learning methods that could increase the risks of inadvertent conflict, and specific mission areas, such as nuclear operations, where the use of AI could be dangerous. To reduce these risks and promote international stability, we explore the potential use of confidence-building measures (CBMs), constructed around the shared interests that all countries have in preventing inadvertent war. Though not a panacea, CBMs could create standards for information-sharing and notifications about AI-enabled systems that make inadvertent conflict less likely.

Introduction

In recent years, the machine learning revolution has sparked a wave of interest in artificial intelligence (AI) applications across a range of industries. Nations are also mobilizing to use AI for national security and military purposes.1 It is therefore vital to assess how the militarization of AI could affect international stability and how to encourage militaries to adopt AI in a responsible manner. Doing so requires understanding the features of AI, the ways it could shape warfare, and the risks to international stability resulting from the militarization of artificial intelligence.

AI is a general-purpose technology akin to computers or the internal combustion engine, not a discrete technology like missiles or aircraft. Thus, while concerns of an “AI arms race” are overblown, real risks exist.2 Additionally, despite the rhetoric of many national leaders, military spending on AI is relatively modest to date. Rather than a fervent arms race, militaries’ pursuit of AI looks more like routine adoption of new technologies and a continuation of the multi-decade trend of adoption of computers, networking, and other information technologies. Nevertheless, the incorporation of AI into national security applications and warfare poses genuine risks. Recognizing the risks is not enough, however. Addressing them requires laying out suggestions for practical steps states can take to minimize risks stemming from military AI competition.3 One approach states could take is adopting confidence-building measures (CBMs): unilateral, bilateral, and/or multilateral actions that states can take to build trust and prevent inadvertent military conflict. CBMs generally involve using transparency, notification, and monitoring to attempt to mitigate the risk of conflict.4 There are challenges involved in CBM adoption due to differences in the character of international competition today versus during the Cold War, when CBMs became prominent as a concept. However, considering possibilities for CBMs and exploring ways to shape the dialogue about AI could make the adoption of stability-promoting CBMs more likely.

Rather than a fervent arms race, militaries’ pursuit of AI looks more like routine adoption of new technologies and a continuation of the multi-decade trend of adoption of computers, networking, and other information technologies.

This paper briefly outlines some of the potential risks to international stability arising from military applications of AI, including ways AI could influence the character of warfare, risks based on the current limits of AI technology, and risks relating to some specific mission areas, such as nuclear operations, in which introducing AI could present challenges to stability. The paper then describes possible CBMs to address these risks, moving from broad measures applicable to many military applications of AI to targeted measures designed to address specific risks. In each discussion of CBMs, the paper lays out both the opportunities and potential downsides of states adopting the CBM.

Military Uses of AI: A Risk to International Stability?

Militaries have an inherent interest in staying ahead of their competitors, or at least not falling behind. National militaries want to avoid fielding inferior military capabilities and so will generally pursue emerging technologies that could improve their ability to fight. While the pursuit of new technologies is normal, some technologies raise concerns because of their impact on stability or their potential to shift warfare in a direction that causes net increased harm for all (combatants and/or civilians). For example, around the turn of the 20th century, great powers debated, with mixed results, arms control against a host of industrial era technologies that they feared could alter warfare in profound ways. These included submarines, air-delivered weapons, exploding bullets, and poison gas.

After the invention of nuclear weapons, concerns surrounding their potential use dominated the attention of policymakers given the weapons’ sheer destructive potential. Especially after the Cuban Missile Crisis illustrated the very real risk of escalation, the United States and the Soviet Union engaged in arms control on a range of weapons technologies, including strategic missile defense, intermediate-range missiles, space-based weapons of mass destruction (WMDs), biological weapons, and apparent tacit restraint in neutron bombs and anti-satellite weapons. The United States and the Soviet Union also, at times, cooperated to avoid miscalculation and improve stability through measures such as the Open Skies Treaty and the 1972 Incidents at Sea Agreement.

It is reasonable and, in fact, vital to examine whether the integration of AI into warfare might also pose risks that policymakers should attend. Some AI researchers themselves have raised alarm at militaries’ adoption of AI and the way it could increase the risk of war and international instability.5 Understanding risks stemming from military use of AI is complicated, however, by the fact that AI is not a discrete technology like missiles or submarines. As a general-purpose technology, AI has many applications, any of which could, individually, improve or undermine stability in various ways.

Militaries are only beginning the process of adopting AI, and in the near term, military AI use is likely to be limited and incremental. Over time, the cognization of warfare through the introduction of artificial intelligence could change warfare in profound ways, just as industrial revolutions in the past shaped warfare.6 Even if militaries successfully manage safety and security concerns and field AI systems that are robust and secure, properly functioning AI systems could create challenges for international stability.

For example, both Chinese and American scholars have hypothesized that the introduction of AI and autonomous systems in combat operations could accelerate the tempo of warfare beyond the pace of human control. Chinese scholars have referred to this concept as a battlefield “singularity,”7 while some Americans have coined the term “hyperwar” to refer to a similar idea.8 If warfare evolves to a point where the pace of combat outpaces humans’ ability to keep up, and therefore control over military operations must be handed to machines, it would pose significant risks for international stability, even if the delegation decision seems necessary due to competitive pressure. Humans might lose control over managing escalation, and war termination could be significantly complicated if machines fight at a pace that is faster than humans can respond. In addition, delegation of escalation control to machines could mean that minor tactical missteps or accidents that are part and parcel of military operations in the chaos and fog of war, including fratricide, civilian casualties, and poor military judgment, could spiral out of control and reach catastrophic proportions before humans have time to intervene.

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The logic of a battlefield singularity, or hyperwar, is troubling precisely because competitive pressures could drive militaries to accelerate the tempo of operations and remove humans “from the loop,” even if they would rather not, in order to keep pace with adversaries. Then-Deputy Secretary of Defense Robert Work succinctly captured this dilemma when he posed the question, “If our competitors go to Terminators ... and it turns out the Terminators are able to make decisions faster, even if they’re bad, how would we respond?”9 While this “arms race in speed” is often characterized tactically in the context of lethal autonomous weapon systems, the same dynamic could emerge operationally involving algorithms designed as decision aids. The perception by policymakers that war is evolving to an era of machine-dominated conflict in which humans must cede control to machines to remain competitive could also hasten such a development, particularly if decision makers lack appropriate education about the limits of AI. In extremis, the shift toward the use of algorithms for military decision-making, combined with a more roboticized battlefield, could potentially change the nature of war. War would still be the continuation of politics by other means in the broadest sense, but in the most extreme case it might feature so little human engagement that it is no longer a fundamentally human endeavor.10

The widespread adoption of AI could have a net effect on international stability in other ways. AI systems could change strategy in war, including by substituting machines for human decision-making in some mission areas, and therefore removing certain aspects of human psychology from parts of war.11 Warfare today is waged by humans through physical machinery (rockets, missiles, machine guns, etc.), but decision-making is almost universally human. As algorithms creep closer to the battlefield, some decisions will be made by machines even if warfare remains a human-directed activity that is fought for human political purposes. The widespread integration of machine decision-making across tactical, operational, and strategic levels of warfare could have far-reaching implications. Already, AI agents playing real-time computer strategy games such as StarCraft and Dota 2 have demonstrated superhuman aggressiveness, precision, and coordination. In other strategy games such as poker and go, AI agents have demonstrated an ability to radically adjust playing styles and risk-taking in ways that would be, at best, challenging for humans to mimic for psychological reasons. AI dogfighting agents have similarly demonstrated superhuman precision and employed different tactics because of the ability to take greater risk to themselves.12

In many ways, AI systems have the ability to be the perfect strategic agents, unencumbered by fear, loss aversion, commitment bias, or other human emotional or cognitive biases and limitations.13 While the specific algorithms and models used for computer games are unlikely to transfer well to combat applications, the general characteristics and advantages of AI agents relative to humans could have applications in the military domain. As in the case of speed, the net consequence of machine decision-making on the psychology of combat could change the character of warfare in profound ways.14

AI could have other cumulative effects on warfare. Policymakers generally assess adversaries’ behavior based on an understanding of their capabilities and intentions.15 Shifts toward AI could undermine policymaker knowledge in both of those arenas. The transition of military capabilities to software, already underway but arguably accelerated by the adoption of AI and autonomous systems, could make it harder for policymakers to accurately judge relative military capabilities. Incomplete information about adversary capabilities would therefore increase, conceivably increasing the risks of miscalculation. Alternatively, the opposite could be true—AI and autonomous systems used for intelligence collection and analysis could radically increase transparency about military power, making it easier for policymakers to judge military capabilities and anticipate the outcome of a conflict in advance. This added transparency could decrease the risks of miscalculation and defuse some potential conflicts before they begin.

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The integration of AI into military systems, in combination with a shift toward a more roboticized force structure, could also change policymakers’ threshold for risk-taking, either because they believe that fewer human lives are at risk or that AI systems enable greater precision, or perhaps because they see AI systems as uniquely dangerous. The perceived availability of AI systems could change policymakers’ beliefs about their ability to foresee the outcome of conflicts or to win.

It is, no doubt, challenging to stand at the beginning of the AI age and imagine the cumulative consequence of AI adoption across varied aspects of military operations, including effects that hinge as much on human perception of the technology as the technical characteristics themselves. The history of attempts to regulate the effects of industrial age weapons in the late 19th and early 20th centuries suggests that even when policymakers accurately anticipated risks from certain technologies, such as air-delivered weapons or poison gas, they frequently crafted regulations that turned out to be ill-suited to the specific forms these technologies took as they matured. Furthermore, even when both sides desired restraint, it frequently (although not always) collapsed under the exigencies of war.16 There is no reason to think that our prescience in predicting the path of future technologies or ability to restrain warfare is any better today. There is merit, however, in beginning the process of thinking about the many ways in which AI could influence warfare, big and small.

Even beyond the scenarios described above, it is possible to frame how military applications of AI could impact international stability into two broad categories: (1) risks related to the character of algorithms and their use by militaries, and (2) risks related to militaries using AI for particular missions.

Risks Due to the Limitations of AI

A challenge for military adoption of AI is that two key risks associated with new technology adoption are in tension. First, militaries could fail to adopt—or adopt quickly enough or employ in the right manner—a new technology that yields significant battlefield advantage. As a recent example, despite the overall growth in the military uninhabited, or unmanned, aircraft market, the adoption of uninhabited vehicles has, at times, been a source of contention within the U.S. defense establishment, principally based on debates over the merits of this new technology relative to existing alternatives.17

Alternatively, militaries could adopt an immature technology too quickly, betting heavily and incorrectly on new and untested propositions about how a technology may change warfare. Given the natural incentive militaries have in ensuring their capabilities work on the battlefield, it may be reasonable to assume that militaries would manage these risks reasonably well, although not without some mishaps. But when balancing the risk of accidents versus falling behind adversaries in technological innovation, militaries arguably place safety as a secondary consideration.18 Militaries may be relatively accepting of the risk of accidents in the pursuit of technological advantage, since accidents are a routine element of military operations, even in training.19 Nevertheless, there are strong bureaucratic interests in ultimately ensuring that fielded capabilities are robust and secure, and existing institutional processes may be able to manage AI safety and security risks with some adaptation.

For militaries, balancing between the risks of going too slow versus going too fast with AI adoption is complicated by the fact that AI, and deep learning in particular, is a relatively immature technology with significant vulnerabilities and reliability concerns.20 These concerns are heightened in situations where there may not be ample data on which to train machine learning systems. Machine learning systems generally rely on very large data sets, which may not exist in some military settings, particularly when it comes to early warning of rare events (such as a nuclear attack) or tracking adversary behavior in a multidimensional battlefield. When trained with inadequate data sets or employed outside the narrow context of their design, AI systems are often unreliable and brittle. AI systems can often seem deceptively capable, performing well (sometimes better than humans) in some laboratory settings, then failing dramatically under changing environmental conditions in the real world. Self-driving cars, for example, may be safer than human drivers in some settings, then inexplicably turn deadly in situations where a human operator would not have trouble. Additionally, deep learning methods may, at present, be insufficiently reliable for safety-critical applications even when operating within the bounds of their design specifications.21

For example, concerns about limits to the reliability of algorithms across demographic groups have hindered the deployment of facial recognition technology in the United States, particularly in high-consequence applications such as law enforcement. Militaries, too, should be concerned about technical limitations and vulnerabilities in their AI systems. Militaries want technologies that work, especially on the battlefield. Accordingly, the AI strategy of the Department of Defense (DoD) calls for AI systems that are “resilient, robust, reliable, and secure.”22 This is undoubtedly the correct approach but a challenge, at least in the near term, given the reliability issues facing many uses of algorithms today and the highly dynamic conditions of battlefield use.

An additional challenge stems from security dilemma dynamics. Competitive pressures could lead nations to shortcut test and evaluation (T&E) in a desire to field new AI capabilities ahead of adversaries. Similar competitive pressures to beat others to market appear to have played an exacerbating role in accident risk relating to AI systems in self-driving cars and commercial airplane autopilots.23 Militaries evaluating an AI system of uncertain reliability could, not unjustifiably, feel pressure to hasten deployment if they believe others are taking similar measures. Historically, these pressures are highest immediately before and during wars, where the risk/reward equation surrounding new technologies can shift due to the very real lives on the line. For example, competitive pressures may have spurred the faster introduction of poison gas in World War I.24 Similarly, in World War II, Germany diverted funds from proven technologies into jet engines, ballistic missiles, and helicopters, even though none of the technologies proved mature until after the war.25 This dynamic risk might spark a self-fulfilling prophecy in which countries accelerate deployment of insufficiently tested AI systems out of the fear that others will deploy first.26 The net effect is not an arms race but a “race to the bottom” on safety, leading to the deployment of unsafe AI systems and heightening the risk of accidents and instability.

Even if military AI systems are adequately tested, the use of AI to enable more autonomous machine behavior in military systems raises an additional set of risks. In delegating decision-making from humans to machines, policymakers may de facto be fielding forces with less flexibility and ability to understand context, which would then have deleterious effects on crisis stability and managing escalation. While machines have many advantages in speed, precision, and repeatable actions, machines today cannot come close to human intelligence in understanding context and flexibly adapting to novel situations. This brittleness of machine decision-making may particularly be a challenge in pre-conflict crisis situations, where tensions among nations run high. Military forces from competing nations regularly interact in militarized disputes below the threshold of war in a variety of contested regions (e.g., the India-Pakistan border, China-India border, South China Sea, Black Sea, Syria, etc.). These interactions among deployed forces sometimes run the risk of escalation due to incidents or skirmishes that can inflame tensions on all sides. This poses a challenge for national leaders, who have imperfect command-and-control over their own military forces. Today, however, deployed military forces rely on human decision-making. Humans can understand broad guidance from their national leadership and commander’s intent, such as “defend our territorial claims, but don’t start a war.” Relative to humans, even the most advanced AI systems today have no ability to understand broad guidance, nor do they exhibit the kinds of contextual understanding that humans frequently label “common sense.”27 Militaries already employ uninhabited vehicles (drones) in contested areas, which have been involved in a number of escalatory incidents in the East China Sea, South China Sea, Syria, and Strait of Hormuz.28 Over time, as militaries incorporate more autonomous functionality into uninhabited vehicles, that functionality could complicate interactions in these and other contested areas.

Autonomous systems may take actions based on programming that, while not a malfunction, are other than what a commander would have wanted a similarly situated human to do in the same situation. While the degree of flexibility afforded subordinates varies considerably by military culture and doctrine, humans have a greater ability to flexibly respond to complex and potentially ambiguous escalatory incidents in ways that may balance competing demands of ensuring national resolve while managing escalation.29 Autonomous systems will simply follow their programming, whatever that may be, even if those rules no longer make sense or are inconsistent with a commander’s intent in the given situation. This challenge is compounded by the fact that human commanders cannot anticipate all of the possible situations that forward-deployed military forces in contested regions may face. Employing autonomous systems in a crisis effectively forces human decision makers to tie their own hands with certain pre-specified actions, even if they would rather not.

Unintended actions by autonomous systems in militarized disputes or contested areas are a challenge for militaries as they adopt more autonomous systems into their forces. The complexity of many autonomous systems used today, even ones that rely on rule-based decision-making, may mean that the humans employing autonomous systems lack sufficient understanding of what actions the system may take in certain situations.30 Humans’ ability to flexibly interpret guidance from higher commanders, even to the point of disregarding guidance if it no longer seems applicable, is by contrast a boon to managing escalation risks by retaining human decision-making at the point of interaction among military forces in contested regions.31

Unintended escalation is not merely confined to lethal actions, such as firing on enemy forces. Nonlethal actions, such as crossing into another state’s territory, can be perceived as escalatory. Even if such actions do not lead directly to war, they could heighten tensions, increase suspicion about an adversary’s intentions, or inflame public sentiment. While in most cases, humans would still retain agency over how to respond to an incident, competing autonomous systems could create unexpected interactions or escalatory spirals. Complex, interactive dynamics between algorithms have been seen in other settings, including financial markets,32 and even in situations where the algorithms are relatively simple.33 Another problem stems from the potential inability of humans to call off autonomous systems once deployed. One reason for employing autonomous functionality is so that uninhabited vehicles can continue their missions even if they are operating without reliable communication links to human controllers. When there is no communication link between human operators and an autonomous system, human operators would have no ability to recall the autonomous system if political circumstances changed such that the system’s behavior was no longer appropriate. This could be a challenge in de-escalating a conflict, if political leaders decide to terminate hostilities but have no ability to recall autonomous systems, at least for some period of time. The result could be a continuation of hostilities even after political leaders desire a cease-fire. Alternatively, the inability to fully cease hostilities could undermine truce negotiations, leading to the continuation of conflict. These problems are not unique to autonomous systems. Political leaders have imperfect command-and-control over human military forces, which has, at times, led to similar incidents with human-commanded deployed forces. For example, the Battle of New Orleans in the War of 1812 was fought after a peace treaty ended the war because of the slowness of communications to deployed forces.

Risks Due to the Use of AI for Particular Military Missions

The introduction of AI into military operations could also pose risks in certain circumstances due to the nature of the military mission, even if the AI system performs correctly and consistent with human intentions. Some existing research already focuses on the intersection of AI with specific military mission areas, most notably nuclear stability.34 Nuclear stability is an obvious area of concern given the potential consequences of an intentional or unintentional nuclear detonation.35 Lethal autonomous weapon systems (LAWS), a particular use of AI in which lethal decision-making is delegated from humans to machines, also represents a focus area of existing research. Other areas may deserve special attention from scholars concerned about AI risks. The intersections of AI with cybersecurity and biosecurity are areas worthy of exploration where there has been relatively less work at present.36

Potentially risky applications of AI extend beyond the battlefield to the use of AI to aid in decision-making in areas such as early warning and forecasting adversary behavior. For example, AI tools to monitor, track, and analyze vast amounts of data on adversary behavior for early indications and warning of potential aggression have clear value. However, algorithms also have known limitations and potentially problematic characteristics, such as a lack of transparency or explainability, brittleness in the face of distributional shifts in data, and automation bias. AI systems frequently perform poorly under conditions of novelty, suggesting a continued role for human judgment. The human tendency toward automation bias, coupled with the history of false alarms generated by non-AI early warning and forecasting systems, suggests policymakers should approach the adoption of AI in early warning and forecasting with caution, despite the potential value of using AI in intelligent decision aids.37 Education and training to ensure the responsible use of AI in early warning and forecasting scenarios will be critical.38

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Finally, autonomous systems raise novel challenges of signaling in contested areas because of ambiguity about whether their behavior was intended by human commanders. Even if the system performs as intended, adversaries may not know whether an autonomous system’s behavior was consistent with human intent because of the aforementioned command-and-control issues. This can create ambiguity in a crisis situation about how to interpret an autonomous system’s behavior. For example, if an autonomous system fired on a country’s forces, should that be interpreted as an intentional signal by the commanding nation’s political leaders, or an accident? This, again, is not a novel problem; a similar challenge exists with human-commanded military forces. Nations may not know whether the actions of an adversary’s deployed forces are fully in line with their political leadership’s guidance. Autonomous systems could complicate this dynamic due to uncertainty about whether the actions of an autonomous system are consistent with any human’s intended action.

The Role of Confidence-Building Measures

AI potentially generates risks for international security due to ways AI could change the character of warfare, the limitations of AI technology today, and the use of AI for specific military missions such as nuclear operations. Especially given the uncertain technological trajectory of advances in AI, what are options to reduce the risks that military applications of AI can pose to international stability?

To advance the conversation about ensuring that military AI adoption happens in the safest and most responsible way possible, this paper outlines a series of potential confidence-building measures aimed at mitigating risks from military uses of AI.39 We introduce these ideas as preliminary concepts for future research, discussion, and examination, rather than to specifically advocate for any of these options. But progress in mitigating the risks from military AI competition requires moving beyond the recognition that risk mitigation is important to the hard work of suggesting, evaluating, and examining the benefits and drawbacks of specific mechanisms.40

This paper focuses on confidence-building measures, a broad category of actions that states can take to reduce instability risks. CBMs include actions such as transparency, notification, and monitoring designed to reduce various risks arising from military competition between states. They generally encompass four areas, as Marie-France Desjardins describes:41

* Information-sharing and communication
* Measures to allow for inspections and observers
* “Rules of the road” to govern military operations
* Limits on military readiness and operations

Confidence-building measures are related to, but distinct from, arms control agreements. Arms control encompasses agreements states make to forgo researching, developing, producing, fielding, or employing certain weapons, features of weapons, or applications of weapons. The set of possible actions states could take is broad, and this paper will focus on the potential benefits and drawbacks of specific AI-related confidence-building measures. Arms control for military AI applications is a valuable topic worthy of exploration, but beyond the scope of this paper.42

Historical Applications of CBMs

Confidence-building measures as a concept rose to prominence during the Cold War as a tool to reduce the risk of inadvertent war. In the wake of the Cuban Missile Crisis, the United States and the Soviet Union began exploring ways to improve their communication. While both sides recognized that war might occur, they had a shared interest, due to the potentially world-ending consequences of a global nuclear war, in ensuring that any such outbreak would be due to a deliberate decision, rather than an accident or a misunderstanding.

The desire to build confidence led to a series of bilateral measures. Less than a year after the Cuban Missile Crisis, in June 1963, the United States and the Soviet Union signed a memorandum of understanding to create a hotline between the senior leadership of the two nations.43 The idea was that this line of communication would provide a mechanism for U.S. and Soviet leaders to reach out to their counterparts and discuss crises in a way that made inadvertent escalation less likely. In 1972, as part of the Strategic Arms Limitation Talks (SALT I) arms control agreement, the United States and the Soviet Union went further, signing the Incidents at Sea Agreement, which they had been negotiating since 1967. The Incidents at Sea Agreement, not initially considered a prominent part of the 1972 SALT I accord, created a mechanism for communication and information surrounding the movement of U.S. and Soviet naval vessels. The agreement regulated dangerous maneuvers and harassment of vessels, established means for communicating the presence of submarines and surface naval movements, and generated a mechanism for regular consultation.44 These successes helped lead to the formalization of the CBM concept in 1975 in Helsinki at the Conference on Security and Cooperation in Europe.45

#### Shortages virtual water trading---that solves conflict through interdependence

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The last argument is about the strategic power of virtual water. Central to this argument is the work of Allan (1996, 1998, 2002) which elaborates on how water resources can be appropriated through the transnational trade of agricultural commodities. The adjective “virtual” is used to stress that such water is not physically present in the commodities that are traded. Some regions of the world, such as the Middle East, do not have enough water to produce all the food required to feed their populations. This situation could be expected to lead social tensions. However, according to Allan, reliance on international trade has allowed these countries to circumvent their chronic water scarcity and meet their needs. In this light, trade can be explicitly considered as a mechanism that has a water-saving function (Hoekstra & Chapagain, 2008; Konar, Hussein, Hanasaki, Mauzerall & Rodriguez-Iturbe, 2013). Allan (1998) noted that the importation of agricultural commodities and other goods is associated with the virtual transfer of the water resources used to produce those goods. More specifically, his work (Allan, 1996, 1998, 2002, 2003, 2005) described how countries' dependence on water for agriculture, which on average accounts for 70% of the entire global water consumption (Richter, 2014), is often satisfied by the import of agricultural commodities. He demonstrates his argument relying also on historical evidence. In the case of the Middle East and North Africa, Allan (1998) estimates that virtual water flows associated with the importation of grains from North America exceeds the actual water flows in the Nile River. It is by analyzing the virtual water trade phenomenon that Allan comes to the conclusion that it is much more logical and convenient to trade with foreign countries and import virtual water from them rather than going at war with them. Despite some analytical criticism (Ansink, 2010), virtual water trade remains at the basis of one of the key arguments used to refute the “water leads to war” thesis. Other studies, mostly on the industrial sector, are also supporting the view that trade reduces the likelihood of conflict, though their focus is neither on water resources nor on virtual water trade (De Angelis, Metulini, Bove, Ricaboni, 2017; Dorussen, 2006; Hegre, Oneal, Russett, 2010). The counterargument, could be that trade has sustained population growth in importing countries, thereby enhancing water scarcity, trade dependence and consequently increasing in the long run the risk of instability while reducing societal resilience (D'Odorico, Laio & Ridolfi, 2010; Suweis et al., 2013).

#### Shortages create interdependence AND shared lines of communication that defuse crisis

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“Water wars are coming!” the newspaper headlines scream. It seems obvious—rivalries over water have been the source of disputes since humans settled down to cultivate food. Even our language reflects these ancient roots: “rivalry” comes from the Latin rivalis, or “one using the same river as another.” Countries or provinces bordering the same river (known as “riparians”) are often rivals for the water they share. As the number of international river basins (and impact of water scarcity) has grown so do the warnings that these countries will take up arms to ensure their access to water. In 1995, for example, World Bank Vice President Ismail Serageldin claimed that “the wars of the next century will be about water.”

These apocalyptic warnings fly in the face of history: no nations have gone to war specifically over water resources for thousands of years. International water disputes— even among fierce enemies—are resolved peacefully, even as conflicts erupt over other issues. In fact, instances of cooperation between riparian nations outnumbered conflicts by more than two to one between 1945 and 1999. Why? Because water is so important, nations cannot afford to fight over it. Instead, water fuels greater interdependence. By coming together to jointly manage their shared water resources, countries can build trust and prevent conflict. Water can be a negotiating tool, too: it can offer a communication lifeline connecting countries in the midst of crisis. Thus, by crying “water wars,” doomsayers ignore a promising way to help prevent war: cooperative water resources management.

### !T – Ag

#### Scarcity forces a shift to sustainable agriculture

Ann Hayden 21, Senior Director of Western Water and Resilient Landscapes at the Environmental Defense Fund, Emmy Cattani, Fifth-Generation Member of Cattani Farms, “Silver Lining to Water Woes Could Be Farmers Putting Their Lands To New Uses Besides Crops”, Fresno Bee, 4/21/2021, https://www.fresnobee.com/opinion/readers-opinion/article250540959.html

The Central Valley has reached a critical juncture. On one path, without proactive, collaborative planning, the Valley could become a haphazard patchwork of dusty fields infested with invasive weeds and pests, further impairing already poor air quality, devastating the agricultural economy and putting many farmworkers out of work. On another path, the Valley can remain a thriving agricultural region amid a mosaic of new land uses, like vibrant habitat corridors for the endangered San Joaquin kit fox or wildlife-friendly groundwater recharge areas for migratory birds or outdoor recreational green spaces for families. A bill that on Thursday unanimously passed out of the Assembly Committee on Water, Parks and Wildlife can help move the Valley down this second, more resilient path. Introduced by Assemblymembers Robert Rivas (D-Hollister) and Rudy Salas (D-Bakersfield), AB 252 will help ease the Valley’s transition to sustainable groundwater use and open the door to exciting new opportunities. In 2014, the Legislature passed the historic Sustainable Groundwater Management Act, the most sweeping change to California water law in a century. Commonly referred to as SGMA (pronounced “sigma”), this law was passed to address decades of groundwater overpumping, which caused significant impacts. During the last drought, overpumping caused land to sink and damaged roads and canals, dried up community drinking water wells, and de-watered wetlands. The implementation of SGMA is critically important to build long-term water sustainability for the Central Valley and will require a variety of tools and approaches to succeed. One unfortunate reality of adjusting to increased water scarcity is that a significant amount of the state’s irrigated agricultural land---potentially the size of Yosemite National Park---will need to shift to less water-intensive agriculture or be taken out of production over the next couple decades. This will undoubtedly be challenging and will be exacerbated by more frequent droughts---like what we’re now experiencing---that will put additional strain on limited water supplies. AB 252 will create the Multi-benefit Land Repurposing Incentive Program to compensate farmers who voluntarily re-purpose some of their previously irrigated land to create new uses that Valley communities need and want. Benefits could include water sustainability, habitat corridors for wildlife, and open space and recreational areas. Importantly, this program can also provide incentives to landowners to make the changes necessary to comply with SGMA sooner and in a way that minimizes economic and social impacts.

#### Industrial ag collapses insect populations---extinction

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* New studies assessing insect declines around the planet find that on average, the decline in insect abundance, seen on nearly every continent, is thought to be around 1-2% per year or 10-20% per decade.
* Precipitous insect declines are being escalated by humanity as soaring population and advanced technology push us closer to overshooting several critical planetary boundaries including biodiversity, climate change, nitrification, and pollution.
* Action on a large scale (international, national, and public/private policymaking), and on a small scale (replacing lawns with insect-friendly habitat, for example) are desperately needed to curb and reverse insect decline.

Chances are, the works of the world’s insects touch your lips every day. The coffee or tea you savor, both are pollinated by insects. Apples, oranges, cabbages, cashews, cherries, carrots, broccoli, watermelon, garlic, cinnamon, basil, sunflower seeds, almonds, canola oil---all are insect-pollinated. Honey, dyes, even some vaccines require insects to come to fruition.

Vital to the world’s food web, nested in nutrient cycling, and embedded in industries---the closer we look, the more we see insects as vital to maintaining life’s frameworks. Referring to this fact, famed biologist E.O. Wilson wrote in 1987, “[I]f invertebrates were to disappear, I doubt the human species could last more than a few months.”

Which is why the precipitous decline of insects is raising alarms.

Insect populations are being reduced at varying rates across space and time, but on average, the decline in their abundance is thought to be around 1-2% per year, or 10-20% per decade.

“Think of a landowner with a million-dollar house on a river that’s a little bit wild. And they’re losing 10% to 20% of their land every decade, and it’s horrifying. It means that after even a century, you really don’t have anything left,” David Wagner, an entomologist with the University of Connecticut told Mongabay in an interview. That, he says of this comparison, is the danger we now face.

Wagner has just edited a newly released in-depth feature in the Proceedings of the National Academy of Science, Global Decline of Insects in the Anthropocene, in which 56 researchers present scientific studies, opinions and news on insect declines. The journal offers perspectives on the ecological, taxonomic, geographical and sociological dimensions of insect declines, along with suggestions on how we move forward to study and reverse this drain on global biodiversity.

Insect “death by a thousand cuts”

In a perspective piece that leads off the special issue, Wagner and his co-authors address the likely causes of insect decline. The main stressors to insects, they write, are changes in land use (particularly deforestation), agriculture, climate change, nitrification, pollution and introduced species. However, the importance of each stressor and how they interact still puzzles scientists.

“There are so many good scientists that can’t figure out what the cause is,” Wagner said. He poses the well-known honeybee as an example. “I mean, this thing is worth billions upon billions of dollars and we don’t know why it’s having such a hard time. And I think the reason is, it’s death by a thousand cuts… most of these things are hit by four or five pretty important stressors, and they’re acting synergistically.”

The articles that follow that opening essay zero in on the key causes for some of the biggest known losses:

A study by Wagner and Peter Raven, president emeritus of the Missouri Botanical Garden, concludes that declines in insect biodiversity and biomass are linked to the intensification of agriculture over the past 50 years.

Research by Dan Janzen and Winnie Hallwachs---both biologists from the University of Pennsylvania who describe themselves as “intense observers of caterpillars, their parasites, and their associates”---focuses on climate change as a stressor. Since the late 1970s, they write, they’ve watched as insect declines came to the dry forests, cloud forests, and rainforests of Costa Rica’s Guanacaste Conservation Area, as the region was plagued by rising temperatures, increasingly erratic seasons and inconsistent rainfall.

Another study in the special feature, titled, Insects and recent climate change, argues that climate may be playing even more of a role in declines than land-use change---which is massive around the planet mostly due to agribusiness expansion. The authors base their climate findings on a Northern California butterflies case study, where declines were severe even in areas suffering little habitat loss. Similar losses within well-protected areas have been detected in Germany and Puerto Rico.

Likewise, butterfly populations in Europe face challenges. In the UK, butterfly numbers have declined by around 50% over the past 50 years, with 8% of known resident species considered extinct. In the Netherlands, upwards of 20% of species have been lost and in Belgium 29%. Researchers suggest habitat loss, habitat degradation and chemical pollution as the primary causes. The authors offer conservation solutions and recommend policy changes to conserve butterflies and other insects---but so far political will has been lacking.

Moving from the winged creatures of the day to night fliers, Wagner and colleagues give an overview of the global state of moth declines. Moths are extremely diverse and cosmopolitan. “For every butterfly that Mongabay readers see during the daytime, there are 19 species of moths flying around at night,” Wagner revealed.

Although moth numbers have declined in some areas, such as in parts of Europe and Central America, in other, mostly temperate areas, many moth taxa are increasing in abundance. Another study found that the overall abundance of arthropods in the Arctic has increased in recent years. Researchers attribute these increases in insect abundance to climate change, which scientists say has both its species winners and losers. As warmer temperatures march northward, new suitable habitats open up for insects. The consequences of this range expansion---and the conflicts which may occur with plant and insect species already occupying those ranges---have yet to be analysed.

Insect declines are emblematic of a larger problem: the earth is in the midst of what some call the “sixth mass extinction.” Birds, amphibians, freshwater mussels, large mammals, all have seen dwindling numbers. The question for entomologists, Wagner said, is whether or not the decline of insects is actually occurring faster than for some other groups, especially because insects are often the direct target of destruction by human, due to pesticide and herbicide use.

Sarah Cornell, a scientist at the Stockholm Resilience Centre (SRC), raises an insect-related question relevant to our time: “There might have been many more mass extinctions. It’s just that we only see extinctions with the things that leave a record… things with skeletons… When people [say], ‘we’re entering the sixth mass extinction.’ Okay, well, how do we know that? We might be entering the 17th?… We might make ourselves extinct before we even reach these hallowed glories of the sixth.”

Overshooting planetary boundaries

Clearly, the loss of insect abundance---depending on where and how fast it occurs---could have far more dire, unforeseen impacts than the loss of coffee or cashews. The wholesale transformation of global ecosystems, triggering mass insect declines, could be pushing the Earth past what scientists have dubbed as a “planetary boundary.”

#### Industrial runoff causes dead zones and ocean collapse---extinction

Dr. Ian Hendy 17, PhD in Trophic Marine Biology, Research and Communication Officer and Senior Scientific Researcher in Marine Ecology at the University of Portsmouth, Institute of Marine Sciences Laboratories, “Gulf of Mexico 'Dead Zone' Is Already A Disaster – But It Could Get Worse”, Phys Org, 8/14/2017, https://phys.org/news/2017-08-gulf-mexico-dead-zone-disaster.html

Each summer, a large part of the Gulf of Mexico "dies". This year, the Gulf's "dead zone" is the largest on record, stretching from the mouth of the Mississippi, along the coast of Louisiana to waters off Texas, hundreds of miles away. Around 8,776 square miles of ocean, an area the size of New Jersey or Wales, is almost lifeless.

John Muir, the famed naturalist and early conservation campaigner, once said that: "When we try to pick out anything by itself, we find it hitched to everything else in the Universe." His point was that everything in nature is connected, and that no part of our ecosystem exists entirely independently from any other.

It is perhaps no surprise then that ultimate cause of the Gulf of Mexico's dead zone can be found many miles inland. Fertilisers used by farmers then wash into the Mississippi River and eventually into the sea, where nutrients such as nitrogen and phosphorus stimulate an explosion in microscopic algae, creating huge "algal blooms". The algae then die and sink to the bottom, where they decompose. But the same bacteria which decompose the algae also use the sea's oxygen during the process, leaving an "anoxic" ocean.

Fish and other mobile sea creatures are able to escape the suffocating dead zone. Less lucky however are the sponges, corals, sea squirts and other animals who live their lives fixed in one place on the sea bed. Low oxygen levels place them under great stress and we have seen huge mortalities. Such losses will of course ripple up the food web, creating a negative chain reaction of increasing mortality rates in larger and larger animals.

The "dead zone" has grown this year due to increased rainfall in America's Midwest washing ever greater amounts of nutrients into the Mississippi, which ultimately end up in the Gulf. Not only is this a huge conservation issue – the Gulf contains key nursery habitats such as mangrove forests, sea grass beds and coral reefs that benefit adjacent fisheries – but it also has huge consequences for the local fishing economy, particularly the shrimp industry.

Steps are under way to slow down the ecological disaster. Some farmers in the Mississippi basin are using large grassy zones along waterways in order to soak up the agricultural fertilisers and filter out many of the nutrients before they make their way down the Mississippi to pollute the Gulf. However, it remains to be seen whether such measures are effective – and US farmers certainly need to greatly reduce the nitrogen and phosphates they use.

In the century since Muir's death, things have sped up. A larger population demands more food which means more deforestation, more farmland and more fertiliser. The increase demand placed on our land is ultimately affecting the marine environment.

These losses are unsustainable. The marine environment is integral for all life on earth, from an ecological and economic point of view. If we keep losing ecosystem services such as coastal nursery habitats and spawning grounds at this current rate, it will not just be an area the size of a state that is a dead zone, but the whole Gulf, or even whole oceans.

#### Bees are on the brink---extinction

Dr. Bruce E. Tonn 21, Professor of Political Science at the University of Tennessee, PhD in Urban and Regional Planning from Northwestern University, BS in Civil Engineering from Stanford University, Senior Researcher in the Environmental Sciences Division of Oak Ridge National Laboratory, Anticipation, Sustainability, Futures and Human Extinction: Ensuring Humanity’s Journey into The Distant Future, p. 33

This second class of existential risks is primarily found in coupled human–natural systems. These could be seen as extinction-level events in and of themselves, but I think they could be initiating or contributory events to human extinction (again see the scenario at the end of Chapter 4). Technically, we also know how to prevent these events or at least how to adapt to them. Here are four to consider:

(1) Significant loss of biodiversity – It is well documented that human behavior is causing a sixth mass species extinction on the earth.44 This is due to many factors including destruction of habitat, spreading of disease (e.g., Chytrid fungus in amphibians), pollution, and climate change. The risk to humanity is that if too many of the species become extinct, global ecosystems could crash, disrupting essential balances of species needed to support ecosystem services and maybe even threatening global balances of oxygen and nitrogen.45

(2) *Agricultural systems failure* – There are numerous additional potentially catastrophic risks facing the world’s agricultural systems. For example, the world currently relies upon only about 14 different crops.46 Unanticipated and unchecked microbial infections could wipe out major portions of the food supply. Soil erosion, extended droughts, fires, and various other natural disasters could also seriously impact the food supply and cause widespread famine.47 At least 75% of the world’s food is dependent in some way on bees for pollination. Currently, the world’s bee population is under extreme stress.48 Many worry that a catastrophic collapse of the world’s bee population could lead to widespread famine and collapse in human population.

#### Earthworm declines causes grain supply disruptions and civilizational collapse

Robert J. Burrowes 20, Founder of the Global Nonviolence Network, Former Honorary State Secretary of The Royal Life Saving Society, Researcher and Environmental Activist, Writer for LA Progressive, Author of “Why Violence?”, “Human Extinction Now Imminent and Inevitable? A Report on the State of Planet Earth”, The Scoop, 1/9/2020, <https://www.scoop.co.nz/stories/HL2001/S00027/human-extinction-now-imminent-and-inevitable.htm>

17. Highlighting the unheralded biodiversity crisis on Earth, as a result of habitat destruction and degradation as well as a multitude of other threats, 73,000 species of life (plants, birds, animals, fish, amphibians, insects, reptiles and microbes) on Earth were driven to extinction with the worldwide loss of many of these species – and certainly including insects, birds, animals and fish – now at catastrophic levels. Tragically, many additional species are now trapped in a feedback loop which will inevitably precipitate their extinction as well because of the way in which ‘co-extinctions’, ‘localized extinctions’ and ‘extinction cascades’ work once initiated and as has already occurred in almost all ecosystem contexts. See the (so far) five-part series ‘Our Vanishing World’. Have you seen a flock of birds of any size recently? A butterfly?

18. Separately from global species extinctions, Earth continued to experience ‘a huge episode of population declines and extirpations, which will have negative cascading consequences on ecosystem functioning and services vital to sustaining civilization. We describe this as a “biological annihilation” to highlight the current magnitude of Earth’s ongoing sixth major extinction event.’ Moreover, local population extinctions ‘are orders of magnitude more frequent than species extinctions. Population extinctions, however, are a prelude to species extinctions, so Earth’s sixth mass extinction episode has proceeded further than most assume.’ See ‘Biological annihilation via the ongoing sixth mass extinction signaled by vertebrate population losses and declines’ and ‘Our Vanishing World: Wildlife’.

19. Wildlife trafficking, worth up to $20 billion in 2019, is pushing many endangered species to the brink of extinction. Illegal wildlife products include jewelry, traditional medicine, clothing, furniture, and souvenirs, as well as some exotic pets, most of which are sold to unaware/unconcerned consumers in the West although China is heavily implicated too. See, for example, Stop Wildlife Trafficking.

20. 16,000,000 acres of pristine rainforest were cut or burnt down for purposes such as the following: acquiring timbers used in construction, clearing land to establish cattle farms so that many people can eat cheap hamburgers, clearing land to establish palm oil plantations so that many people can eat processed (including junk) foods based on this oil, clearing land to establish palm oil and soybean plantations so that some people can delude themselves that they are using a ‘green biofuel’ in their car (when, in fact, these fuels generate a far greater carbon footprint than fossil fuels), mining (much of it illegal) for a variety of minerals (such as gold, silver, copper, coltan, cassiterite and diamonds), and logging to produce woodchips so that some people can buy cheap paper, including cheap toilet paper. One outcome of this destruction is that 40,000 tropical tree species are now threatened with extinction. See ‘Our Vanishing World: Rainforests’, ‘Measuring the Daily Destruction of the World’s Rainforests’, ‘Estimating the global conservation status of more than 15,000 Amazonian tree species’ and ‘Half of Amazon Tree Species Face Extinction’.

Another outcome is that ‘the precious Amazon is teetering on the edge of functional destruction and, with it, so are we’. How long do we have? ‘The tipping point is here, it is now.’ Professor Thomas E. Lovejoy and his fellow researcher Carlos Nobre elaborate this point: ‘Bluntly put, the Amazon not only cannot withstand further deforestation but also now requires rebuilding as the underpinning base of the hydrological cycle if the Amazon is to continue to serve as a flywheel of continental climate for the planet and an essential part of the global carbon cycle.’ See ‘Amazon Tipping Point: Last Chance for Action’.

21. Vast quantities of soil were washed away as we destroyed the rainforests, and enormous quantities of both inorganic constituents (such as heavy metals like cadmium, chromium, lead, mercury, nickel and zinc) and organic pollutants (particularly synthetic chemicals in the form of fertilizers, pesticides and herbicides) were dumped into the soil as well, thus reducing its nutrients and killing the microbes and earthworms within it. We also contaminated enormous quantities of soil with radioactive waste. See Soil-net, ‘Glyphosate effects on soil rhizosphere-associated bacterial communities’ and ‘Disposing of Nuclear Waste is a Challenge for Humanity’.

To briefly elaborate the evidence in relation to earthworms: Given ‘recent reports of critical declines of microbes, plants, insects and other invertebrates, birds and other vertebrates, the situation pertaining to neglected earthworms’ was evaluated in an extensive investigation recently undertaken by Robert J. Blakemore. His research demonstrated an 83.3 percent decline in earthworms in agrichemical farms – that is, those that use pesticides, herbicides and synthetic fertilizers – compared with farms utilizing organic methods. Why? Because ‘it is impossible to replace or artificially engineer the myriad beneficial processes and services freely provided by earthworms’ which includes extensive burrows in pastures enriched with soil organic matter that allow ingress of air & water and provide living space for other soil organisms. Moreover, given that ecological services overall have been given a median value of US$135 trillion per year, which is almost double the global economic GDP of around $75 trillion – see ‘Changes in the global value of ecosystem services’ and ‘Valuing nature and the hidden costs of biodiversity loss’ – Blakemore reaches an obvious conclusion: ‘Persistence with failing chemical agriculture makes neither ecological nor economic sense.’ See ‘Critical Decline of Earthworms from Organic Origins under Intensive, Humic SOM-Depleting Agriculture’.

Given that this multifaceted destruction of the soil fundamentally threatens the global grain supply, when the ability to grow, store and distribute grains at scale is a defining element of civilization, as Professor Guy McPherson eloquently explains it: ‘A significant decline in grain harvest will surely drive this version of civilization to the abyss and beyond.’ See ‘Seven Distinct Paths to Loss of Habitat for Humans’.

#### It turns war---insect collapse causes global conflict

Larry Schwartz 14, Brooklyn-Based Freelance Writer with a Focus on Health, Science and American History, “10 of the Biggest Threats to Human Existence”, AlterNet, 7/26/2014, http://www.alternet.org/10-biggest-threats-human-existence

3. Bee Decline

Bees are dying—a lot of them, due to CCD, Colony Collapse Disorder. “One of every three bites of food eaten worldwide depends on pollinators, especially bees, for a successful harvest,” says Elizabeth Grossman, author of Chasing Molecules: Poisonous Products, Human Health. Plants depend on spreading their pollen to produce food. Bees are pollinators. No bees, no food (or at least much less). As many as 50% of the hives in the United States and Europe have collapsed in the past 10 years. The suspect in bee deaths is a class of chemicals called neonicotinoids, pesticides used on a massive scale in commercial farming. It is believed the chemicals impair the bees’ sense of direction, preventing them from returning to the hive.

With reduced pollen in the hive, fewer queen bees are produced, and eventually the colonies collapse. The European Commission has imposed a ban on these pesticides after the European Food Safety Agency concluded that they posed a “high acute risk” to honeybees. The United States, however, has declined to join Europe in banning neonicotinoids, citing other possible causes of CCD, including parasites. Meanwhile, as Nero fiddles, Rome is burning and bees are quickly disappearing. It is not hard to imagine a scenario where resulting acute food shortages bring on mass starvation, war and human extinction.

### Norming

#### No space escalation.

Bowen 18 [Bleddyn Bowen, Lecturer in International Relations at the University of Leicester. The Art of Space Deterrence. February 20, 2018. https://www.europeanleadershipnetwork.org/commentary/the-art-of-space-deterrence/]

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.

#### Offensive capabilities are weak, there are lots of defenses---their ev is hype

Dr. Joan Johnson-Freese 16, Ph.D. in Political Science and International Relations from Kent State University, Chair of the Department of National Security Studies at the Naval War College, and Theresa Hitchens, Senior Research Scholar at the Center for International and Security Studies and Former Director of the United Nations Institute for Disarmament Research (UNIDIR), “Stop The Fearmongering Over War In Space: The Sky’s Not Falling, Part 1”, Breaking Defense, 12/27/2016, https://breakingdefense.com/2016/12/stop-the-fearmongering-over-war-in-space-the-skys-not-falling-part-1/

Star Wars it ain’t, but the Pentagon is increasingly anxious over threats to its satellites, as we’ve reported frequently in recent years. But in this op-ed, scholars Joan Johnson-Freese and Theresa Hitchens argue that war in space is dangerously overhyped. — the editors

In the last two years, we’ve seen rising hysteria over a future war in space. Fanning the flames are not only dire assessments from the US military, but also breathless coverage from a cooperative and credulous press. This reporting doesn’t only muddy public debate over whether we really need expensive systems. It could also become a self-fulfilling prophecy. The irony is that nothing makes the currently slim possibility of war in space more likely than fearmongering over the threat of war in space.

Two television programs in the past two years show how egregious this fearmongering can get. In April 2015, the CBS show 60 Minutes ran a segment called “The Battle Above.” In an interview with General John Hyten, the then-chief of U.S. Air Force Space Command, it came across loud and clear that the United States was being forced to prepare for a battle in space — specifically against China — that it really didn’t want.

Gen. John Hyten: It’s a competition that I wish wasn’t occurring, but it is. And if we’re threatened in space, we have the right of self-defense, and we’ll make sure we can execute that right.

David Martin: And use force if necessary.

Gen. John Hyten: That’s why we have a military. You know, I’m not NASA.

It was explained by Hyten and other guests that China is building a considerable amount of hardware and accumulating significant know-how regarding space, all threatening to space assets Americans depend on every day. If viewers weren’t frightened after watching the segment, it wasn’t for lack of trying on the part of CBS.

Using terms like “offensive counterspace” as a 1984 NewSpeak euphemism for “weapons,” it was made clear that the United States had no choice but to spend billions of dollars on offensive counterspace technology to not just thwart the Chinese threat, but control and dominate space. While it didn’t actually distort facts — just omit facts about current U.S. space capabilities — the segment was basically a cost-free commercial for the military-industrial complex.

In retrospect though, “The Battle Above” was pretty good compared to CNN’s recent special, War in Space: The Next Battlefield. The latter might as well have been called Sharknado in Space – because the only far-out weapons technology our potential adversaries don’t have, according to the broadcast, seems to be “sharks with frickin’ laser beams attached to their heads!”

First, CNN needs to hire some fact checkers. Saying “unlike its adversaries, the U.S. has not yet weaponized space” is deeply misleading, like saying “unlike his political opponents, President-Elect Donald Trump has not sprouted wings and flown away”: A few (admittedly alarming) weapons tests aside, no country in the world has yet weaponized space. Contrary to CNN, stock market transactions are not timed nor synchronized through GPS, but a closed system. Cruise missiles can find their targets even without GPS, because they have both GPS and precision inertial measurement units onboard, and IMUs don’t rely on satellite data. Oh, and the British rock group Pink Floyd holds the only claim to the Dark Side of the Moon: There is a “far side” of the Moon — the side always turned away from the Earth — but not a “dark side” — which would be a side always turned away from the Sun.

More nefariously, the segment sensationalized nuggets of truth within a barrage of half-truths, backed by a heavy bass, dramatic soundtrack (and gravelly-voiced reporter Jim Sciutto) and accompanied by sexy and scary visuals.

Make no mistake there are dangers in space, and the United States has the most to lose if space assets are lost. The question is how best to protect them. Here are a few facts CNN omitted.

The Reality

The U.S. has all of the technologies described on the CNN segment and deemed potentially offensive: maneuverable satellites, nano-satellites, lasers, jamming capabilities, robotic arms, ballistic missiles that can be used as anti-satellite weapons, etc. In fact, the United States is more technologically advanced than other countries in both military and commercial space.

That technological superiority scares other countries; just as the U.S. military space community is scared of other countries obtaining those technologies in the future. The U.S. military space budget is more than 10 times greater than that of all the countries in the world combined. That also causes other countries concern.

More unsettling still, the United States has long been leery of treaty-based efforts to constrain a potential arms race in outer space, as supported by nearly every other country in the world for decades. Indeed, under the administration of George W. Bush, the U.S. talking points centered on the mantra “there is no arms race in outer space,” so there is no need for diplomat instruments to constrain one. Now, a decade later, the U.S. military – backed by the Intelligence Community which operates the nation’s spy satellites – seems to be shouting to the rooftops that the United States is in danger of losing the space arms race already begun by its potential adversaries. The underlying assumption — a convenient one for advocates of more military spending — is that now there is nothing that diplomacy can do.

However, it must be remembered that most space-related technologies – with the exception of ballistic missiles and dedicated jammers – have both military and civil/commercial uses; both benign — indeed, helpful — and nefarious uses. For example, giving satellites the ability to maneuver on orbit can allow useful inspections of ailing satellites and possibly even repairs.

Further, the United States is not unable to protect its satellites, as repeated during the CNN broadcast by various interviewees and the host. Many U.S. government-owned satellites, including precious spy satellites, have capabilities to maneuver. Many are hardened against electro-magnetic pulse, sport “shutters” to protect optical “eyes” from solar flares and lasers, and use radio frequency hopping to resist jamming.

Offensive weapons, deployed on the ground to attack satellites, or in space, are not a silver bullet. To the contrary, U.S. deployment of such weapons may actually be detrimental to U.S. and international security in space (as we argued in a recent Atlantic Council publication, Towards a New National Security Space Strategy). Further, there are benefits to efforts started by the Obama Administration to find diplomatic tools to restrain and constrain dangerous military activities in space.

These diplomatic efforts, however, would be undercut by a full-out U.S. pursuit of “space dominance.” This includes dialogue with China, the lack of which Gen. William Shelton, retired commander of Air Force Space Command, lamented in the CNN report.

Given CNN’s “cast,” the spin was not surprising. Starting with Ghost Fleet author Peter Singer set the sensationalist tone, which never altered. The apocalyptic opening, inspired by Ghost Fleet, posited a scenario where all U.S. satellites are taken off-line in nearly one fell swoop. Unless we are talking about an alien invasion, that scenario is nigh on impossible. No potential adversary has such capabilities, nor will they ever likely do so. There is just too much redundancy in the system.

#### Deterrence and interdependence check

Kyle L. Evanoff 19, Research Associate for International Institutions and Global Governance at the Council on Foreign Relations, “Big Bangs, Red Herrings, and the Dilemmas of Space Security”, Council on Foreign Relations, 6/27/2019, https://www.cfr.org/blog/big-bangs-red-herrings-and-dilemmas-space-security

Analysts pointed to Mission Shakti as a vivid example of growing contestation in the outer space domain. Traditional U.S. dominance in space has eroded as a litany of foreign actors (collaborator and competitor alike) have increased their spacefaring prowess, including through the development and use of ASAT weapons and dual-use uncrewed orbiters capable of space rendezvous and proximity operations [PDF]. Pundits fear that such space technologies could alter the calculus of deterrence to inauspicious effect or, worse, become instruments in an adversary’s enactment of a “space Pearl Harbor.” These fears are valid in some senses, overblown and misleading in others. Developments in space pose significant challenges for strategic stability. Obsessive concern with the remote contingency of kinetic warfare in orbit, however, detracts from efforts to address more pressing space security issues and makes catastrophic outcomes more, not less, probable.

Missiles and Lasers and Viruses, Oh My

Recent years have witnessed burgeoning democratization in the outer space domain as plummeting costs—both for manufacturing satellites and placing them in orbit—and proliferating technologies have enabled new spacefaring actors to deploy assets in Earth orbit. The number of active satellites has ballooned to more than two thousand, and their integration into military operations and civil life has deepened in tandem. Recognition of the indispensability of these orbital assets to numerous areas of strategic competition, and defense planners’ emphasis on offensive capabilities as a deterrence measure, has led states to invest large sums in the development of ASAT weapons of various stripes.

In their April Space Threat Assessment 2019 [PDF] report, Todd Harrison, Kaitlyn Johnson, and Thomas G. Roberts of the Center for Strategic and International Studies outline four categories of counterspace operations: kinetic physical attacks, non-kinetic physical attacks, electronic attacks, and cyberattacks. This litany of potential threats, which vary in their severity, reversibility, ease of attribution, and other aspects, makes U.S. policymakers uneasy. After over half a century of spacefaring pre-eminence, the United States has come to depend on the remote-sensing, telecommunications, and positioning, navigation, and timing capabilities that satellites provide. The resounding defeat of the Iraqi military by American and coalition forces during the Gulf War of the early 1990s underscored the substantial battlefield advantages that orbital capabilities confer, and numerous subsequent conflicts have affirmed the U.S. military’s tactical and strategic reliance on space assets. Proliferating counterspace systems heighten the potential for adversaries to disrupt American command, control, and communications networks, as well as surveillance and reconnaissance operations. In attacking these critical space systems, U.S. adversaries could compromise large segments of the national defense enterprise.

Indeed, an insecure orbital environment poses significant challenges for broader strategic stability. Actors in possession of counterspace capabilities can threaten or attack vital elements of ballistic missile launch detection architectures and other systems integral to national and international security, which opens new avenues for intentional, inadvertent, or accidental dispute or conflict escalation. In this sense, novel satellite vulnerabilities add layers of technical and psychological complexity to already labyrinthine deterrence calculations. The effect compounds in light of the deep integration of satellites into information and communications networks: cyber intrusions into space systems are a tantalizing option for state and nonstate actors, and such operations carry their own elaborate deterrence considerations, not least the difficulty of attribution. The net result is a convoluted deterrence landscape, rife with uncertainty and in constant motion thanks to the rapid clip and often competitive character of technological innovation.

Swords of Many Edges

For staunch deterrence advocates, this uncertainty justifies expanding counterspace arsenals. In their view, preventing a space Pearl Harbor in which a U.S. adversary launches a crippling surprise attack against American orbital assets requires evincing the certainty of a devastating counterattack. One way of accomplishing this is through the unambiguous demonstration of effective counterspace capabilities. The clearer the demonstration, the better. In this sense, ASAT missile tests, which are easy to attribute and spectacular in nature, hold great allure as a means of signaling orbital strike capabilities.

Such tests, however, come with significant drawbacks. The most obvious of these is that they generate large amounts of dangerous space debris, which pose serious hazards to spacecraft. Each new fragment requires monitoring and, in cases of potential collisions, risk assessment and avoidance maneuvers. Debris-generating military operations, in this sense, are a self-defeating proposition. ASAT missile tests also come with nebulous reputational costs, as the corpus of international space law, including the 1967 Outer Space Treaty, emphasizes that uses of space should be peaceful in nature. Likewise, UN Debris Mitigation Guidelines [PDF] affirm the importance of minimizing space junk, a dictum inconsistent with kinetic weapons testing. Western media heaped scorn on India for its violation of the important, if incipient, norm against debris generation, even after the country took pains to destroy a low-altitude satellite in order to minimize the lifespan of the bulk of the fragments.

Another important consideration for would-be ASAT testers lies in the potential for space militarization to ignite or exacerbate international arms races. Although military activities have been a persistent feature of the Space Age, those activities have often furthered peaceful as much as warlike pursuits, as has been the case with many remote-sensing operations and the opening of the U.S. Global Positioning System to civilian use. Militarization is a process rather than a state of affairs, and one that takes various forms at that. Deterrence implications notwithstanding, the development and deployment of counterspace capabilities can drive potential adversaries to develop and deploy similar capabilities, contributing to the erosion of norms of peaceful use.

Some military planners and policymakers’ assertions to the contrary, space is at present less a domain of warfighting than a domain of deep interdependence. The value of combat support functions performed from space, as important as they are to battlefield success, pales in comparison to that of other satellite-facilitated services, which are vital to myriad aspects of contemporary global society. Common space security interests include minimizing debris-generation, coordinating on satellite placement and radio-frequency spectrum use, monitoring terrestrial and space weather and the global environment, ensuring the integrity of global navigation satellite systems, tracking licit and illicit ground, air, and maritime movements, scanning for hazardous comets and asteroids, and conducting scientific observations and experiments. Many of these require states to work together to maximize benefits and minimize risks. Perceptions that one or more countries are attempting in systematic fashion to exert dominance and preclude other actors’ access to the domain and its benefits, then, carry significant dangers. They bend state behavior toward aggression and actual warfighting.

Security in the Heavens and on Earth

National governments, including that of the United States, should be careful not to make active contributions to such perceptions. Although low-level grey zone aggression has become commonplace for space-linked systems due to the relative ease and reversibility of many cyber and electronic attacks, space remains free of kinetic combat at present, as a recent Secure World Foundation report [PDF] emphasizes. Rather than responding to limited attacks by expanding counterspace arsenals, which carries the risk of contributing to arms race dynamics, U.S. and allied policymakers should accept some amount of limited aggression as more or less inevitable. They should place more emphasis on diplomacy—not weaponry—as a tool in mitigating these sorts of attacks. The United States should work with other spacefaring powers to reach consensus on non-binding rules of the road for space, using the International Code of Conduct for Outer Space Activities [PDF] that the European Union proposed in 2008 as a rough starting point. While new international law could be a greater boon still, formal UN discussions on the Prevention of an Arms Race in Outer Space have yielded little progress since the mid-1980s. A joint Chinese-Russian proposal for a Treaty on the Prevention of the Placement of Weapons in Outer Space, for instance, has significant shortcomings and has drawn open condemnation from the United States. Such paralysis, in tandem with the Trump administration’s and U.S. Senate Republicans’ disdain of multilateral treaties, makes a formal agreement a farfetched proposition for now.

More important, U.S. policymakers should avoid making decisions on the basis of a possible, though highly improbable, space Pearl Harbor. They should recognize that latent counterspace capabilities—as exemplified in 2008’s Operation Burnt Frost, which saw the United States repurpose a ballistic missile interceptor to destroy a satellite—are more than sufficient to deter adversaries from launching a major surprise attack in almost all scenarios, especially in light of the aforementioned deep interdependence in the space domain. Adding to the deterrence effect are uncertain offensive cyber capabilities. The United States continues to launch incursions into geopolitical competitors’ critical systems, such as the Russian power grid, and has demonstrated a willingness to employ cyberattacks in the wake of offline incidents, as it did after Iran shot down a U.S. drone last week. Unlike in the nuclear arena, where anything short of the prospect of nuclear retaliation holds limited dissuasive power, space deterrence can stem from military capabilities in various domains. For this reason, an attack on a U.S. satellite could elicit any number of responses. The potential for cross-domain retaliation, combined with the high strategic value of space assets, means that any adversary risks extreme escalation in launching a major assault on American space architectures. Again, well-conceived diplomatic efforts are useful in averting such scenarios altogether

#### Space innovation scenario is bogus--

1] Public sector will continue and fill in commercial space gap

2] No reverse causal argument or uniqueness, innovation now is sufficient

3] No internal link—PTD won’t unite Russia China and the US under global governance, even if they win strong space norms are established they won’t govern together in nanotech and synthetic biotech